

# Distinctive Characteristics

Antirotation 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.

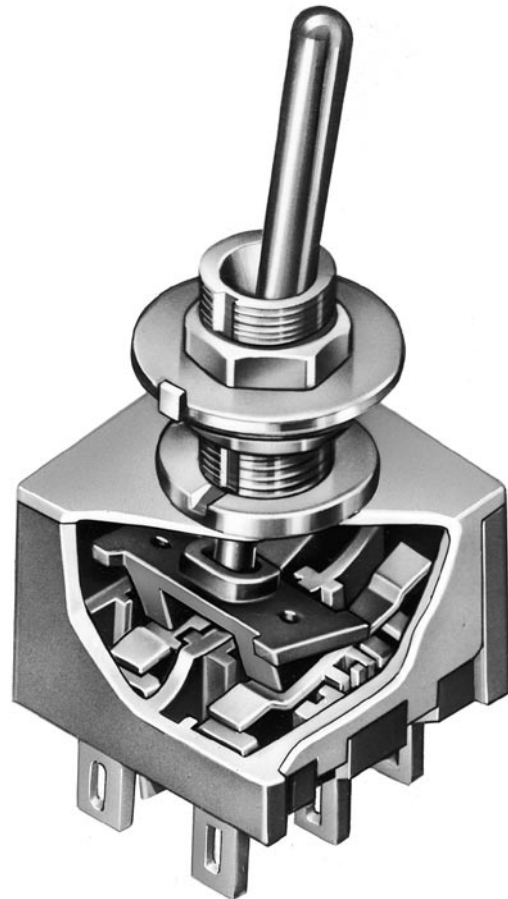
Molded diallyl phthalate case has a UL flammability rating of 94V-0.

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

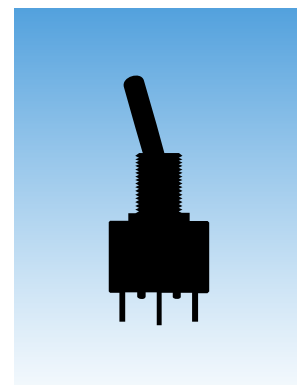
Prominent external insulating barriers increase insulation resistance and dielectric strength.

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
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### 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 ~ 7: Wave Soldering: 5 seconds maximum @ 270°C maximum. Manual Soldering: 3 seconds maximum @ 350°C maximum
<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, 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>C-UL Recognized:</b> All models recognized at 6A @ 125V AC, 3A @ 250V AC or 0.4VA maximum @ 28V DC maximum; C-UL File No. WOYR8.E44145; add "/C-UL" to end of part number to order C-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

**SMALL TOGGLES**

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

**SMALL BUSHINGS**

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

**CONTACT MATERIALS & RATINGS**

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

**OPTIONAL CAPS**

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

**CAP COLORS**

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

**CIRCUITS**

<b>*1</b>	ON	NONE	OFF
<b>2</b>	ON	NONE	ON
<b>3</b>	ON	OFF	ON
<b>5</b>	ON	NONE	(ON)
<b>8</b>	(ON)	OFF	(ON)
<b>9</b>	ON	OFF	(ON)
<b>**4</b>	ON	ON	ON
<b>**6</b>	(ON)	ON	(ON)
<b>**7</b>	ON	ON	(ON)

( ) = Momentary

\* ON-NONE-OFF circuit available in 1- and 2-pole only.

\*\* 3-ON circuits

**LARGE TOGGLES**

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

**LARGE BUSHINGS**

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

**LOCKING LEVER**

<b>L</b>	.201" (5.1mm) Dia. Locking Lever
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**BUSHINGS FOR LOCKING LEVERS**

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

**TERMINALS**

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

**For Locking Lever**

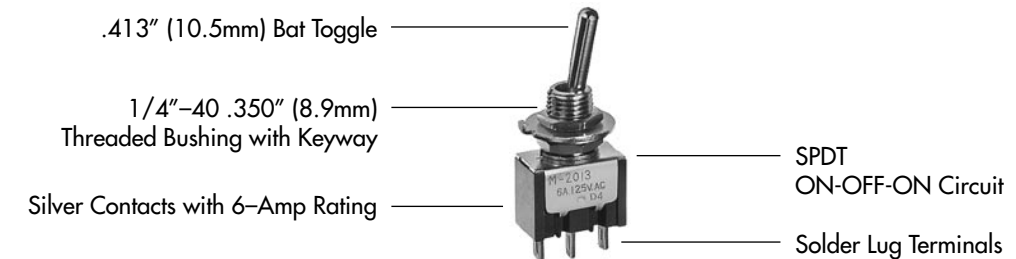
Supplied with nickel plated cap as standard.

**Optional Aluminum Caps**

<b>A</b>	Black
<b>C</b>	Red
<b>G</b>	Blue
<b>H</b>	Gray

**DESCRIPTION FOR TYPICAL ORDERING EXAMPLE**

**M2013SS1W01**



**IMPORTANT:**

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

## POLES & CIRCUITS

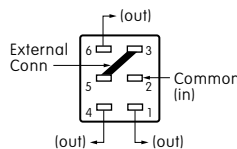
Pole	Model	Toggle Position ( ) = Momentary			Connected Terminals			Throw & Schematics
		Down <small>Keyway ↘</small>	Center	Up	Down <small>Keyway ↘</small>	Center	Up	
SP	M2011	ON	NONE	OFF	2-3	OPEN	OPEN	SPST 
SP	M2012 M2013 M2015 M2018 M2019	ON ON ON (ON) ON	NONE OFF NONE OFF OFF	ON ON (ON) (ON) (ON)	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)			

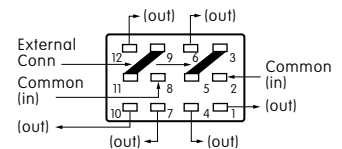
The SP3T model utilizes a double pole base.

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

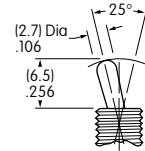
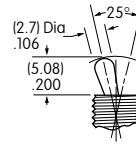
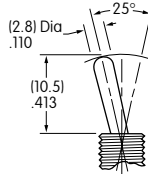
**S** .413" (10.5mm)  
Bat

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

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

**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".



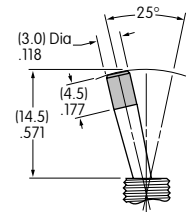
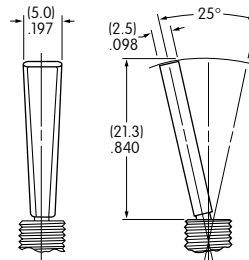
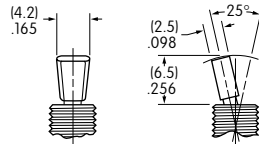
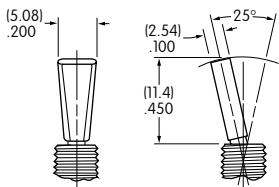
**Standard Material & Finish:** Brass with Bright Chrome  
Contact factory for optional finishes.

**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  
Material: Polycarbonate



Only Available in 1- & 2-Pole

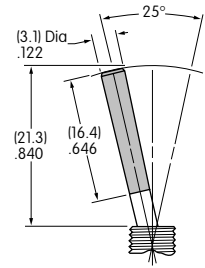
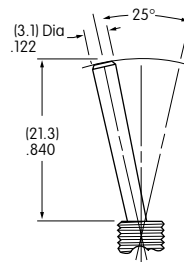
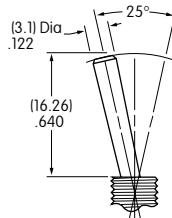
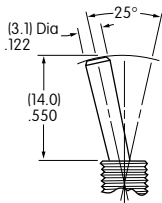
Only Available in 1- & 2-Pole

**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  
Material: Polyethylene



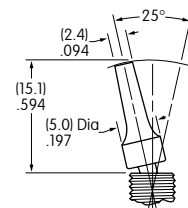
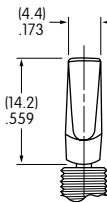
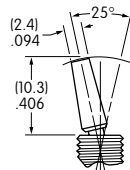
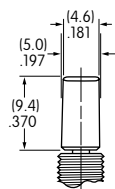
Only Available in 1- & 2-Pole

Only Available in 1- & 2-Pole

Only Available in 1- & 2-Pole

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

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

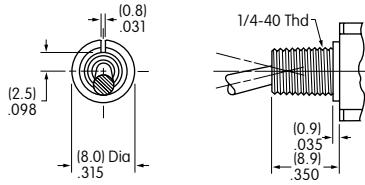


Cap Colors Available:

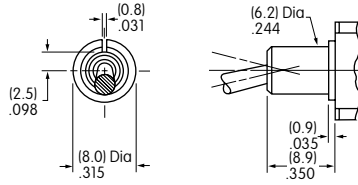
- A** Black
- B** White
- C** Red
- E** Yellow
- F** Green
- G** Blue
- H** Gray (For K1 & K2 only)

## SMALL BUSHINGS

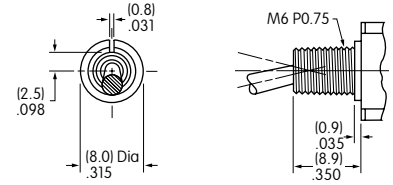
**S1** 1/4-40 .350" (8.9mm)  
Threaded with Keyway



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



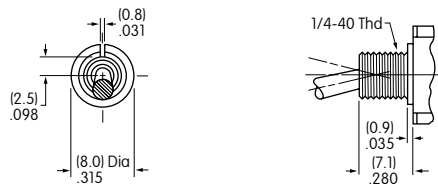
**S4** 6mm/.350" (8.9mm)  
Threaded with Keyway



Maximum Panel Thickness with  
Standard Hardware: .102" (2.6mm)

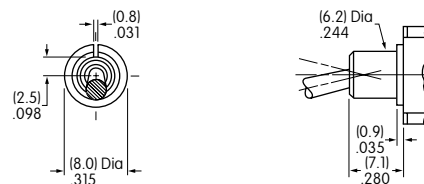
Maximum Panel Thickness with  
Standard Hardware: .102" (2.6mm)

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



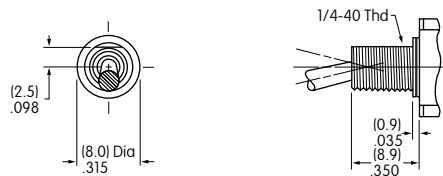
When using this bushing, toggle length is increased by .070". Maximum Panel Thickness with Standard Hardware: .031" (0.8mm)

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



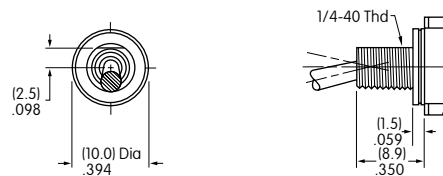
When using this bushing, toggle length is increased by .070".

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



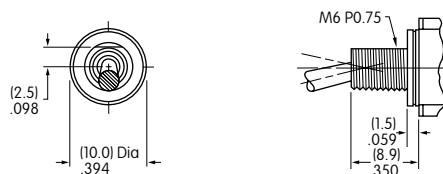
Maximum Panel Thickness with  
Standard Hardware: .102" (2.6mm)

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



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

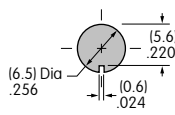
**D8** 6mm/.350" (8.9mm)  
Threaded Splashproof with D Flat



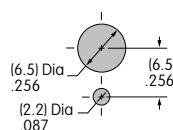
### Standard Hardware Supplied for Small Bushings

		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

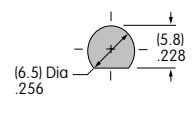
For S1, S2, A1, A2,  
or S4 Bushing  
with Keyway  
& for L1 Bushing



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



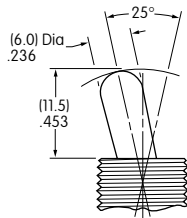
For D1, D3, or D8  
Bushing with D Flat  
& for  
L3 Bushing



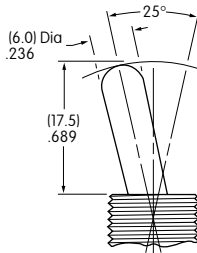
## LARGE TOGGLES

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

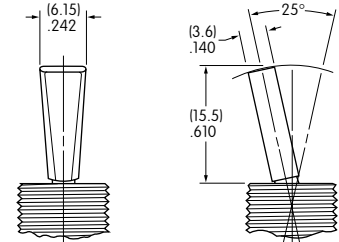
**B** .453" (11.5mm)  
Large Bat



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



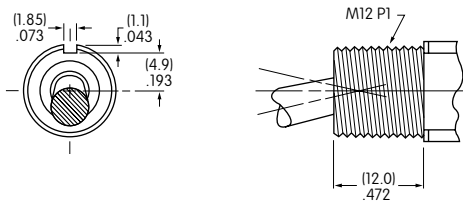
**R** .610" (15.5mm)  
Large Flatted



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

## LARGE BUSHINGS

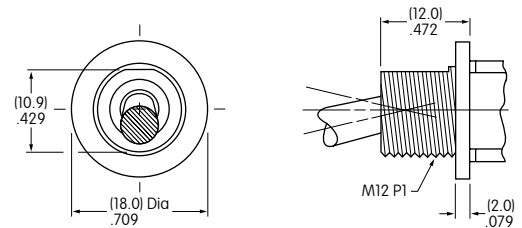
**B1** Large .472" (12.0mm)  
Threaded with Keyway



Maximum Panel Thickness with  
Standard Hardware: .216" (5.5mm)

**Standard Hardware for B1:**  
1 hex face nut AT503M, 1 locking ring AT506M,  
1 lockwasher AT508, and 1 hex backup nut AT527M

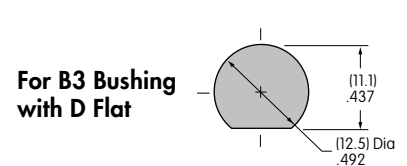
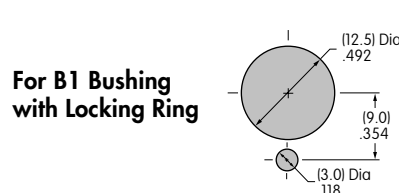
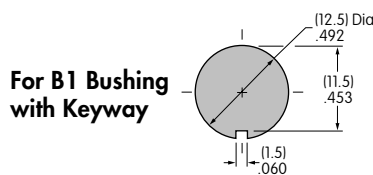
**B3** Large .472" (12.0mm)  
Threaded Splashproof with D Flat



Maximum Panel Thickness with  
Standard Hardware: .256" (6.5mm)

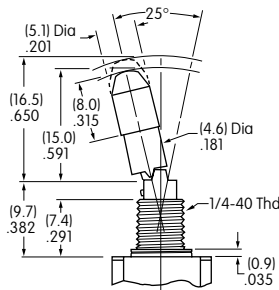
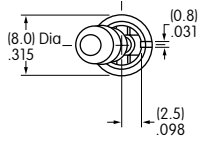
**Standard Hardware for B3:**  
1 hex face nut AT503M  
and 1 o-ring AT401P

### Panel Cutouts



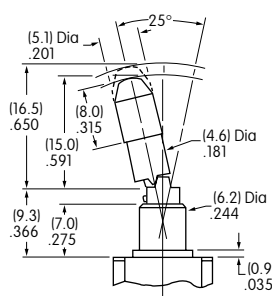
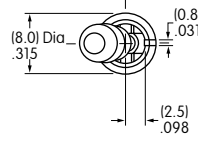
## LOCKING LEVER & BUSHINGS

### LL1 Threaded with Keyway

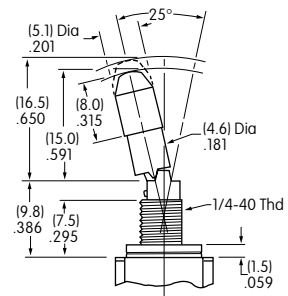
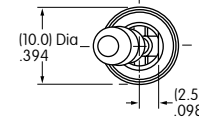


Maximum Panel Thickness with Standard Hardware: .047" (1.2mm)

### LL2 Smooth with Keyway



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

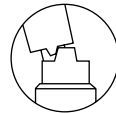


Maximum Panel Thickness with Standard Hardware: .047" (1.2mm)

Lever Material & Finish: Brass with Chrome Plating

### Locking Mechanism

on-none-on



2 positions lock

on-none-(on)



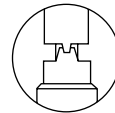
1 position locks

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



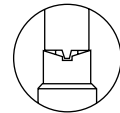
2 positions lock

on-off-on  
on-on-on

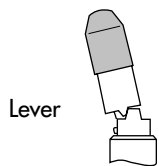


3 positions lock

(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

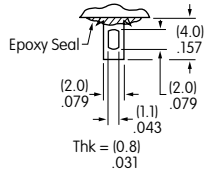
Note: This dual rated option is suitable when two or more identical switches are used in logic and in power circuits within the same application. See Supplement section to find complete explanation of dual rating and operating range.



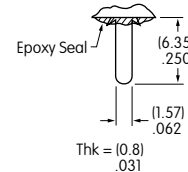
## TERMINALS

### 01 Solder Lug

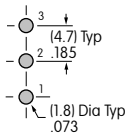
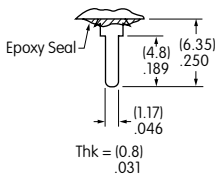
The .043" x .079" (1.1mm x 2.0mm) oblong hole accommodates 1 solid 18-gauge wire or 2 solid or stranded 20-gauge wires.



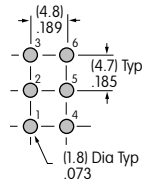
### 02 .062" (1.57mm) Wide Quick Connect



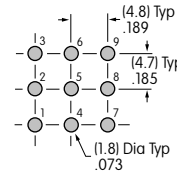
### 03 .250" (6.35mm) Straight PC



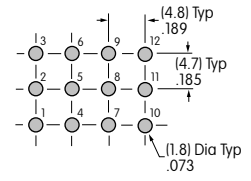
Single Pole



Double Pole



Three Pole



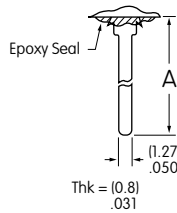
Four Pole

### 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



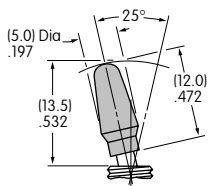
If using as extended PC terminal, refer to the above footprints.

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

## OPTIONAL CAPS & CAP COLORS

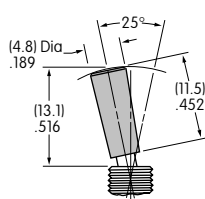
### B AT415 for S Bat Toggle

Material: Polyethylene



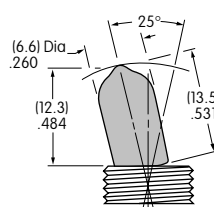
### C AT444 Conical Cap for S Bat Toggle

Material: Polyethylene



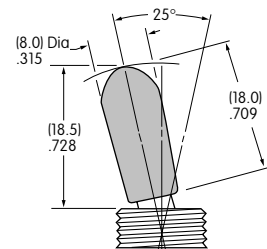
### R AT434 for B Toggle

Material: Polyvinyl Chloride



### V AT406 for B2 Toggle

Material: Polyvinyl Chloride



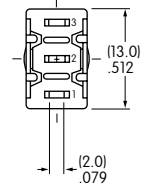
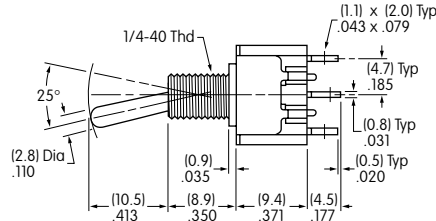
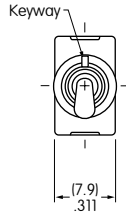
Cap Colors Available:

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

## TYPICAL SWITCH DIMENSIONS

### Solder Lug

### Single Pole

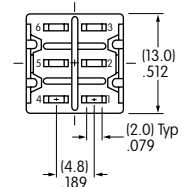
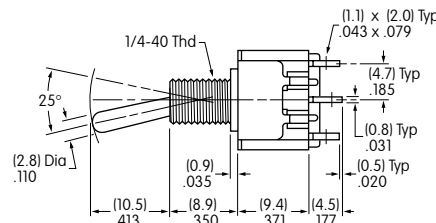
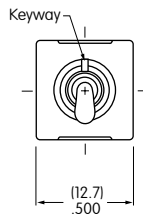


M2012SS1W01

M2011 model does not have terminal 1.

### Solder Lug

### Double Pole

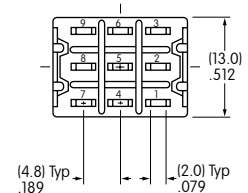
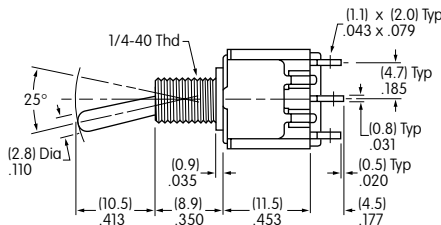
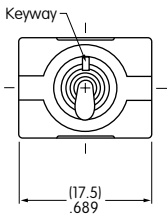


M2022SS1W01

M2021 model does not have terminals 1 & 4.

### Solder Lug

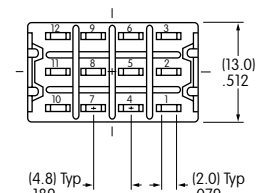
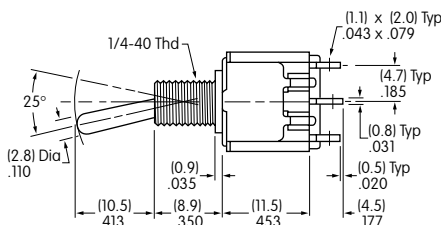
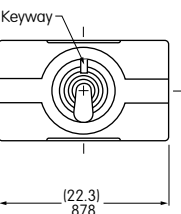
### Three Pole



M2032SS1W01

### Solder Lug

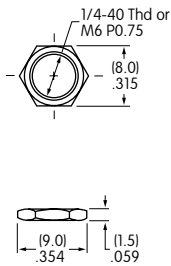
### Four Pole



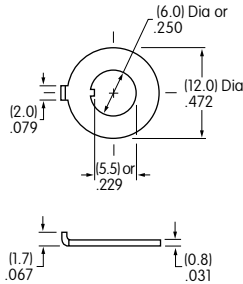
M2042SS1W01

## STANDARD HARDWARE FOR SMALL & LARGE BUSHINGS

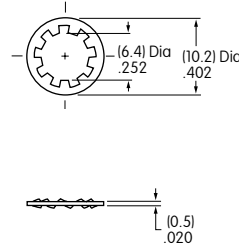
**AT513H for Inch**  
**AT513M for Metric**  
**Hex Nut**  
Brass/Nickel



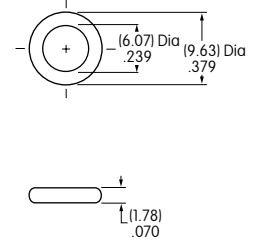
**AT507H for Inch**  
**AT507M for Metric**  
**Locking Ring**  
Steel with Zinc/Chrome



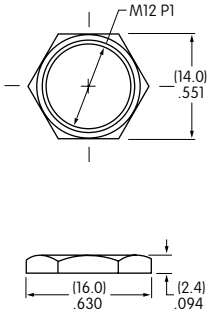
**AT509**  
**Lockwasher**  
Steel with Zinc/Chrome  
(not supplied with splashproof models)



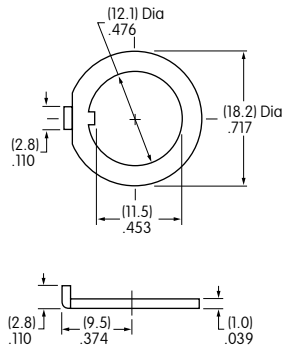
**AT516**  
**O-ring for Splashproof Models**  
Nitrile Butadiene Rubber



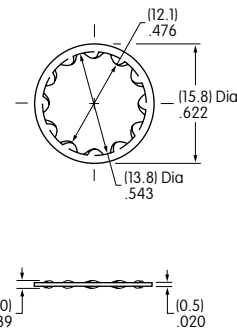
**AT503M**  
**Hex Face Nut**  
Brass/Chrome



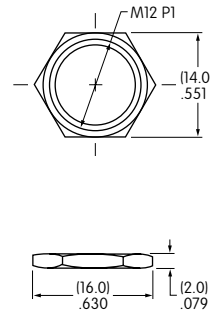
**AT506M**  
**Locking Ring**  
Steel with Zinc/Chrome



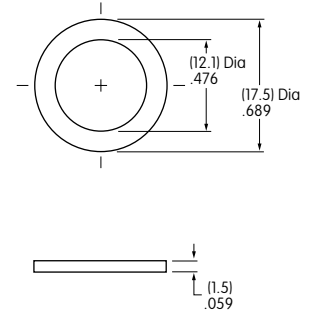
**AT508**  
**Lockwasher**  
Steel with Zinc/Chrome  
(Not supplied with splashproof models)



**AT527M**  
**Hex Nut**  
Steel with Nickel Plating



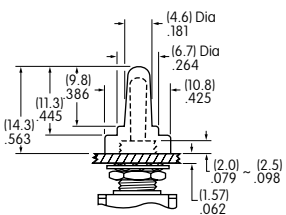
**AT401P**  
**O-ring for Splashproof Models**  
Natural Rubber



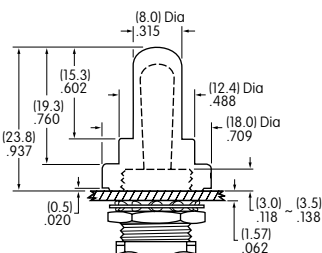
## OPTIONAL SPLASHPROOF BOOTS

Various optional nuts and ON-OFF plates are available; dimensions are shown in the Accessories & Hardware section.

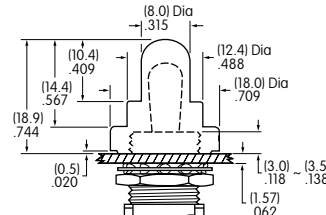
**AT428 (M-metric H-Inch)**  
**.445" (11.3mm)**  
**Boot for S Toggle**  
Silicone Rubber



**AT402**  
**.760" (19.3mm)**  
**Boot for B2 Toggle**  
Silicone Rubber



**AT402S**  
**.567" (14.4mm)**  
**Boot for B Toggle**  
Silicone Rubber



**AT401**  
**.461" (11.7mm)**  
**Boot for B2 Toggle**  
Nitrile Butadiene Rubber

