NKK SWITCHES

Toggles

Contents Toggles

Contents

General Specifications

Electrical Capacity (Resistive Load)

Logic Level: 0.4VA maximum @ 28V AC/DC maximum
(Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)
Note: Find additional explanation of operating range in Supplement section.

Other Ratings

Contact Resistance: 50 milliohms maximum
Insulation Resistance: 500 megohms minimum @ 500V DC
Dielectric Strength: 500V AC minimum between contacts for 1 minute minimum;
500V AC minimum between contacts & case for 1 minute minimum
Mechanical Life: 100,000 operations minimum for On-None-On & On-Off-On
50,000 operations minimum for other circuits
Electrical Life: 50,000 operations minimum
Nominal Operating Force: 1.47N (momentary); 1.18N (maintained) for .394" (10.0mm) toggles
2.73N (momentary); 1.84N (maintained) for all other toggles
Contact Timing: Nonshorting (break-before-make)
Angle of Throw: 26°

Materials & Finishes

Toggle: Glass fiber reinforced polyamide for antistatic; nickel plated brass for all others
Case Housing: Glass fiber reinforced polyamide
Support Bracket: Tin plated phosphor bronze
Movable Contact: Phosphor bronze with gold plating
Stationary Contacts: Brass with gold plating
Terminals: Brass with gold plating

Environmental Data

Operating Temperature Range: –30°C through +85°C (–22°F through +185°F)
Humidity: 90 ~ 95% humidity for 240 hours @ 40°C (104°F)
Vibration: 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
Shock: 50G (490m/s^2) acceleration (tested in 6 right angled directions, with 5 shocks in each direction)

PCB Processing

Soldering: Wave Soldering Recommended. See Profile A in Supplement section.
Manual Soldering: See Profile B in Supplement section.
Cleaning: Automated cleaning. See Cleaning Specifications in Supplement section.

Standards & Certifications

The A Series toggles have not been tested for UL recognition or CSA certification.
These switches are designed for use in a low-voltage, low-current, logic-level circuit.
When used as intended in a logic-level circuit, the results do not produce hazardous energy.

Distinctive Characteristics

Subminiature size saves space on PC boards.

Specifically developed for logic-level applications.

Totally sealed body construction prevents contact contamination and allows time- and money-saving automated soldering and cleaning.

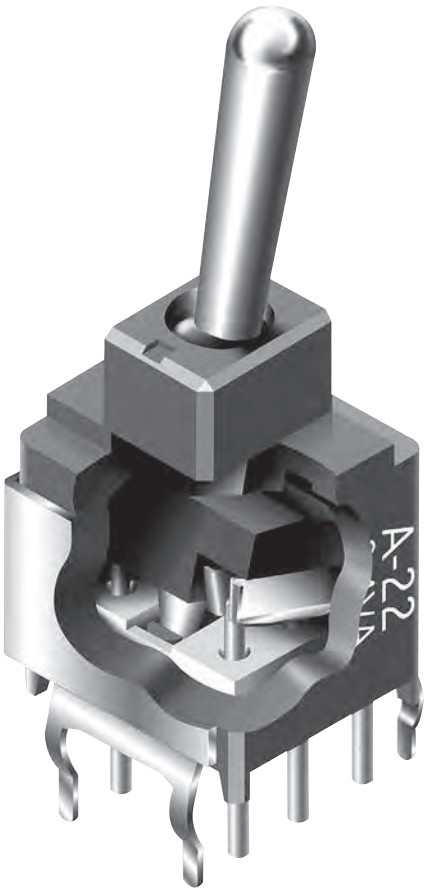
Award-winning STC contact mechanism with benefits unavailable in conventional mechanisms: smoother, positive detent actuation, increased contact stability and unparalleled logic-level reliability. (Additional STC details in Terms & Acronyms; see Supplement contents.)

Molded-in, epoxy sealed or ultrasonically welded terminals lock out flux, solvents, and other contaminants.

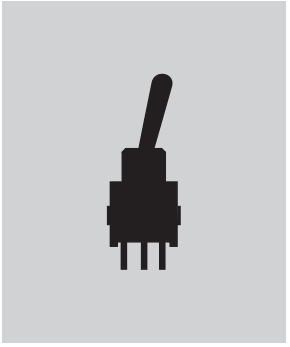
.100" x .100" (2.54mm x 2.54mm) terminal spacing conforms to standard PC board grid spacing.

Toggle option in antistatic material available for dissipating electrostatic discharges.

Matching indicators available.



Actual Size



TYPICAL SWITCH ORDERING EXAMPLE

A | 1 | 2 | J | V | — | ☐ | ☐

Poles

1	SPST SPDT
2	DPDT SP3T

Toggles

A	.394" (10.0mm) Bat
J	.248" (6.3mm) Bat
J2	.248" (6.3mm) Antistatic Bat
E	.394" (10.0mm) Flatted
H	.248" (6.3mm) Flatted
K	Snap Top for A or B Paddle

Optional Caps

G	.394" (10.0mm) Bat Lever Cap
J	.248" (6.3mm) Bat Lever Cap

Paddles

A	Short Paddle for K Toggle
B	Long Paddle for K Toggle

Circuits

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

( ) = Momentary

*3-ON circuits

PC Terminals

P	Straight
B	Straight with Bracket
B1	Straight with Inline Bracket (Single Pole only)
H	Right Angle with Bracket
V	Vertical with Bracket
V1	Vertical with Inline Bracket (Single Pole only)

Cap Colors / Paddle Colors

Cap Colors		Paddle Colors
A	Black	A
B	White	B
C	Red	C
---	Yellow	E
---	Green	F
---	Blue	G
---	Gray	H

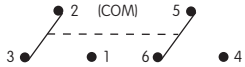
DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

A12JV

POLES & CIRCUITS

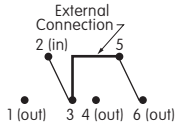
Pole	Model	Toggle Position ( ) = Momentary: Up	Center	Down	Connected Terminals: Up	Center	Down	Throw & Schematics
SP	**A11**	OFF	NONE	ON	OPEN	OPEN	3-1	SPST
SP	**A12** **A13** **A15** **A1R** **A18** **A19** **A1S**	ON ON ON (ON) (ON) ON (ON)	NONE OFF NONE NONE OFF OFF OFF	ON ON (ON) ON (ON) (ON) ON	2-3	OPEN	2-1	SPDT
DP	**A22** **A23** **A25** **A2R** **A28** **A29** **A2S**	ON ON ON (ON) (ON) ON (ON)	NONE OFF NONE NONE OFF OFF OFF	ON ON (ON) ON (ON) (ON) ON	2-3 5-6	OPEN	2-1 5-4	DPDT

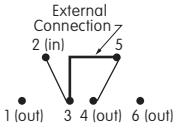
Note: Terminal numbers are not actually on the switch.

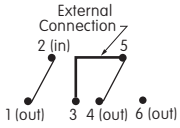


For 3 Throw (3-on)

Pole	Model	Connected Terminals & Schematics: Up	Center	Down
SP	**A24** **A26** **A27**	ON (ON) ON	ON ON ON	ON (ON) (ON)
		2-3 5-6	2-3 5-4	2-1 5-4



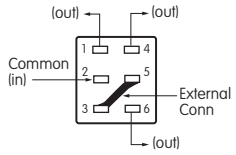




External Connection

The SP3T model utilizes a double pole base.

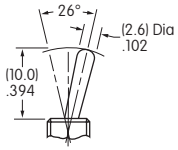
External connections must be made during field installation.



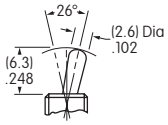
TOGGLES

Standard Material & Finish: Brass with Bright Nickel **Material & Finish for J2:** Matte finish black glass fiber reinforced polyamide

A **.394" (10.0mm) Bat**



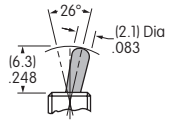
J **.248" (6.3mm) Bat**



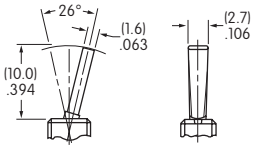
J2 **.248" (6.3mm) Antistatic Bat**

Dissipating 20Kv ESD: Straight PC

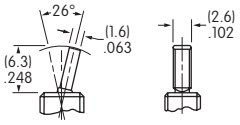
Dissipating 10Kv ESD: Straight PC with Bracket, Right Angle, & Vertical



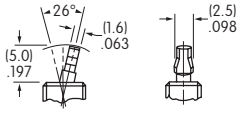
E **.394" (10.0mm) Flatted**



H **.248" (6.3mm) Flatted**



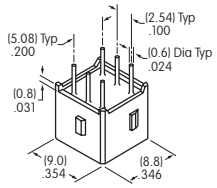
K **Snap Top for Paddles**



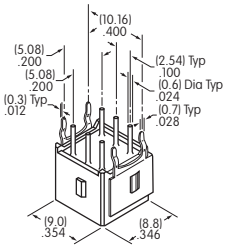
PC TERMINALS

Use of a support bracket is recommended to increase PCB mounting strength and stability.

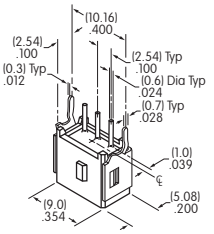
P **Straight**



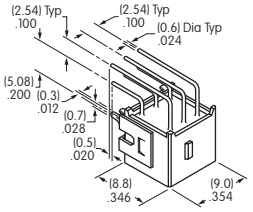
B **Straight with Bracket**



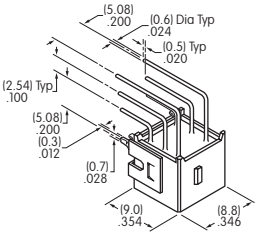
B1 **Straight with Inline Bracket**
Single Pole only



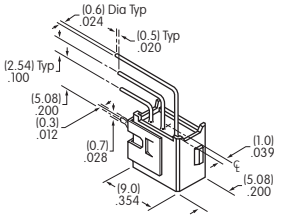
H **Right Angle with Bracket**



V **Vertical with Bracket**



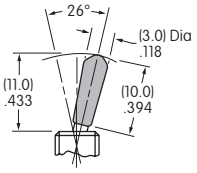
V1 **Vertical with Inline Bracket**
Single Pole only



CAPS & PADDLES

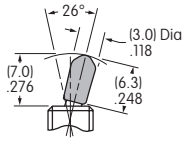
G **AT4003**
.394" (10.0mm) Bat Lever Cap

Material: PVC
Colors Available:
A, B, C



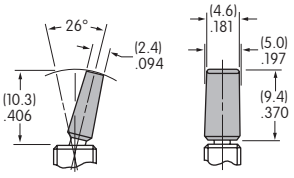
J **AT4064**
.248" (6.3mm) Bat Lever Cap

Material: PVC
Colors Available:
A, B, C



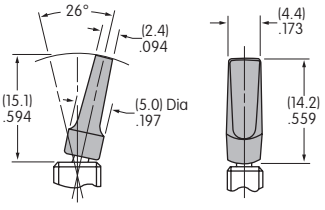
A **AT467**
Short Paddle

Material: Polyamide
Colors Available:
A, B, C, E, F, G, H



B **AT468**
Long Paddle

Material: Polyamide
Colors Available:
A, B, C, E, F, G, H

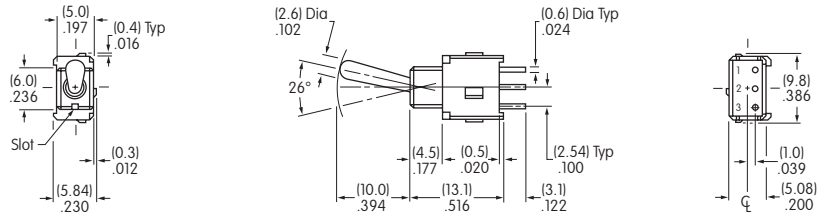


Color Codes:

A Black **B** White **C** Red **E** Yellow **F** Green **G** Blue **H** Gray

TYPICAL SWITCH DIMENSIONS

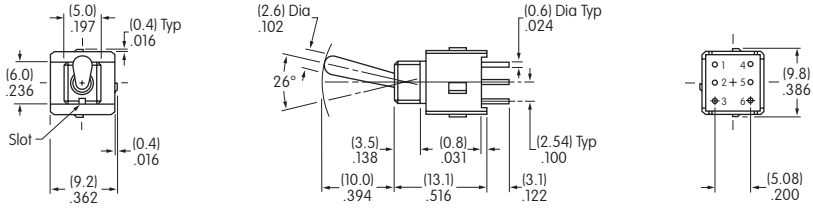
Single Pole — Straight PC



A11 models do not have Terminal 2

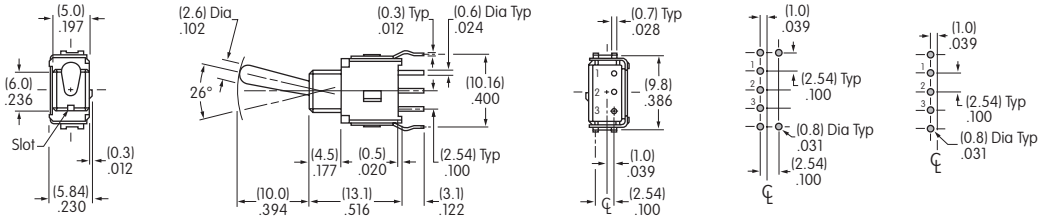
A12AP

Double Pole — Straight PC



A22AP

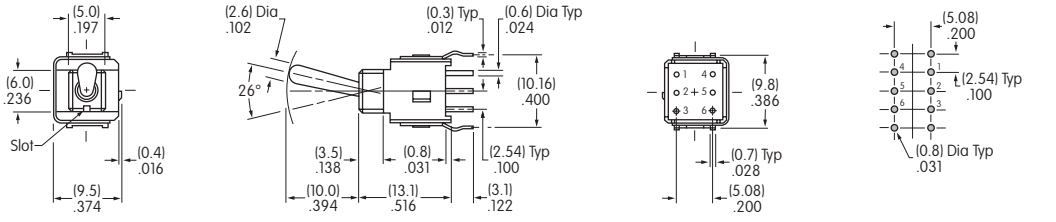
Single Pole — Straight PC • Bracket



B Terminals B1 Terminals

A12AB

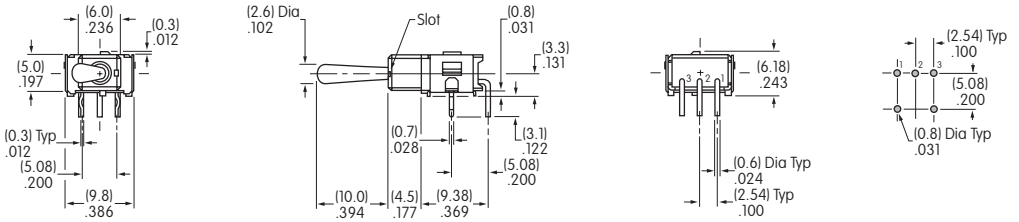
Double Pole — Straight PC • Bracket



A22AB

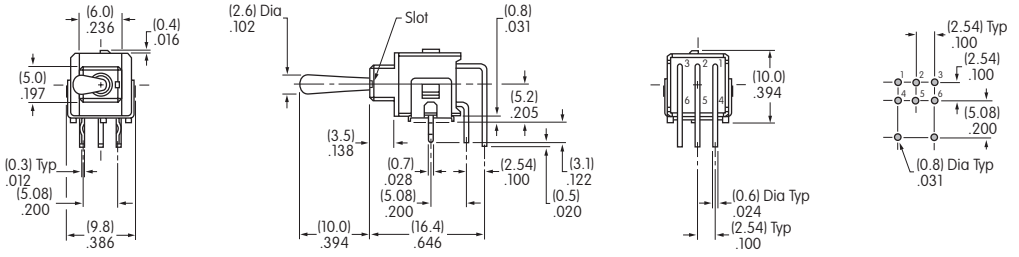
TYPICAL SWITCH DIMENSIONS

Right Angle PC — Single Pole



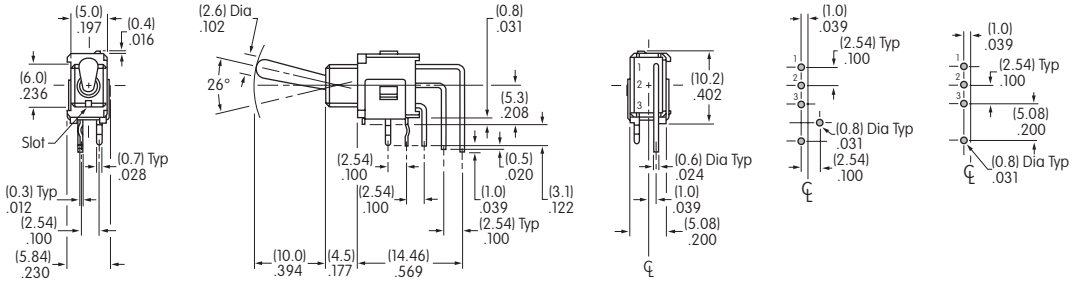
A12AH

Right Angle PC — Double Pole



A22AH

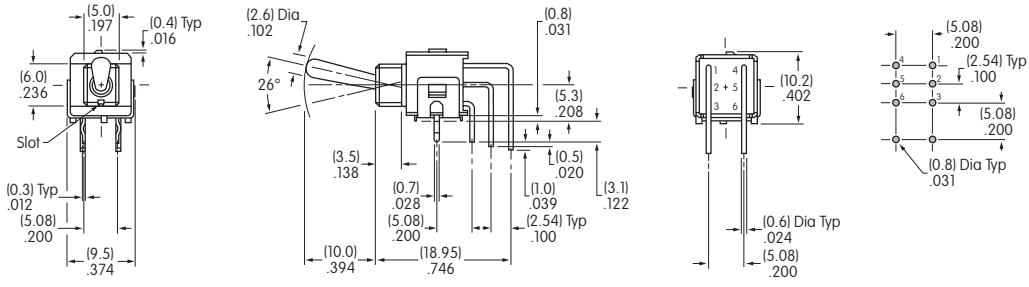
Vertical PC — Single Pole



A12AV

V Terminals V1 Terminals

Vertical PC — Double Pole



A22AV

General Specifications

Electrical Capacity (Resistive Load)

Logic Level: 0.4VA maximum @ 28V AC/DC maximum
(Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)
Note: Find additional explanation of operating range in Supplement section.

Other Ratings

Contact Resistance: 50 milliohms maximum
Insulation Resistance: 500 megohms minimum @ 500V DC
Dielectric Strength: 500V AC minimum for 1 minute minimum
Mechanical Life: 100,000 operations minimum for On-None-On & On-Off-On
50,000 operations minimum for other circuits
50,000 operations minimum for locking lever models
Electrical Life: 50,000 operations minimum
Nominal Operating Force: Toggles A, A1, E & K with Long Paddle: 1.47N (momentary); 1.18N (maintained)
Toggles J & H & K with Short Paddle: 2.72N (momentary); 1.84N (maintained)
Toggle L: 0.59N
Contact Timing: Nonshorting (break-before-make)
Angle of Throw: 26°

Materials & Finishes

Toggle: Nickel plated brass
Bushing: Carbon blended polyamide; nickel plated zinc alloy for locking levers & threaded bushing
Gasket: Nitrile butadiene rubber
Case Housing: Glass fiber reinforced polyamide
Support Bracket: Tin plated phosphor bronze
Movable Contact: Phosphor bronze with gold plating
Stationary Contacts: Copper alloy with gold plating
Terminals: Copper alloy with gold plating

Environmental Data

Operating Temperature Range: –30°C through +85°C (–22°F through +185°F)
Humidity: 90 ~ 95% humidity for 96 hours @ 40°C (104°F)
Vibration: 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
Shock: 50G (490m/s^2) acceleration (tested in 6 right angled directions, with 5 shocks in each direction)

Installation

Mounting Torque: .30 ~ .45Nm (2.65 ~ 3.98 lb•in) for A1 actuator with threaded bushing only

PCB Processing

Soldering: Wave Soldering Recommended: See Profile A in Supplement section.
Manual Soldering: See Profile A in Supplement section.
Cleaning: Automated cleaning. See Cleaning specifications in Supplement section.

Standards & Certifications

Flammability Standards: UL94V-0 available
The B Series toggles have not been tested for UL recognition or CSA certification.
These switches are designed for use in a low-voltage, low-current, logic-level circuit.
When used as intended in a logic-level circuit, the results do not produce hazardous energy.

Distinctive Characteristics

Subminiature size saves space on PC boards.

Specifically developed for logic-level applications.

Antistatic superstructure, consisting of the carbon impregnated bushing and the support bracket, prevents static discharge to the contacts. Static electricity from an operator's touch travels from actuator through the bushing and bracket to the PC board.

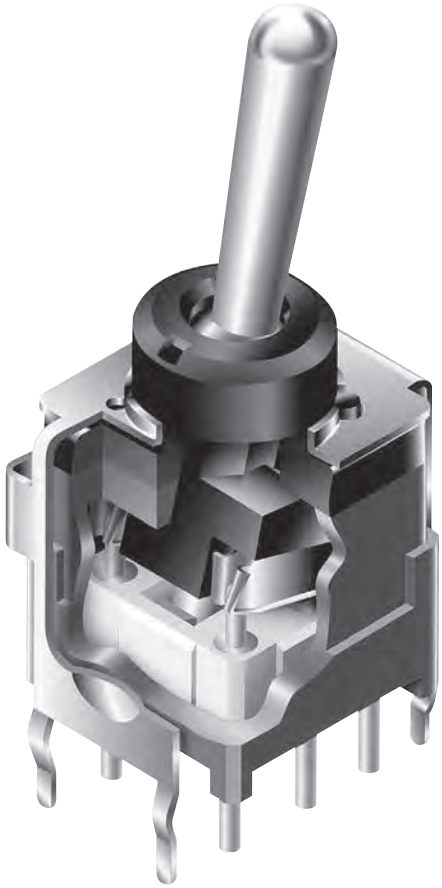
Locking lever mechanism offered as a toggle option.

Optional threaded, 6mm diameter bushing for panel seal mounting meets IP65 of IEC60529 specifications (similar to NEMA 4 and 13).

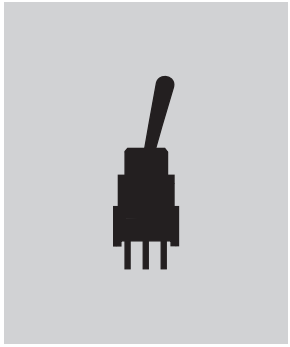
Totally sealed body construction prevents contact contamination and allows time- and money-saving soldering and cleaning. Epoxy sealed terminals lock out flux and other contaminants.

Award-winning STC contact mechanism with benefits unavailable in conventional mechanisms: smoother, positive detent actuation, increased contact stability and unparalleled logic-level reliability. (Additional STC details in Terms & Acronyms; see Supplement section.)

.100" x .100" (2.54mm x 2.54mm) terminal spacing conforms to standard PC board grid spacing.



Actual Size



Series B

Process Sealed Subminiature Antistatic Toggles

TYPICAL SWITCH ORDERING EXAMPLE

B 1 2 A B — ☐ ☐

Poles

1	SPDT
2	DPDT

Toggles

A	.394" (10.0mm) Bat
A1	.315" (8.0mm) Bat with Panel Seal Threaded Bushing (Straight PC only)
J	.248" (6.3mm) Bat
E	.394" (10.0mm) Flatted
H	.248" (6.3mm) Flatted
L	Locking Lever (with Circuits 2 & 3 only)

Optional Caps

G	.394" (10.0mm) Bat Lever Cap
J	.248" (6.3mm) Bat Lever Cap

Circuits

2	ON	NONE	ON
3	ON	OFF	ON
5	ON	NONE	(ON)
*R	(ON)	NONE	ON
8	(ON)	OFF	(ON)
9	ON	OFF	(ON)
*S	(ON)	OFF	ON

( ) = Momentary

* Reverse circuits R & S available with right angle & vertical only

PC Terminals

P	Straight
*B	Straight with Bracket
*H	Right Angle with Bracket
*V	Vertical with Bracket

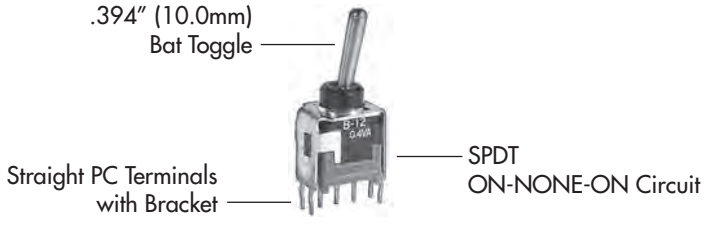
* Bracketed models are ESD protected

Cap Colors / Paddle Colors

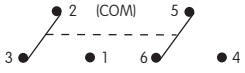
Cap Colors		Paddle Colors
A	Black	A
B	White	B
C	Red	C
---	Yellow	E
---	Green	F
---	Blue	G
---	Gray	H

DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

B12AB



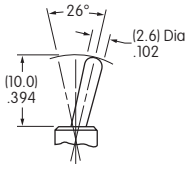
POLES & CIRCUITS

Pole	Model	Toggle Position ( ) = Momentary: Up	Center	Down	Connected Terminals: Up	Center	Down	Throw & Schematics
		Slot			Slot			Note: Terminal numbers are not actually on the switch.
SP	B12	ON	NONE	ON	2-3	OPEN	2-1	SPDT 
	B13	ON	OFF	ON				
	B15	ON	NONE	(ON)				
	B1R	(ON)	NONE	ON				
	B18	(ON)	OFF	(ON)				
	B19	ON	OFF	(ON)				
	B1S	(ON)	OFF	ON				
DP	B22	ON	NONE	ON	2-3 5-6	OPEN	2-1 5-4	DPDT 
	B23	ON	OFF	ON				
	B25	ON	NONE	(ON)				
	B2R	(ON)	NONE	ON				
	B28	(ON)	OFF	(ON)				
	B29	ON	OFF	(ON)				
	B2S	(ON)	OFF	ON				

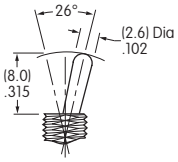
TOGGLES

Standard Material & Finish: Brass with Bright Nickel

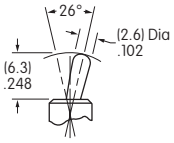
A **.394" (10.0mm) Bat**



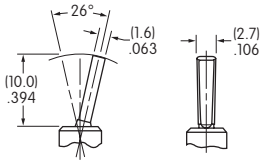
A1 **.315" (8.0mm) Bat with Panel Seal Threaded Bushing**



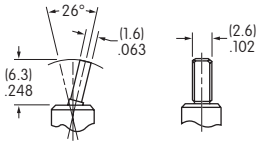
J **.248" (6.3mm) Bat**



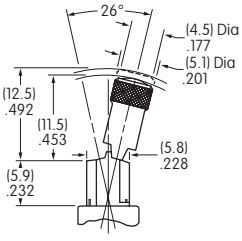
E **.394" (10.0mm) Flatted**



H **.248" (6.3mm) Flatted**



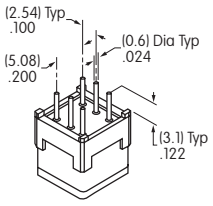
L **Locking Lever**



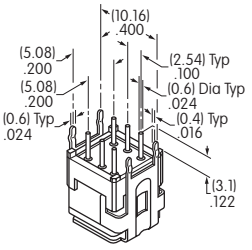
PC TERMINALS

Use of a support bracket is recommended to increase PCB mounting strength and stability.

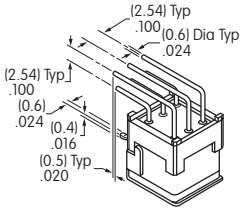
P **Straight**



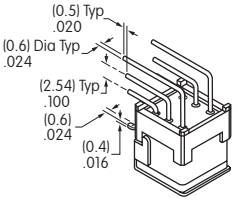
B **Straight with Bracket**



H **Right Angle with Bracket**



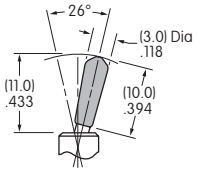
V **Vertical with Bracket**



OPTIONAL CAPS

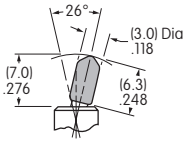
G **AT4003**
.394" (10.0mm) Bat Lever Cap

Material: PVC
Colors Available:
A, B, C



J **AT4064**
.248" (6.3mm) Bat Lever Cap

Material: PVC
Colors Available:
A, B, C

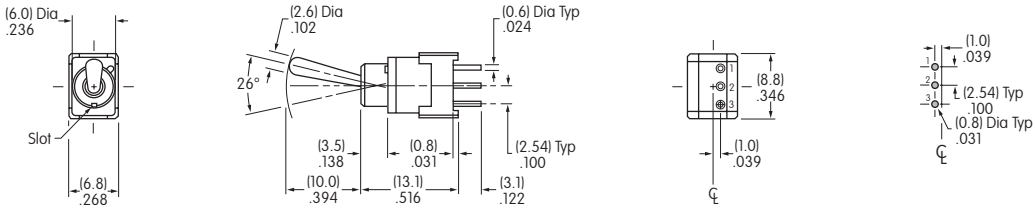


Color Codes:

A Black **B** White **C** Red **E** Yellow **F** Green **G** Blue **H** Gray

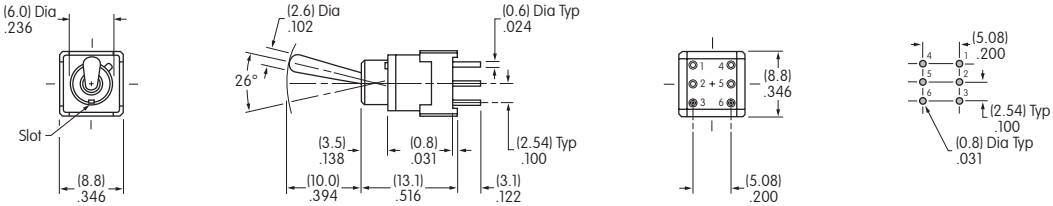
TYPICAL SWITCH DIMENSIONS

Single Pole — Straight PC



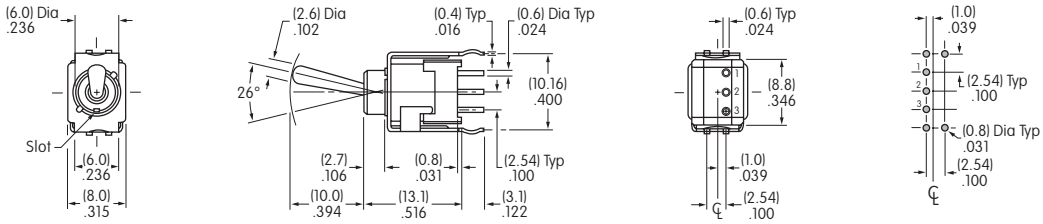
B12AP

Double Pole — Straight PC



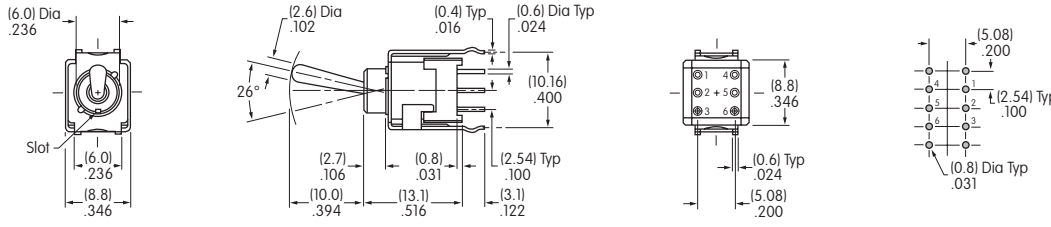
B22AP

Single Pole — Straight PC • Bracket



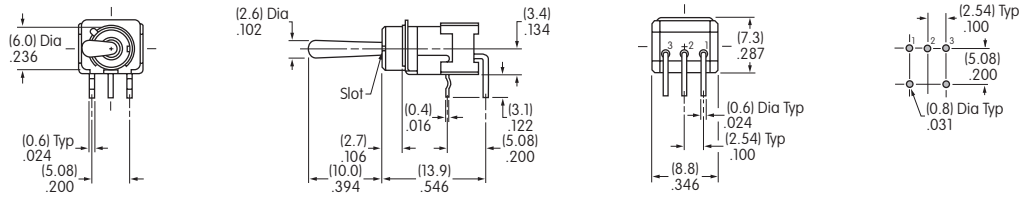
B12AB

Double Pole — Straight PC • Bracket



B22AB

Single Pole — Right Angle PC

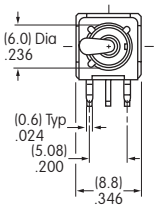


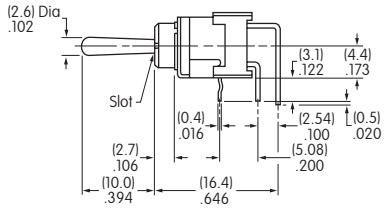
B12AH

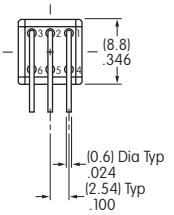
TYPICAL SWITCH DIMENSIONS

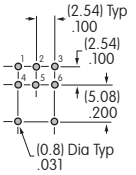
Right Angle PC — Double Pole

B22AH



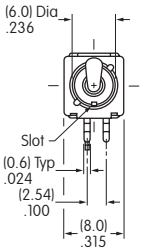


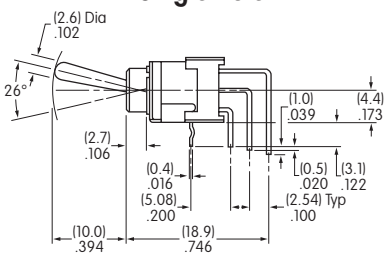


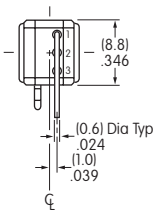


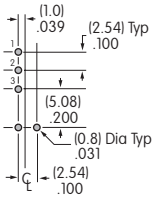
Vertical PC — Single Pole

B12AV



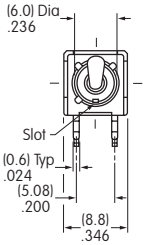


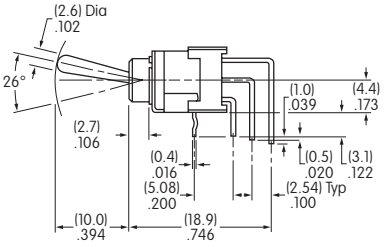


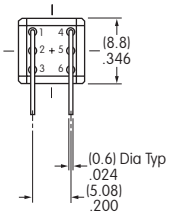


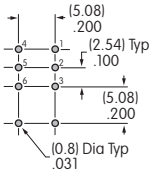
Vertical PC — Double Pole

B22AV



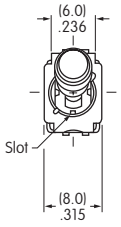


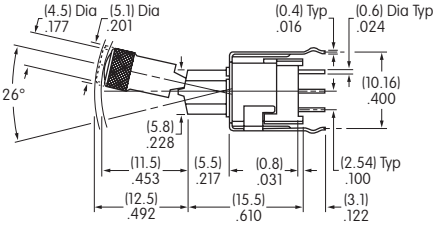


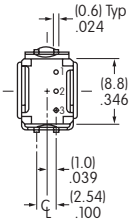


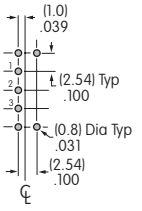
Locking Lever • Straight PC • Bracket — Single Pole

B12LB



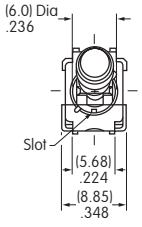


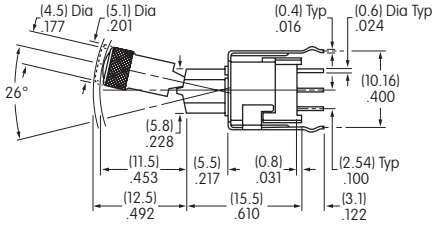


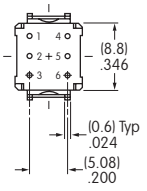


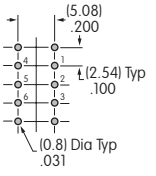
Locking Lever • Straight PC • Bracket — Double Pole

B22LB



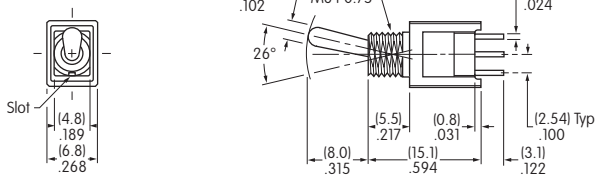






TYPICAL SWITCH DIMENSIONS

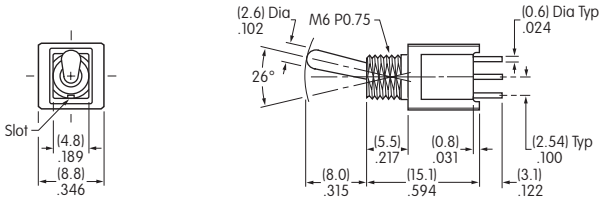
Panel Seal • Single Pole



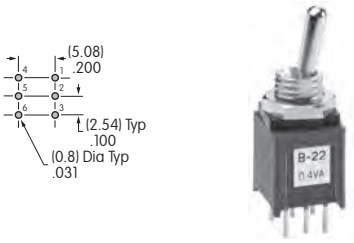
Threaded Bushing • Straight PC

B12A1P

Panel Seal • Double Pole



Threaded Bushing • Straight PC

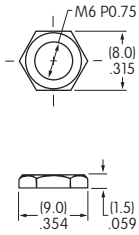


B22A1P

STANDARD HARDWARE & PANEL CUTOUT

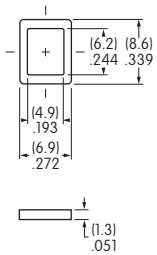
AT513M
Metric Hex Nut

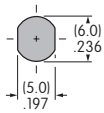
Material:
Brass,
Nickel plated



AT063
Gasket

Material:
Nitrile butadiene rubber





Maximum Panel Thickness with Standard Hardware: .087" (2.2mm)

General Specifications

Electrical Capacity (Resistive Load)

Logic Level: 0.4VA maximum @ 28V AC/DC maximum
(Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)
Note: Find additional explanation of operating range in Supplement section.

Other Ratings

Contact Resistance: 50 milliohms maximum
Insulation Resistance: 500 megohms minimum @ 500V DC
Dielectric Strength: 500V AC minimum for 1 minute minimum
Mechanical Life: 100,000 operations minimum
Electrical Life: 50,000 operations minimum
Nominal Operating Force: 1.18N
Contact Timing: Nonshorting (break-before-make)
Angle of Throw: 26°

Materials & Finishes

Actuator: Polyamide
Bushing Housing: Polyamide
Case Housing: Glass fiber reinforced polyamide
Support Bracket: Phosphor bronze with tin plating
Movable Contact: Phosphor bronze with gold plating
Stationary Contacts: Brass with tin plating
Terminals: Brass with gold plating

Environmental Data

Operating Temperature Range: –25°C through +55°C (–13°F through +131°F)
Humidity: 90 ~ 95% humidity for 240 hours @ 40°C (104°F)
Vibration: 10 ~ 55Hz with peak-to-peak amplitude of 1.5mm traversing the frequency range & returning in 5 minutes; 3 right angled directions for 2 hours
Shock: 50G (490m/s^2) acceleration (tested in 3 right angled directions, with 5 shocks in each direction)

PCB Processing

Soldering: Wave Soldering recommended. See Profile A in Supplement section.
Manual Soldering: See Profile A in Supplement section.
Cleaning: Automated alcohol based cleaning recommended, 5 minutes maximum. Do not use high-purity alcohol (50% alcohol or more) or organic solvent. High alcohol solution can damage clear plastic. See Cleaning specifications in Supplement section.

Standards & Certifications

The B Series illuminated toggles have not been tested for UL recognition or CSA certification.
These switches are designed for use in a low-voltage, low-current, logic-level circuit.
When used as intended in a logic-level circuit, the results do not produce hazardous energy.

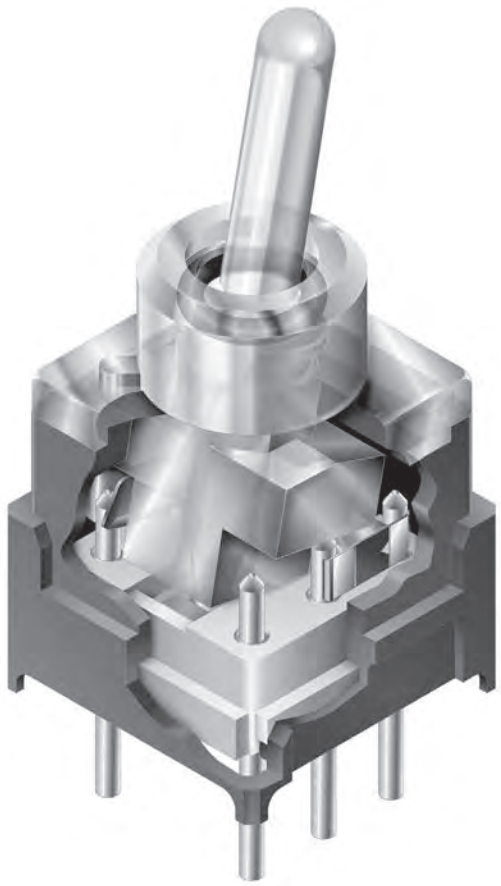
Distinctive Characteristics

LED provides maximum illumination to bushing and actuator, indicating actuator status in highly visible green, red, or amber for single color or red/green for bicolor.

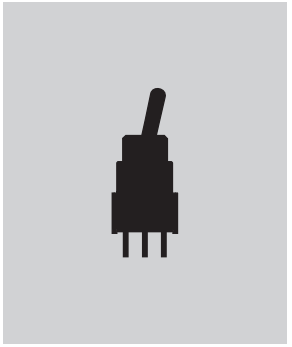
Totally sealed body construction prevents contact contamination and allows time- and money-saving automated soldering and cleaning. Molded-in, epoxy sealed terminals lock out flux and other contaminants.

Award-winning STC contact mechanism with benefits unavailable in conventional mechanisms: smoother, positive detent actuation, increased contact stability, and unparalleled logic-level reliability. (Additional STC details in Terms & Acronyms; see Supplement section.)

.100" x .100" (2.54mm x 2.54mm) terminal spacing conforms to standard PC board grid spacing.



Actual Size



TYPICAL SWITCH ORDERING EXAMPLE

B	1	2	J	J	P	C

Poles

1	SPDT

Circuits

2	ON	NONE	ON

Combines with single color or bicolor LEDs

3	ON	OFF	ON

Combines with bicolor LED only

Actuator

J	Clear

Bushing

J	Clear

PC Terminals

P	Straight
H	Right Angle
V	Vertical

LEDs

Single Color	
C	Red
D	Amber
F	Green

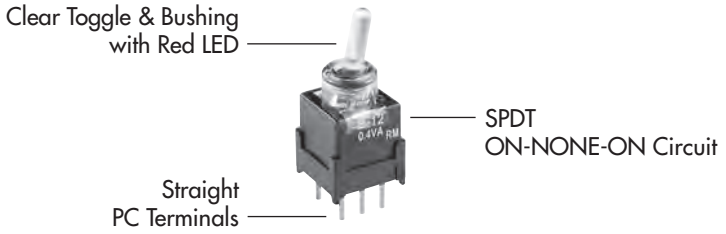
ON-NONE-ON only

Bicolor	
CF	Red/Green

ON-NONE-ON & ON-OFF-ON

DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

B12JJPC

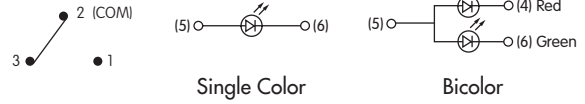


POLE & CIRCUITS

Pole Throw	Model	Toggle Position: Up	Toggle Position: Center	Toggle Position: Down	Connected Terminals: Up	Connected Terminals: Center	Connected Terminals: Down
SPDT	**B12**	ON	NONE	ON	2-3	NONE	2-1
	B13	ON	OFF	ON	2-3	OPEN	2-1

Note: Terminal numbers are not actually on the switch. LED circuit is isolated and requires an external power source.

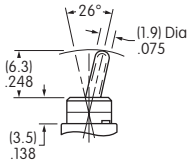
Throw & Schematics



Single Color | Bicolor

ACTUATOR & BUSHING

J Clear Toggle



J Clear Bushing

LED COLORS & SPECIFICATIONS

LEDs are an integral part of the switch and not available separately. The electrical specifications shown are determined at a basic temperature of 25°C. If the source voltage exceeds the rated voltage, a ballast resistor is required.
The resistor value can be calculated by using the formula in the Supplement section.

Colors		Single Color			Bicolor
		C Red	D Amber	F Green	CF Red/Green
Maximum Forward Current	I_{FM}	30mA	30mA	25mA	30mA/25mA
Typical Forward Current	I_F	20mA	20mA	20mA	20mA/20mA
Forward Voltage	V_F	1.95V	2.0V	3.3V	1.95V/3.3V
Maximum Reverse Voltage	V_{RM}	5V	5V	5V	5V/5V
Current Reduction Rate Above 25°C	ΔI_F	0.40mA/°C		0.33mA/°C	0.40mA/°C/0.33mA/°C
Ambient Temperature Range		–25°C ~ +55°C			

PC TERMINALS

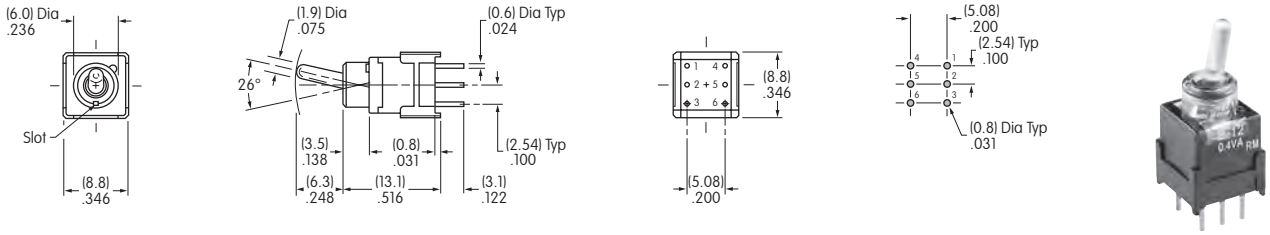
P Straight

H Right Angle with Bracket

V Vertical with Bracket

TYPICAL SWITCH DIMENSIONS

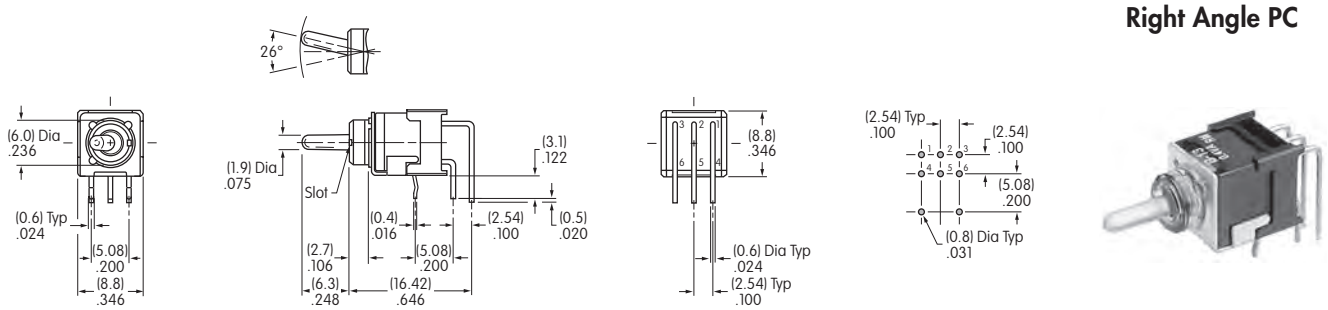
Straight PC



Terminal 4 is a support pin on single color models.

B12JJPC

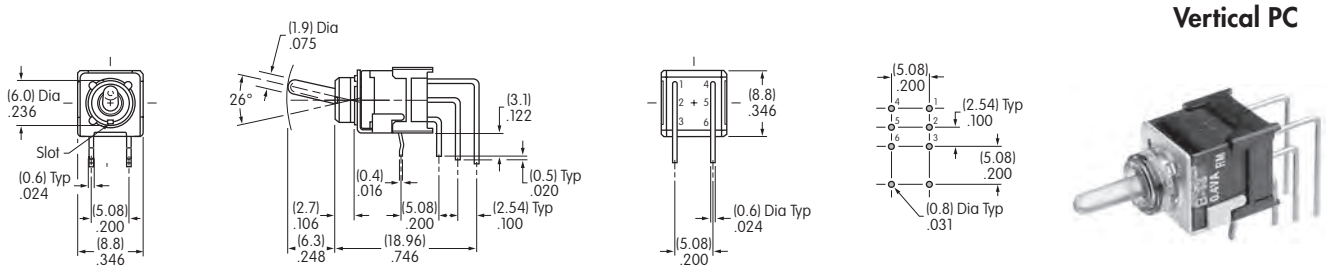
Right Angle PC



Terminal 4 is a support pin on single color models.

B13JJHCF

Vertical PC



Terminal 4 is a support pin on single color models.

B13JJVCF

General Specifications

Electrical Capacity (Resistive Load)

Logic Level: 0.4VA maximum @ 48V AC/DC maximum
(Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 48V)
Note: Find additional explanation of operating range in Supplement section.

Other Ratings

Contact Resistance: 50 milliohms maximum
Insulation Resistance: 1,000 megohms minimum @ 500V DC
Dielectric Strength: 1,000V AC minimum between contacts for 1 minute minimum;
1,500V AC minimum between contacts & case for 1 minute minimum
Mechanical Life: 100,000 operations minimum for bat lever models
50,000 operations minimum for locking lever models
Electrical Life: 50,000 operations minimum
Contact Timing: Nonshorting (break-before-make)
Angle of Throw: 24°

Materials & Finishes

Toggle/Lever: Brass with chrome plating
Bushing: Brass with nickel plating
Support Bracket: Straight PC: phosphor bronze with tin plating; right angle & vertical: brass with tin plating
Housing: Polybutylene terephthalate (PBT) (UL94V-0)
Base: 1- and 2-pole GFR polyamide (UL94V-0); 4-pole liquid crystal polymer (LCP) (UL94V-0)
Movable Contacts: Phosphor bronze with gold plating
Stationary Contacts: Brass with gold plating
Terminals: Brass with gold plating

Environmental Data

Operating Temp Range: –10°C through +70°C (+14°F through +158°F)
Humidity: 90 ~ 95% humidity for 240 hours @ 40°C (104°F)
Vibration: 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
Shock: 50G (490m/s^2) acceleration (tested in 6 right angled directions, with 5 shocks in each direction)

PCB Processing

Soldering: Wave Soldering recommended. See Profile A in Supplement section.
Manual Soldering: 1- & 2-pole: 3 seconds maximum @ 350°C maximum;
4-pole: 4 seconds maximum @ 410°C maximum
Cleaning: Hand clean locally using alcohol based solution.
See Cleaning specifications in Supplement section.

Standards & Certifications

Flammability Standards: UL94V-0 rated housing & base
The D2 Series toggles have not been tested for UL recognition or CSA certification.
These switches are designed for use in a low-current, logic level circuit.
When used as intended in a logic level circuit, the results do not produce hazardous energy.

Distinctive Characteristics

Base of heat resistant resin meets UL94V-0 flammability rating.

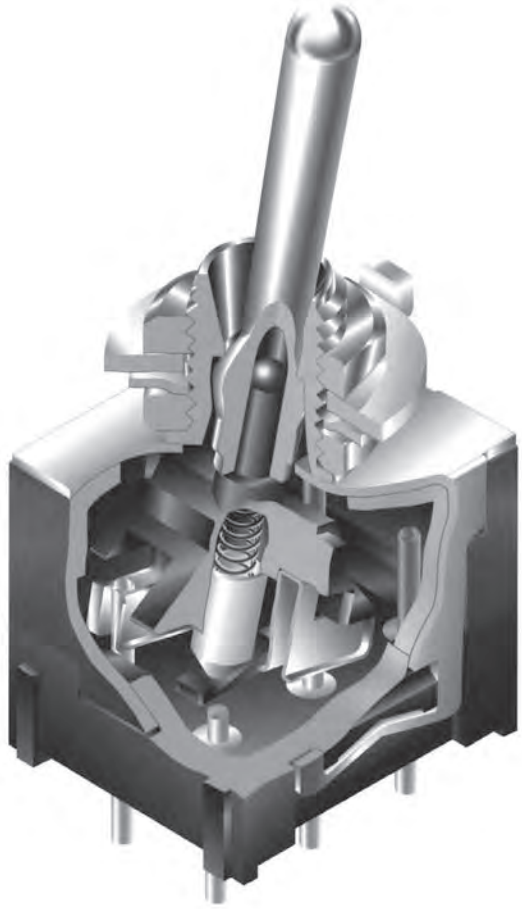
Maximized voltage capability of 48V allows use in medium source applications and increases operating life.

Award-winning STC contact mechanism with benefits unavailable in conventional mechanisms: smoother positive detent actuation, increased contact stability, and unparalleled reliability. (Additional STC details under Terms and Acronyms in the Supplement section.)

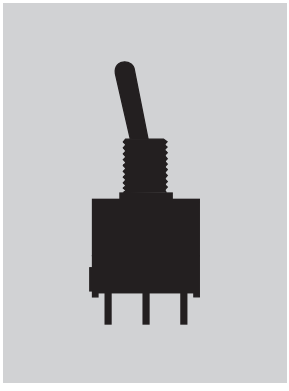
Round .031" (0.8mm) diameter PC terminals for easy PCB assembly.

Terminal spacing conforms to standard .100" (2.54mm) PC board grid spacing.

Molded-in terminals prevent entry of flux, solvents, and other contaminants.



Actual Size



TYPICAL SWITCH ORDERING EXAMPLE

D220 [1] [2] [ ] [P]

Poles	
1	SPDT
2	DPDT
*4	4PDT

* Combines with ON-NONE-ON circuit only & not available with Right Angle

Actuators	
No Code	.413″ (10.5mm) Bat Lever
L	.200″ (5.1mm) Diameter Locking Lever

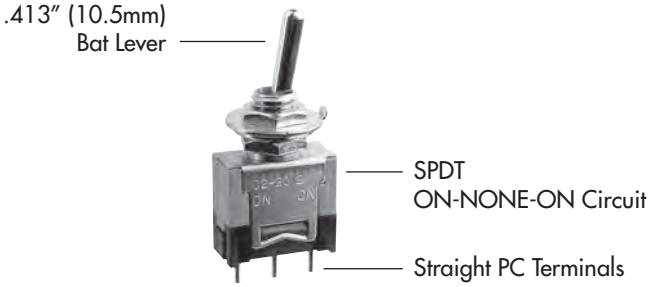
Circuits			
2	ON	NONE	ON
3	ON	OFF	ON
5	ON	NONE	(ON)
8	(ON)	OFF	(ON)
9	ON	OFF	(ON)

( ) = Momentary

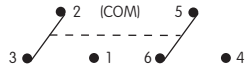
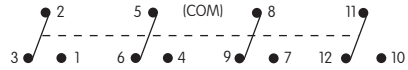
PC Terminals	
P	Straight
B	Straight with Bracket
H	Right Angle w/Bracket
V	Vertical with Bracket

DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

D22012P



POLES & CIRCUITS

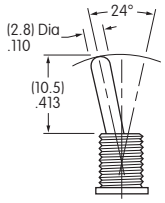
Pole	Model	Toggle Position ( ) = Momentary: Down (Keyway)	Center	Up	Connected Terminals: Down (Keyway)	Center	Up	Throw & Schematics
SP	**D22012** **D22013** **D22015** **D22018** **D22019**	ON ON ON (ON) ON	NONE OFF NONE OFF OFF	ON ON (ON) (ON) (ON)	2-3	OPEN	2-1	SPDT 
DP	**D22022** **D22023** **D22025** **D22028** **D22029**	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 
4P	**D22042**	ON	NONE	ON	2-3 5-6 8-9 11-12	OPEN	2-1 5-4 8-7 11-10	4PDT 

Note: Terminal numbers are not actually on the switch.

ACTUATORS

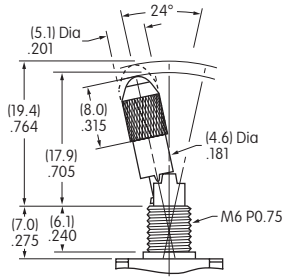
No Code **.413" (10.5mm) Bat Lever**

Material:
Chrome over brass



L **.413" (5.1mm) Diameter Locking Lever**

Material:
Chrome over brass



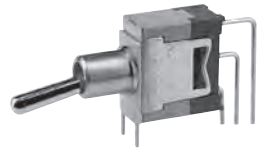
PC TERMINALS

P **Straight**

B **Straight with Bracket**

H **Right Angle with Bracket**

V **Vertical with Bracket**

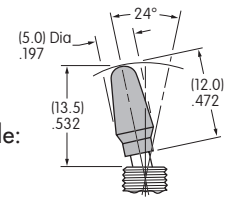


OPTIONAL CAPS & CAP COLORS

AT415
Bat Lever Cap

Material:
Polyethylene

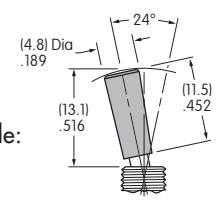
Colors Available:
A B C E F G



AT444 Bat Lever
Conical Cap

Material:
Polyethylene

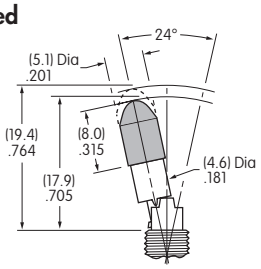
Colors Available:
A B C E F G



AT427 Cap Supplied with Locking Lever

Material:
Anodized
Aluminum

Colors Available:
A C G

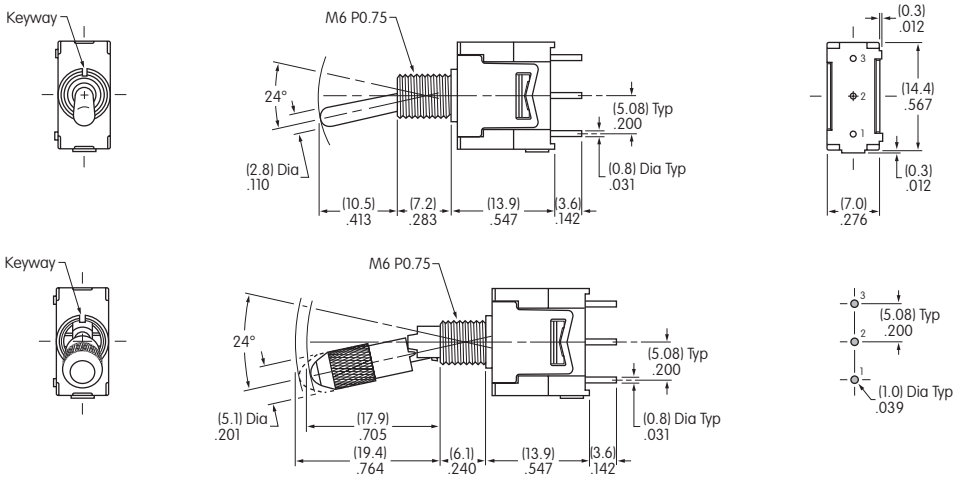


Colors Codes: **A** Black **B** White **C** Red **E** Yellow **F** Green **G** Blue

TYPICAL SWITCH DIMENSIONS

Straight PC • Single Pole

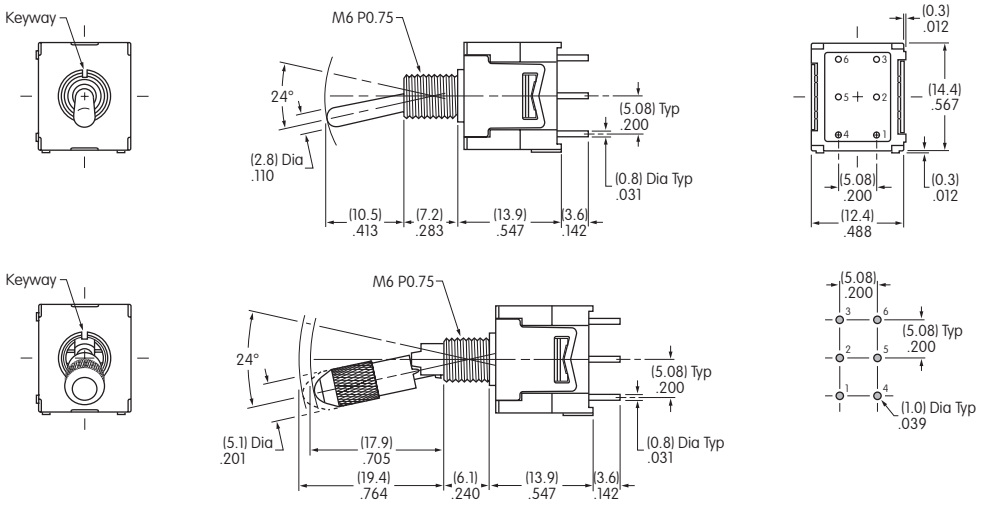
D22012P D22012LP



Actuator in Down Position

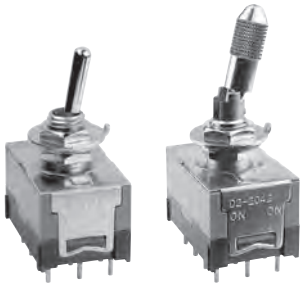
Straight PC • Double Pole

D22022P D22022LP

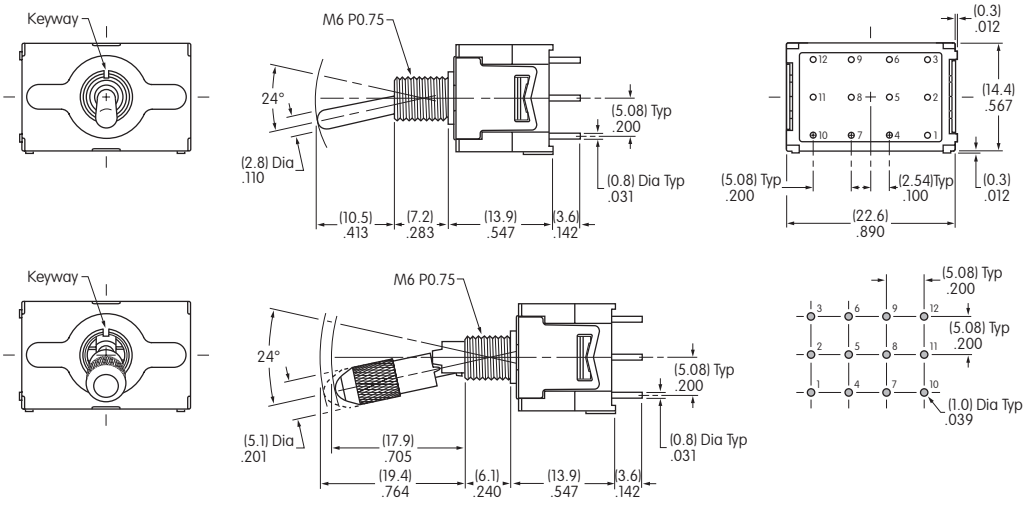


Actuator in Down Position

Straight PC • Four Pole

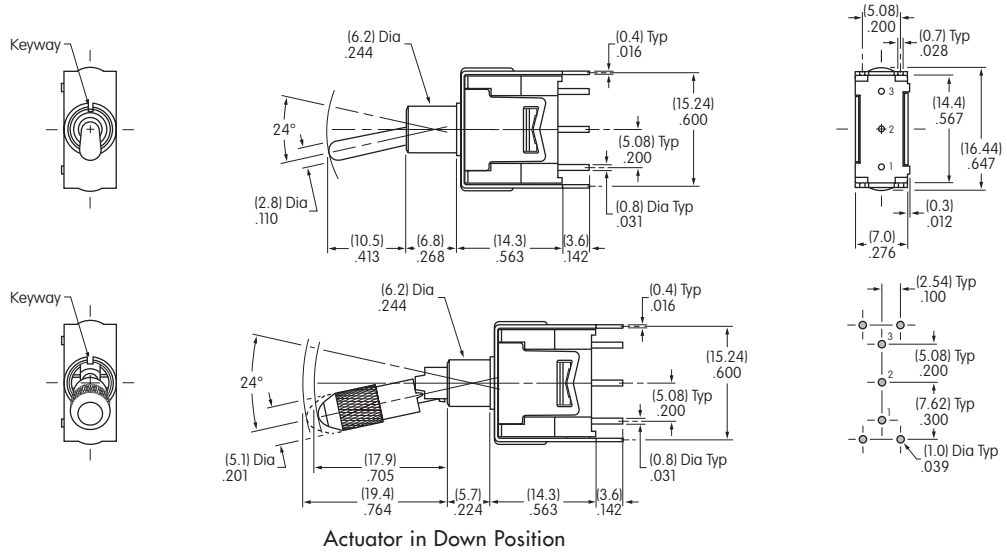


D22042P D22042LP



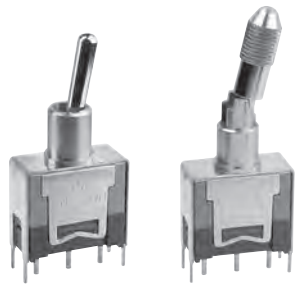
Actuator in Down Position

TYPICAL SWITCH DIMENSIONS

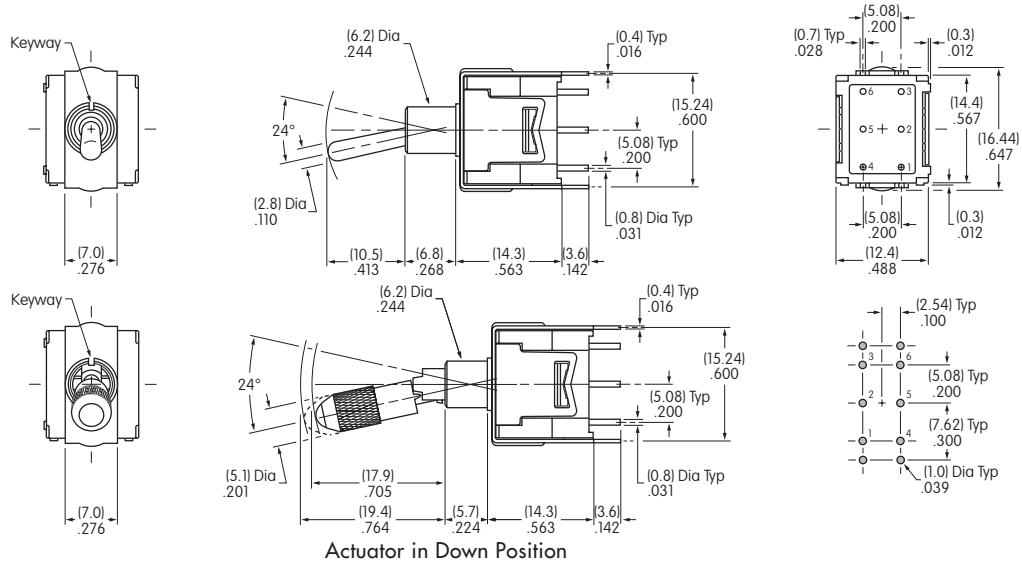


Actuator in Down Position

Straight PC • Bracket Single Pole

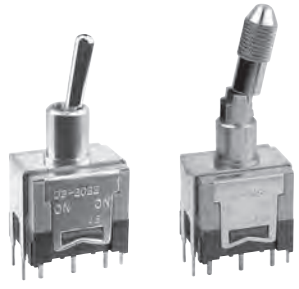


D22012B **D22012LB**

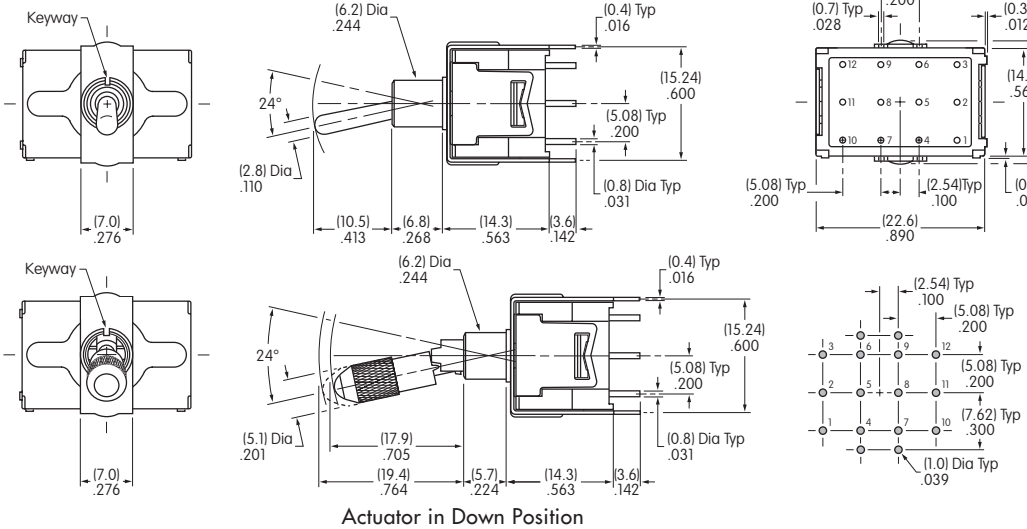


Actuator in Down Position

Straight PC • Bracket Double Pole

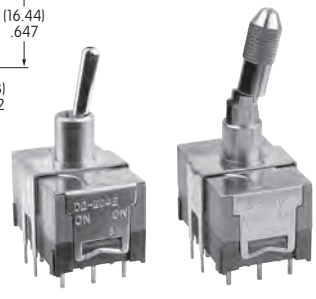


D22022B **D22022LB**



Actuator in Down Position

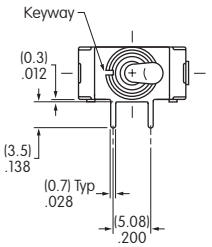
Straight PC • Bracket Four Pole

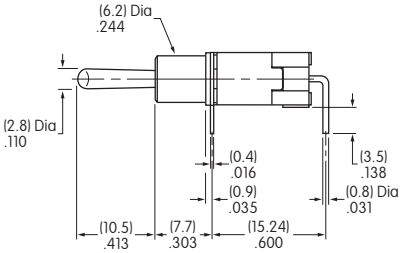


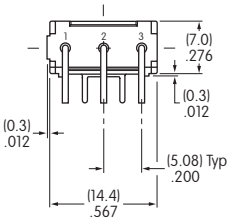
D22042B **D22042LB**

TYPICAL SWITCH DIMENSIONS

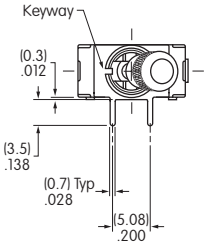
Right Angle PC • Single Pole

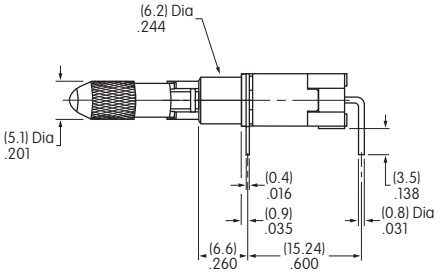


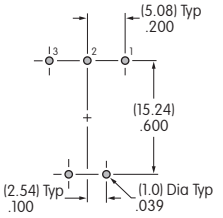




D22012H



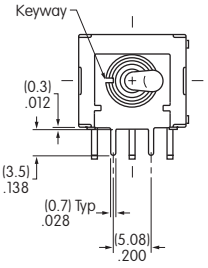


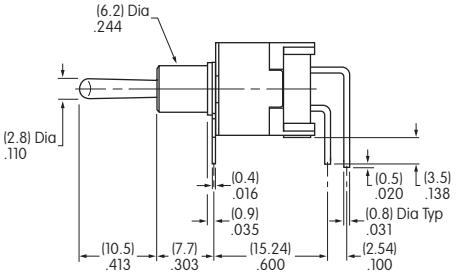


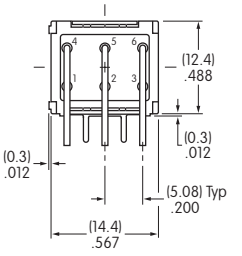
D22012LH

Actuator in Down Position

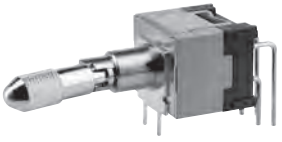
Right Angle PC • Double Pole

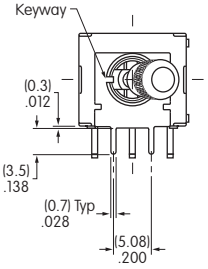


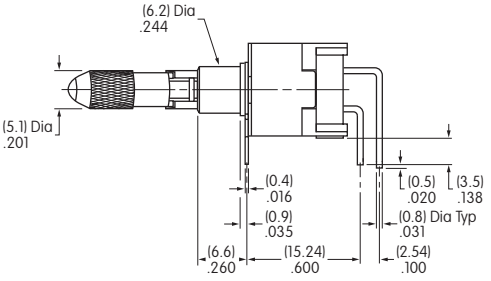


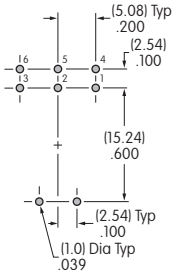


D22022H







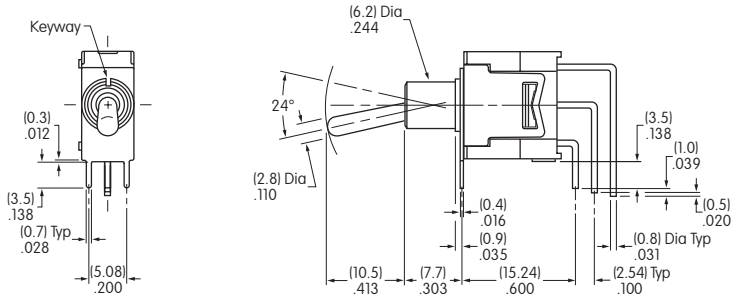


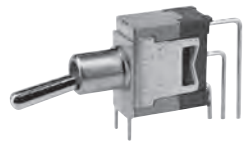
D22022LH

Actuator in Down Position

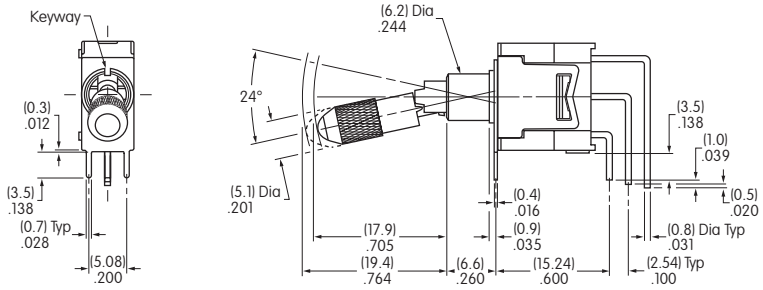
TYPICAL SWITCH DIMENSIONS

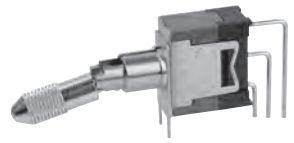
Vertical PC • Single Pole





D22012V

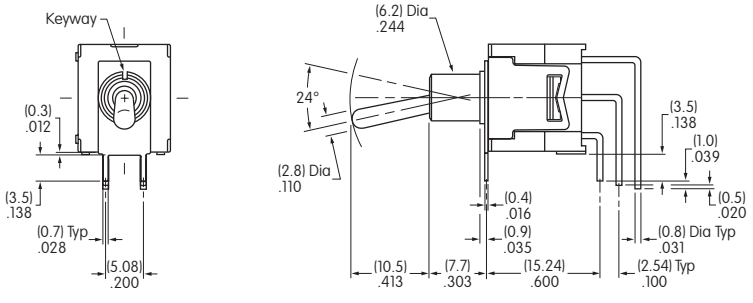


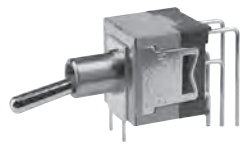


Actuator in Down Position

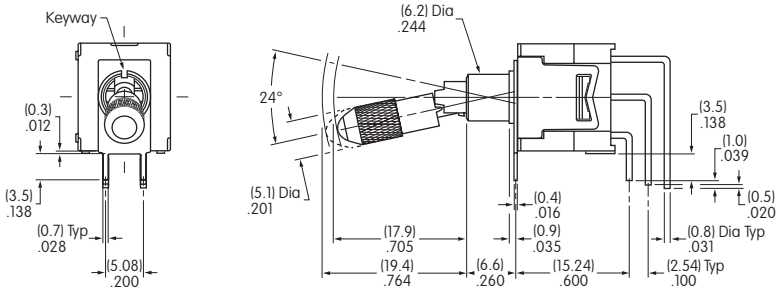
D22012LV

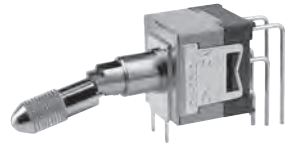
Vertical PC • Double Pole





D22022V



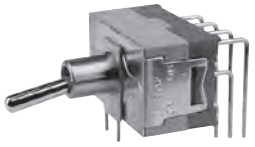


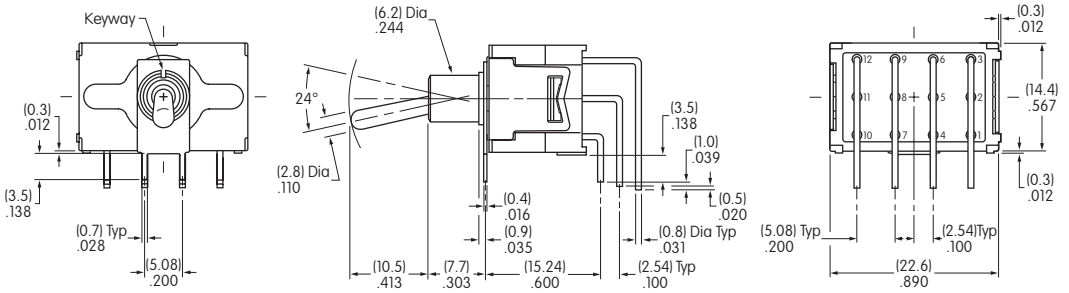
Actuator in Down Position

D22022LV

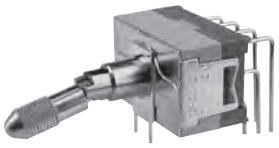
TYPICAL SWITCH DIMENSIONS

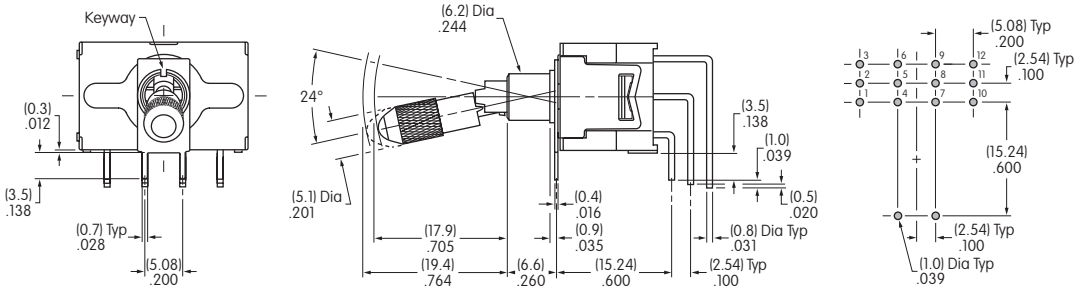
Vertical PC • Four Pole





D22042V



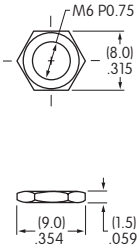


D22042LV

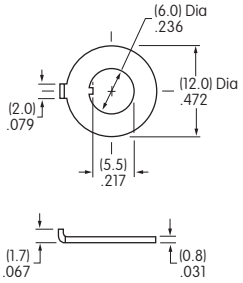
Actuator in Down Position

STANDARD HARDWARE

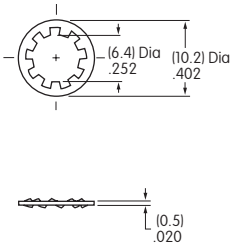
AT513M
Hex Nut
Brass with nickel plating
2 supplied



AT507M
Locking Ring
Steel with zinc/chromate
1 supplied

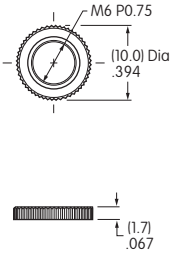


AT509
Lockwasher
Steel with zinc/chromate
1 supplied



OPTIONAL

AT501M
Knurled Face Nut
Brass with chrome plating

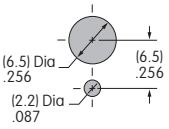


PANEL CUTOUTS & MAXIMUM PANEL THICKNESS

With Standard Hardware

.087" (2.2mm) for Standard Lever

.051" (1.3mm) for Locking Lever



Without Bottom Hex Nut

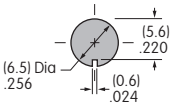
.154" (3.9mm) for Standard Lever

.110" (2.8mm) for Locking Lever

Without Locking Ring

.118" (3.0mm) for Standard Lever

.083" (2.1mm) for Locking Lever



Without Locking Ring & Bottom Hex Nut

.185" (4.7mm) for Standard Lever

.142" (3.6mm) for Locking Lever

General Specifications

Electrical Capacity (Resistive Load)

Logic Level: 0.4VA maximum @ 28V AC/DC maximum
(Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)
Note: Find additional explanation of operating range in Supplement section.

Other Ratings

Contact Resistance: 80 milliohms maximum
Insulation Resistance: 500 megohms minimum @ 500V DC
Dielectric Strength: 500V AC minimum for 1 minute minimum
Mechanical Life: 100,000 operations minimum for On-None-On & On-Off-On
50,000 operations minimum for other circuits
Electrical Life: 100,000 operations minimum for On-None-On & On-Off-On
50,000 operations minimum for other circuits
Nominal Operating Force: 0.93N for momentary & 1.20N for maintained
Angle of Throw: 28°

Materials & Finishes

Actuator: Glass fiber reinforced polyamide
Case: Glass fiber reinforced polyamide
Sealing Rings: Nitrile butadiene rubber
Movable Contacts: Phosphor bronze with gold plating
Stationary Contacts: Phosphor bronze with gold plating
Base: Glass fiber reinforced polyamide
Terminals: Phosphor bronze with gold plating
Support Bracket: Phosphor bronze with tin plating

Environmental Data

Operating Temperature Range: –25°C through +85°C (–13°F through +185°F)
Humidity: 90 ~ 95% humidity for 96 hours @ 40°C (104°F)
Vibration: 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
Shock: 50G (490m/s^2) acceleration (tested in 6 right angled directions, with 5 shocks in each direction)

PCB Processing

Soldering: Wave Soldering recommended: See Profile A in Supplement section.
Manual Soldering: See Profile A in Supplement section.
Cleaning: Automated cleaning. See Cleaning specifications in Supplement section.

Standards & Certifications

The G Series toggles have not been tested for UL recognition or CSA certification.
These switches are designed for use in a low-voltage, low-current, logic-level circuit.
When used as intended in a logic-level circuit, the results do not produce hazardous energy.

Distinctive Characteristics

Ultra-miniature size allows high density mounting, and extremely light weight of 0.25 gram makes these switches ideal for handheld equipment.

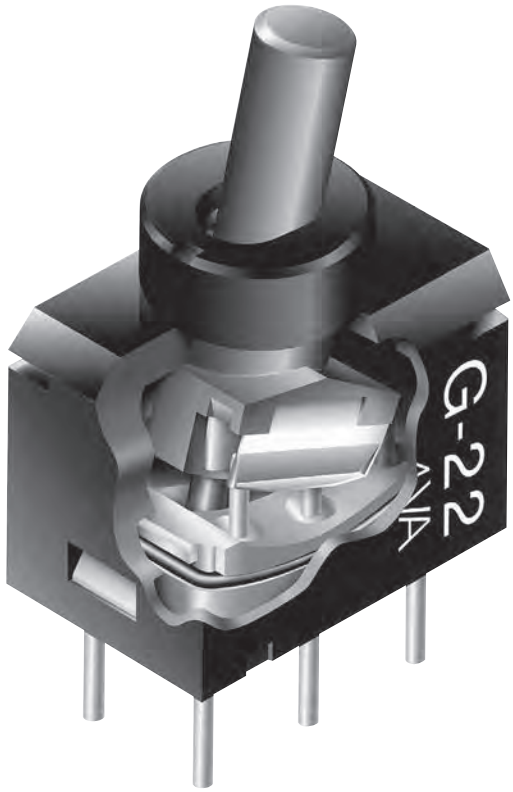
Totally sealed body construction prevents contact contamination and allows time- and money-saving automated soldering and cleaning.

Molded-in, epoxy sealed terminals lock out flux, solvents, and other contaminants.

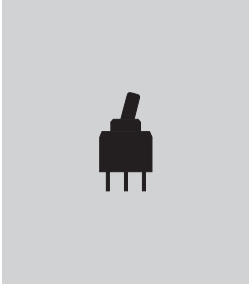
Award-winning STC contact mechanism with benefits unavailable in conventional mechanisms: smooth, positive detent actuation, increased contact stability, and unparalleled logic-level reliability. (Additional STC details in Terms & Acronyms; see Supplement section.)

.100" x .100" (2.54mm x 2.54mm) terminal spacing conforms to standard PC board grid spacing. Round terminals facilitate easier through-hole mounting on PC boards.

Matching indicators available.



Actual Size



Series G

Process Sealed Ultra-Miniature Toggles

TYPICAL SWITCH ORDERING EXAMPLE

G **1** **3** **A** **H**

Poles	
1	SPDT
2	DPDT

Circuits			
2	ON	NONE	ON
3	ON	OFF	ON
5	ON	NONE	(ON)
8	(ON)	OFF	(ON)
9	ON	OFF	(ON)

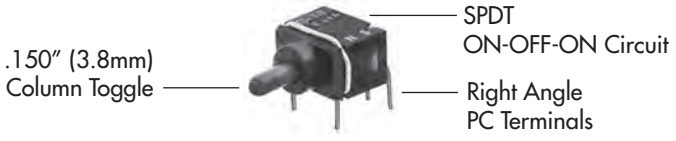
( ) = Momentary

Actuator	
A	.150" (3.8mm) Column Toggle

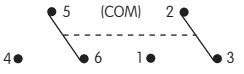
PC Terminals	
P	Straight
H	Right Angle
V	Vertical

DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

G13AH

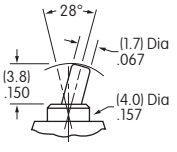


POLES & CIRCUITS

		Toggle Position ( ) = Momentary			Connected Terminals			Throw & Schematics
Pole	Model	Up (Slot)	Center	Down	Up (Slot)	Center	Down	Note: Terminal numbers are not actually on the switch.
SP	G12 G13 G15 G18 G19	ON ON ON (ON) ON	NONE OFF NONE OFF OFF	ON ON (ON) (ON) (ON)	5-6	OPEN	5-4	SPDT 
DP	G22 G23 G25 G28 G29	ON ON ON (ON) ON	NONE OFF NONE OFF OFF	ON ON (ON) (ON) (ON)	5-6 2-3	OPEN	5-4 2-1	DPDT 

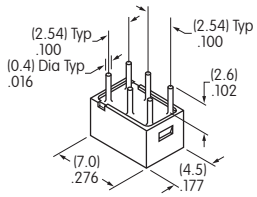
ACTUATOR

A **.150" (3.8mm) Column Toggle**

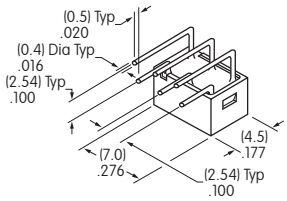


PC TERMINALS

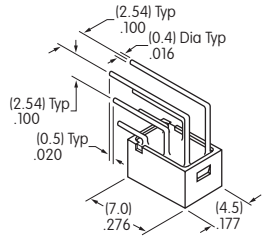
P Straight



H Right Angle

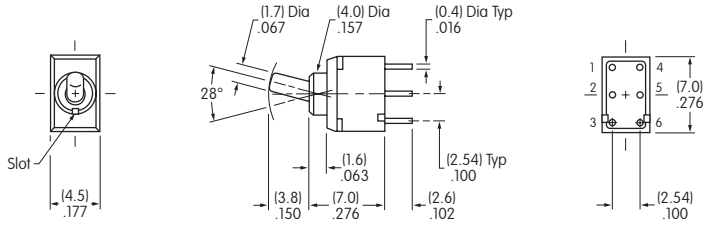


V Vertical

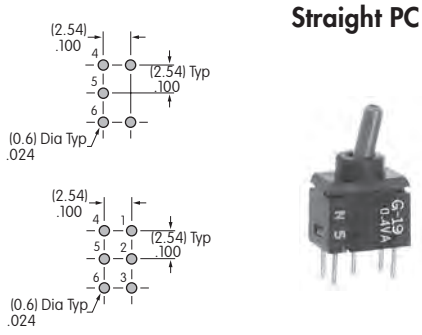


TYPICAL SWITCH DIMENSIONS

Single & Double Pole



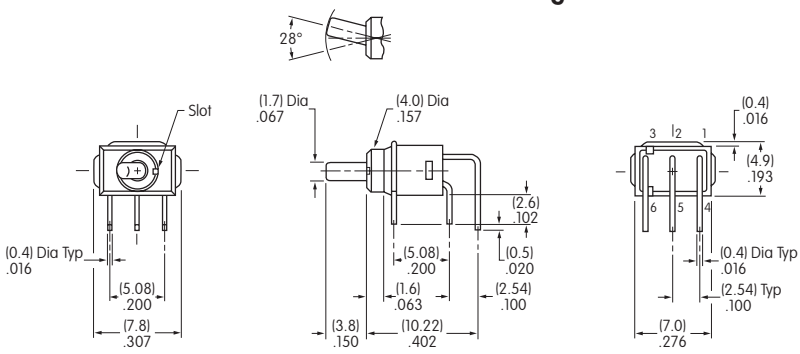
Straight PC



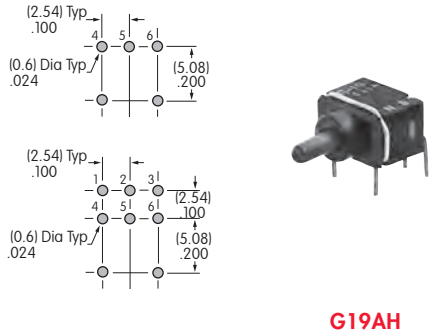
On single pole models, locations 1 & 3 are for support pins.

G19AP

Single & Double Pole

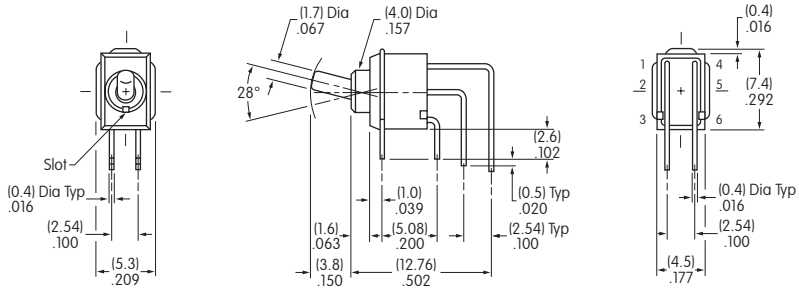


Right Angle PC

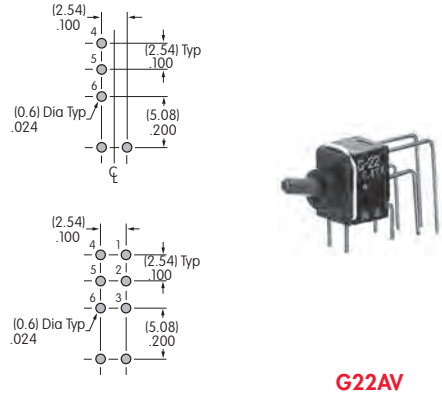


G19AH

Single & Double Pole



Vertical PC



G22AV

General Specifications

Electrical Capacity (Resistive Load)

Logic Level: 0.4VA maximum @ 28V AC/DC maximum
(Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)
Note: Find additional explanation of operating range in Supplement section.

Other Ratings

Contact Resistance: 80 milliohms maximum
Insulation Resistance: 500 megohms minimum @ 500V DC
Dielectric Strength: 500V AC minimum for 1 minute minimum
Mechanical Life: 100,000 operations minimum
Electrical Life: 100,000 operations minimum
10,000 operations minimum @ 0.1A @ 28V AC/DC
Nominal Operating Force: 1.30N
Angle of Throw: 28°

Materials & Finishes

Actuator: Polyamide
Case: Glass fiber reinforced polyamide
Sealing Rings: Nitrile butadiene rubber
Movable Contacts: Phosphor bronze with gold plating
Stationary Contacts: Phosphor bronze with gold plating
Base: Glass fiber reinforced polyamide
Power Terminals: Phosphor bronze with gold plating
Lamp Terminals: Phosphor bronze with gold plating

Environmental Data

Operating Temperature Range: –25°C through +55°C (–13°F through +131°F)
Humidity: 90 ~ 95% humidity for 240 hours @ 40°C (104°F)
Vibration: 10 ~ 500Hz with peak-to-peak amplitude of 1.5mm traversing the frequency range & returning in 1 minute; 3 right angled directions for 2 hours
Shock: 50G (490m/s^2) acceleration (tested in 6 right angled directions, with 5 shocks in each direction)

PCB Processing

Soldering: Wave Soldering recommended. See Profile A in Supplement section.
Manual Soldering: See Profile A in Supplement section.
Cleaning: Automated cleaning. See Cleaning specifications in Supplement section.

Standards & Certifications

The G Series toggles have not been tested for UL recognition or CSA certification.
These switches are designed for use in a low-voltage, low-current, logic-level circuit.
When used as intended in a logic-level circuit, the results do not produce hazardous energy.

Distinctive Characteristics

Fully illuminated toggle for highly visible status indication with LED in red, green, or amber for single color and red/green for bicolor.

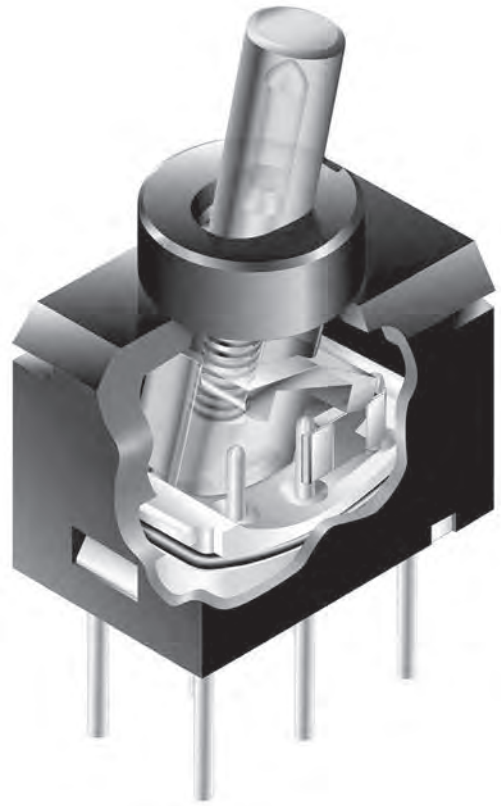
Ultra-miniature size allows high density mounting, and extremely light weight makes these switches ideal for handheld equipment.

Totally sealed body construction prevents contact contamination and allows time- and money-saving automated soldering and cleaning.

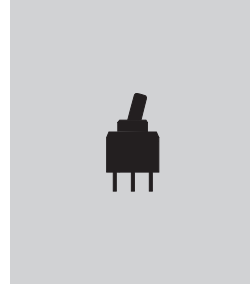
Molded-in, epoxy sealed terminals lock out flux, solvents, and other contaminants.

Award-winning STC contact mechanism with benefits unavailable in conventional mechanisms: smooth, positive detent actuation, increased contact stability, and unparalleled logic-level reliability. (Additional STC details in Terms & Acronyms; see Supplement section.)

.100" x .100" (2.54mm x 2.54mm) terminal spacing conforms to standard PC board grid spacing. Round terminals facilitate easier through-hole mounting on PC boards.



Actual Size



Series G

Fully Illuminated Ultra-Miniature Toggles

TYPICAL SWITCH ORDERING EXAMPLE

G | 1 | 2 | J | H | C

Pole

1	SPDT

Circuits

2	ON	NONE	ON

Combines with single color or bicolor LEDs

3	ON	OFF	ON

Combines with bicolor LED only

Actuator

J	Clear

PC Terminals

P	Straight
H	Right Angle
V	Vertical

LEDS

Single Color	
C	Red
D	Amber
F	Green

ON-NONE-ON only

Bicolor	
CF	Red/Green

ON-NONE-ON & ON-OFF-ON

DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

G12JHC

POLES & CIRCUITS

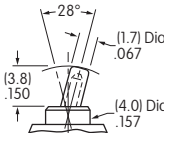
Pole Throw	Model	Toggle Position: Up	Center	Down	Connected Terminals: Up	Center	Down
SPDT	G12	ON	NONE	ON	2-3	NONE	2-1
	G13	ON	OFF	ON	2-3	OPEN	2-1

Note: Terminal numbers are not actually on the switch. LED circuit is isolated and requires an external power source.

Schematics

ACTUATOR

J **Clear Toggle**



LED COLORS & SPECIFICATIONS

LEDs are an integral part of the switch and not available separately. The electrical specifications shown are determined at a basic temperature of 25°C.

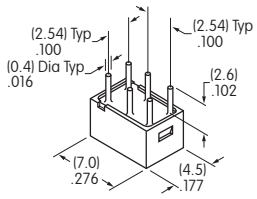
If the source voltage exceeds the rated voltage, a ballast resistor is required.

The resistor value can be calculated by using the formula in the Supplement; see Supplement Index.

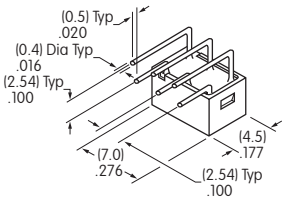
		Single Color			Bicolor
	Colors	C Red	D Amber	F Green	CF Red/Green
Maximum Forward Current	I_{FM}	30mA	30mA	25mA	30mA/25mA
Typical Forward Current	I_F	20mA	20mA	20mA	20mA/20mA
Forward Voltage	V_F	2.0V	2.0V	2.1V	2.0V/2.1V
Maximum Reverse Voltage	V_{RM}	5V	5V	5V	5V/5V
Current Reduction Rate Above 25°C	ΔI_F	0 - No current Reduction Rate within Ambient Temperature Range			
Ambient Temperature Range		−25° ~ +55°C			

PC TERMINALS

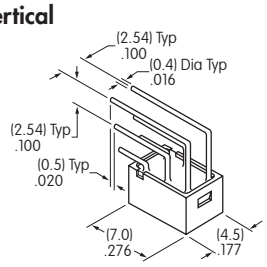
P Straight



H Right Angle

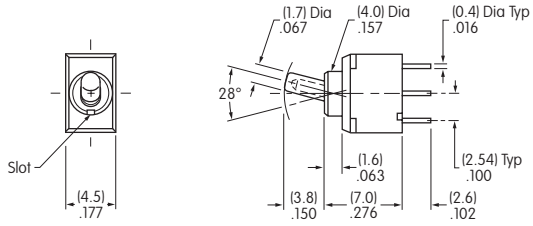


V Vertical



TYPICAL SWITCH DIMENSIONS

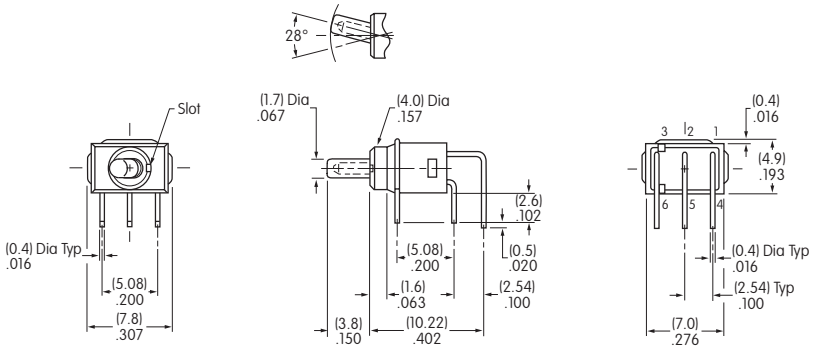
Straight PC



5 & 6 are LED terminals; 4 is a support pin on single color models & an LED terminal on bicolor models.

G12JPC

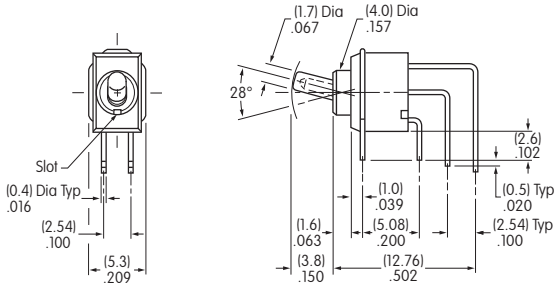
Right Angle PC

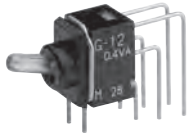


5 & 6 are LED terminals; 4 is a support pin on single color models & an LED terminal on bicolor models.

G12JHD

Vertical PC





5 & 6 are LED terminals; 4 is a support pin on single color models & an LED terminal on bicolor models.

G12JVCF

General Specifications

Electrical Capacity (Resistive Load)

Logic Level: 0.4VA maximum @ 28V AC/DC maximum
(Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)
Note: See Supplement section for explanation of operating range.

Other Ratings

Contact Resistance: 80 milliohms maximum
Insulation Resistance: 500 megohms minimum @ 500V DC
Dielectric Strength: 500V AC minimum for 1 minute minimum
Mechanical Life: 50,000 operations minimum
Electrical Life: 50,000 operations minimum
Nominal Operating Force: 1.6N for momentary & 1.7N for maintained
Angle of Throw: 28°

Materials & Finishes

Actuator: Polyphenylene sulfide (UL94V-0)
Case: Polyphenylene sulfide (UL94V-0)
Sealing Rings: Nitrile butadiene rubber
Movable Contacts: Phosphor bronze with gold plating
Stationary Contacts: Phosphor bronze with gold plating
Base: Polyphenylene sulfide (UL94V-0)
Terminals: Phosphor bronze with gold plating

Environmental Data

Operating Temperature Range: –30°C through +85°C (–22°F through +185°F)
Humidity: 90 ~ 95% humidity for 96 hours @ 40°C (104°F)
Vibration: 10 ~ 500Hz with peak-to-peak amplitude of 1.5mm traversing the frequency range & returning in 1 minute; 3 right angled directions for 2 hours
Shock: 50G (490m/s^2) acceleration (tested in 6 right angled directions, with 5 shocks in each direction)

Installation

Mounting: It is recommended that the body of models for upright mounting without bracket be fastened to a panel or similar support for protection of solder joints from mechanical stress.
Coplanarity: See specifications in Terms & Acronyms in Supplement section

Processing

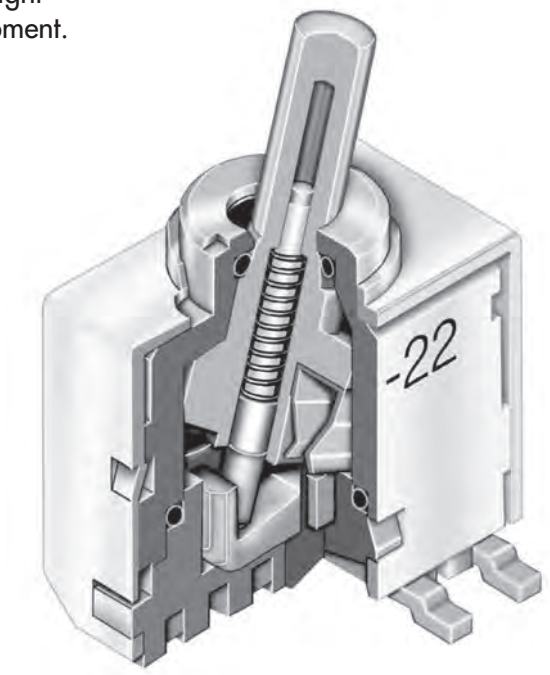
Soldering: Reflow Soldering recommended. See Profile B in Supplement section.
Manual Soldering: See Profile B in Supplement section.
Cleaning: Automated cleaning. See Cleaning specifications in Supplement section.

Standards & Certifications

Flammability Standard: UL94V-0 actuator, case & base
The G3T Series toggles have not been tested for UL recognition or CSA certification.
These switches are designed for use in a low-voltage, low-current, logic-level circuit.
When used as intended in a logic-level circuit, the results do not produce hazardous energy.

Distinctive Characteristics

Ultra-miniature size allows high density mounting, and extremely light weight of 0.6 gram makes these switches ideal for handheld equipment.



Tape-reel and stick-tube packaging allow rapid automated placement of surface mount devices. Tape-reel packaging meets EIA-481-D Standard.

Heat resistant resin used for housing, base, and lever allows vapor phase and infrared convection reflow soldering.

Combination of design features achieves total seal and allows automated processing techniques, including flux cleaning procedures: one-piece bushing and housing, rubber seals surrounding actuator and base, epoxy at joint of case and base, and molded-in, epoxy-sealed terminals.

Award-winning STC contact mechanism with benefits unavailable in conventional mechanisms: smoother, positive detent actuation, increased contact stability and unparalleled logic-level reliability. (Additional STC details in Terms & Acronyms; see Supplement section.)

Gull-wing terminals provide mechanical stability during soldering and simplified solder joint inspection.

Coplanarity: all considered surfaces must lie between two parallel planes that are a maximum distance apart of .0059" (0.15mm). (Additional coplanarity details in Terms and Acronyms in the Supplement section.)

Actual Size

Series G3T

Process Sealed Ultra-Miniature SMT Toggles

TYPICAL SWITCH ORDERING EXAMPLE

G3T [1] [2] [A] [H] — [ ]

Poles

1	SPDT
2	DPDT

Actuator

A	.150" (3.8mm) Column Toggle

Packaging

R	Tape-Reel for Right Angle Only 500 Pieces/Reel
S	Stick-Tube for Upright Mount 50 Pieces/Stick
No Code	Partitioned Tray for Upright & Right Angle Any Quantity

Packaging details at end of G3T Series

Circuits

2	ON	NONE	ON
3	ON	OFF	ON
5	ON	NONE	(ON)
8	(ON)	OFF	(ON)
9	ON	OFF	(ON)

( ) = Momentary

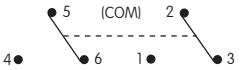
Terminals

P	Gull Wing for Upright Mount
B	Gull Wing for Upright with Bracket Mount
H	Gull Wing for Right Angle Mount

DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

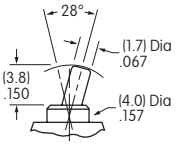
G3T12AH

POLES & CIRCUITS

		Toggle Position ( ) = Momentary			Connected Terminals			Throw & Schematics
Pole	Model	Up	Center	Down	Up	Center	Down	Note: Terminal numbers are not actually on switch.
SP	G3T12 G3T13 G3T15 G3T18 G3T19	ON ON ON (ON) ON	NONE OFF NONE OFF OFF	ON ON (ON) (ON) (ON)	5-6	OPEN	5-4	SPDT 
DP	G3T22 G3T23 G3T25 G3T28 G3T29	ON ON ON (ON) ON	NONE OFF NONE OFF OFF	ON ON (ON) (ON) (ON)	5-6 2-3	OPEN	5-4 2-1	DPDT 

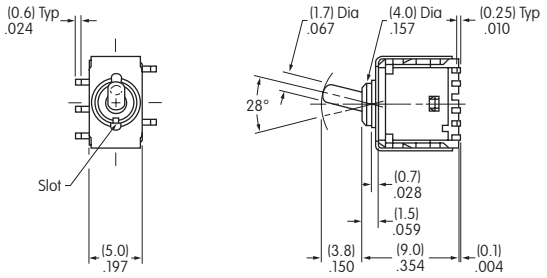
ACTUATOR

A .150" (3.8mm) Column Toggle



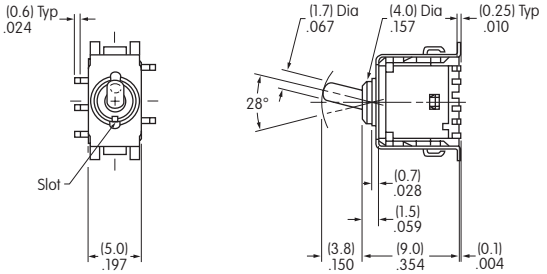
TYPICAL SWITCH DIMENSIONS

Single & Double Pole — Upright Mounting



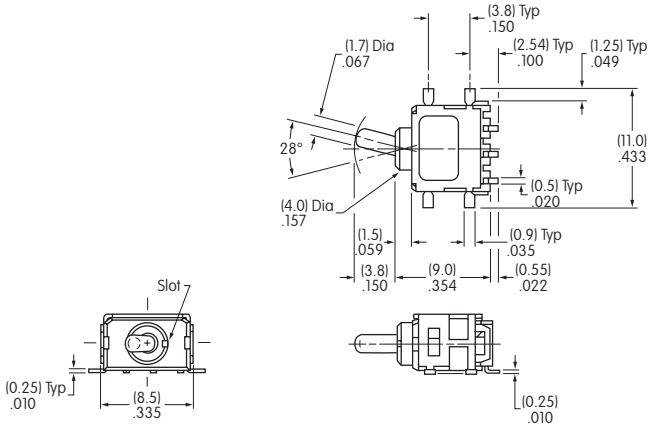
G3T12AP

Single & Double Pole — Upright Mounting with Bracket

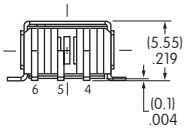


G3T22AB

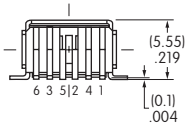
Right Angle Mounting



Single Pole



Double Pole

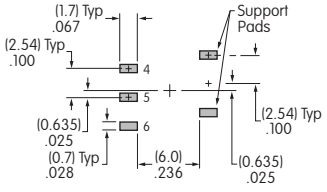


G3T12AH

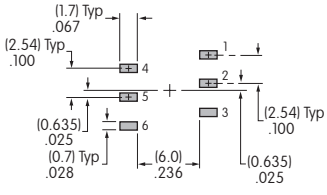
Pad Layouts for Surface Mount Terminals

Upright Mounting

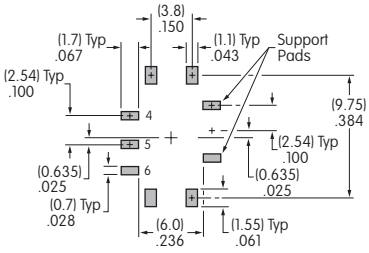
Single Pole Double Throw

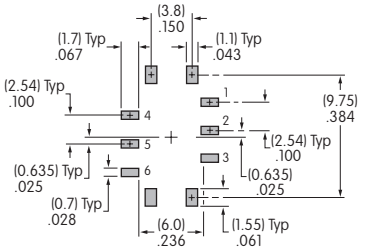


Double Pole Double Throw

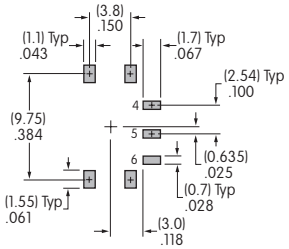


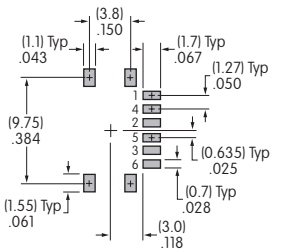
Upright Mounting with Bracket





Right Angle Mounting





PACKAGING

R **Tape-Reel for Right Angle**

500 pieces per reel

Switches must be ordered in 500-piece increments when tape-reel packaging is selected.

This packaging meets EIA-481-D Standard for "16mm and 24mm Embossed Carrier Taping of Surface Mount Components for Automatic Handling."

S **Stick-Tube for Upright Mount**

50 pieces per stick

Switches must be ordered in 50-piece increments when stick-tube packaging is selected.

No Code **Partitioned Tray for Upright & Right Angle**

Any quantity

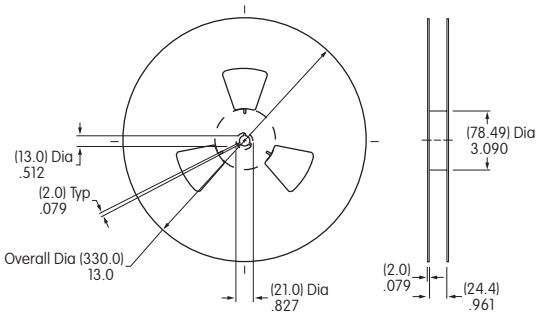
If the G3 upright models are ordered in less than 50-piece increments or the right angle models in less than 500-piece increments, the switches are packaged in a partitioned tray. No code is required.

PACKAGING (CONTINUED)

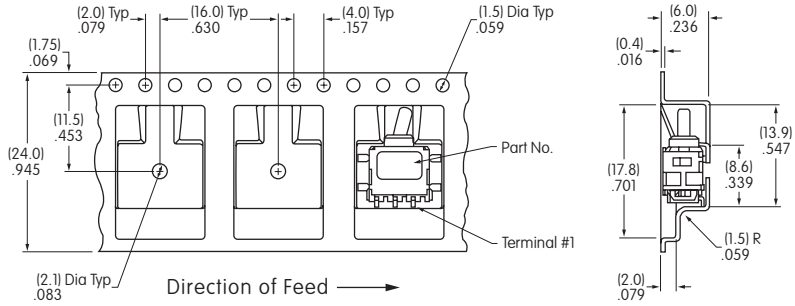
Tape-Reel Packaging for Right Angle Mount

Each tape-reel of 550 pockets contains 500 switches.

Minimum Leader Length: 7.87" (200mm) Minimum Trailer Length: 1.97" (50mm)



Reel Dimensions



Tape Dimensions

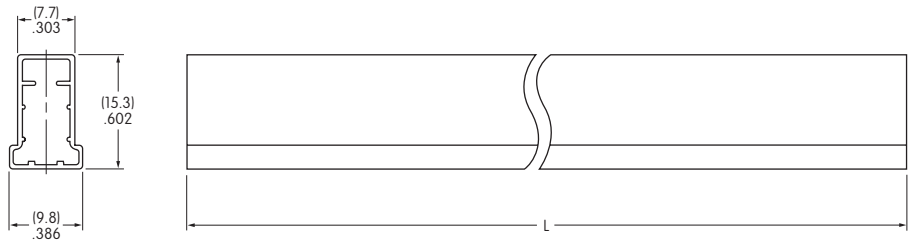
Stick-Tube Packaging for Upright Mount

Each stick-tube contains 50 switches.

L = Length

G3T Upright (code P)
18.31" (465mm)

G3T Upright with Bracket (code B)
21.26" (540mm)



Stick-Tube Dimensions

General Specifications

Electrical Capacity (Resistive Load)

Power Level (silver): 6A @ 125V AC & 3A @ 250V AC
4A @ 30V DC for On-None-On; 3A @ 30V DC for all other circuits

Logic Level (gold): 0.4VA maximum @ 28V AC/DC maximum (Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)

Other Ratings

Contact Resistance: 10 milliohms maximum for silver; 20 milliohms maximum for gold

Insulation Resistance: 1,000 megohms minimum @ 500V DC

Dielectric Strength: 1,000V AC minimum between contacts for 1 minute minimum;
1,500V AC minimum between contacts and case for 1 minute minimum

Mechanical Life: 50,000 operations minimum

Electrical Life: 50,000 operations minimum for silver at 3A @ 250V AC; 25,000 operations minimum for silver at 6A @ 125V AC; 50,000 operations minimum for gold

Angle of Throw: 25°

Environmental Data

Operating Temp Range: –30°C through +85°C (–22°F through +185°F)

Sealing: Waterproofing, achieved with boot at base of lever plus o-rings inside and outside of bushing, meets IP67 of IEC60529 Standards (dust tight and protection against effects of temporary immersion). See further explanation on page A51.

Processing

Soldering: Manual Soldering for SIlver: ON-NONE-ON: See Profile B in Supplement section.
ON-OFF-ON and (ON)-OFF-(ON): See Profile A in Supplement section.
Manual Soldering for Gold, all circuits: See Profile A in Supplement section.
Note: Lever must be in OFF (center) position while soldering.

Distinctive Characteristics

Inner o-ring and external rubber washer seal the switch to achieve IP67 of IEC60529 Standards (dust tight and water protected for temporary immersion).

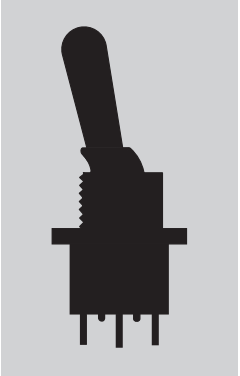
Waterproof boot at base of toggle further ensures protection against wet environments.

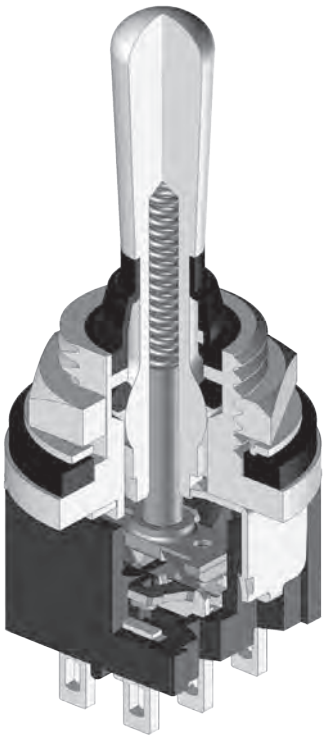
Actuation provides smooth, sturdy tactile feel.

Polished, chrome-plated actuator paired with the waterproof boot not only delivers in terms of sleek design, but also functionality and reliability.

Superb quality and construction design prohibit entry of harmful particles that may otherwise compromise lever operation.

Actual Size





TYPICAL SWITCH ORDERING EXAMPLE

M20 | 1 | 2 | WB | G | 01

Poles

1	SPDT
2	DPDT

Circuits

2	ON	NONE	ON
3	ON	OFF	ON
8	(ON)	OFF	(ON)

( ) = Momentary

Toggle with Large Bushing

WB	.787" (20.0mm) Bat with Large .472" (12.0mm) Threaded Bushing with D Flat

Contact Material & Ratings

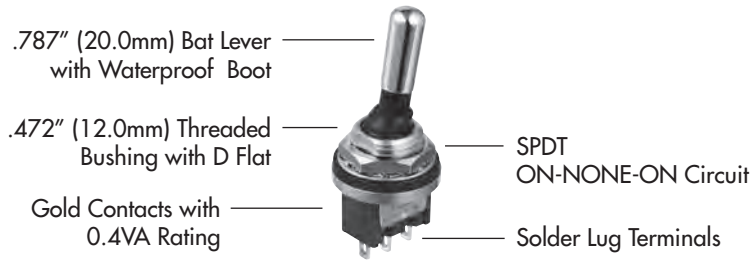
W	Silver; Rated 6A @ 125V AC & 3A @ 250V AC
G	Gold; Rated 0.4VA max @ 28V AC/DC max

Terminals

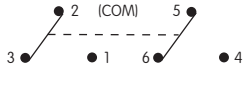
01	Solder Lug

DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

M2012WBG01

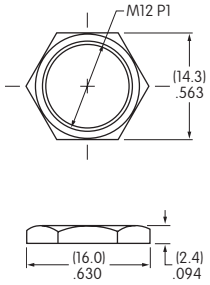


POLES & CIRCUITS

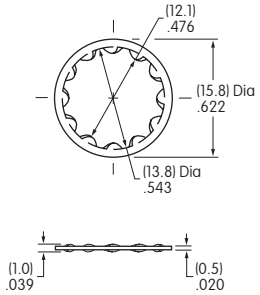
Pole	Model	Toggle Position ( ) = Momentary: Up	Center	Down	Connected Terminals: Up	Center	Down	Throw & Schematics
								Note: Terminal numbers are not actually on the switch.
SP	**M2012 M2013 M2018**	ON ON (ON)	NONE OFF OFF	ON ON (ON)	2-3	OPEN	2-1	SPDT 
DP	**M2022 M2023 M2028**	ON ON (ON)	NONE OFF OFF	ON ON (ON)	2-3 5-6	OPEN	2-1 5-4	DPDT 

STANDARD HARDWARE

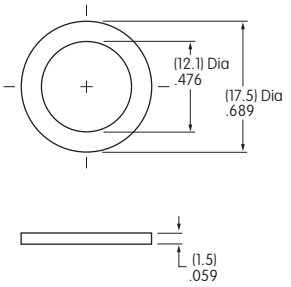
AT503M Hex Face Nut
Brass/Chrome



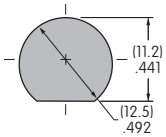
AT508 Lockwasher
Steel with Zinc/Chromate



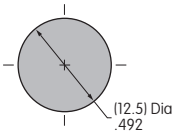
AT401P O-ring
Nitrile Butadiene Rubber



PANEL CUTOUTS & THICKNESS



Anti-rotation

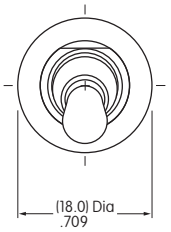


No
Anti-rotation

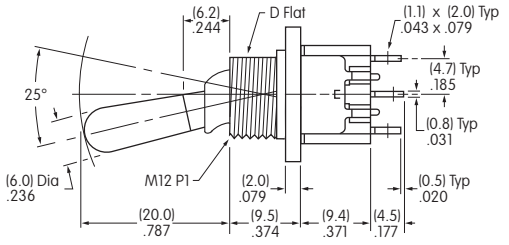
Maximum Effective Panel Thickness
.138" (3.5mm)

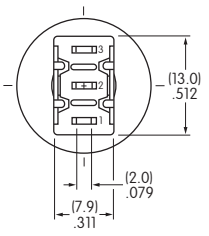
TYPICAL SWITCH DIMENSIONS

Solder Lug



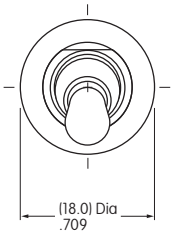
Single Pole



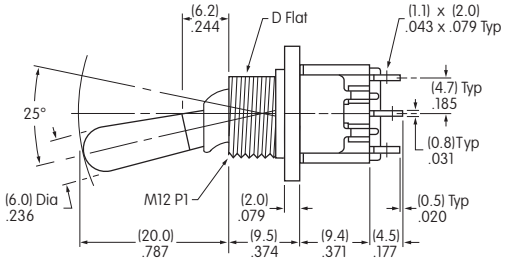


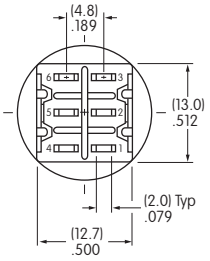
M2012WBG01

Solder Lug



Double Pole





M2022WBG01

APPLICATION CONSIDERATIONS

The Dual Seal Waterproof M Toggle is designed as a panel seal switch, and not to be used under water.

Material Properties

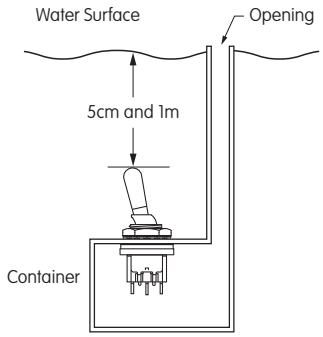
The material for the waterproof boot is silicone rubber. While silicone rubber has excellent heat, cold and weather resistant properties, it has less durability and oil resistance.

The o-rings are made of nitrile butadiene rubber, which excels in durability and oil and chemical resistance. Its performance is less durable with lower weather and ozone resistant characteristics.

Evaluate the products in reguard to your application and intended environment with these properties in mind.

Waterproof Test Conditions

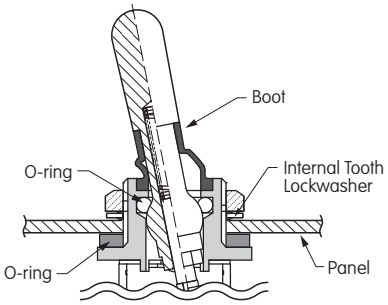
Waterproofing is measured by submersing the switch 5 centimeters from the water surface (see illustration), and opening and closing 50 times at a frequency of 50 – 60 times per minute. The switch is then submersed 1 meter from the surface and left in this position for 30 minutes.



Repeat opening and closing same as previous test. The resulting insulation resistance and voltage capacity are both within the rated values, and water has not entered inside the switch or installation panel.

Panel Installation

For panel installation, the internal tooth lockwasher is installed above the panel. The external o-ring mounts below the panel.



Applications

- Construction Equipment
- Hospitality and Restaurant
- Transportation
- Medical Equipment
- Machine Tooling
- Marine Equipment *

* Salt spray tested as per Mil-STD-810G section 509.5.

General Specifications

Electrical Capacity (Resistive Load)

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

Other Ratings

Contact Resistance: 10 milliohms maximum for silver; 20 milliohms maximum for gold
Insulation Resistance: 1,000 megohms minimum @ 500V DC
Dielectric Strength: 1,000V AC minimum between contacts for 1 minute minimum;
1,500V AC minimum between contacts and case for 1 minute minimum
Mechanical Life: 100,000 operations minimum; 50,000 operations minimum for flat, locking & splashproof devices
Electrical Life: 25,000 operations minimum for silver; 50,000 operations minimum for gold;
50,000 operations minimum for silver at 3A @ 125V AC
Angle of Throw: 25°

Materials & Finishes

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

Environmental Data

Operating Temp Range: –30°C through +85°C (–22°F through +185°F)
Humidity: 90 ~ 95% humidity for 96 hours @ 40°C (104°F)
Vibration: 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
Shock: 50G (490m/s^2) acceleration (tested in 6 right angled directions, with 5 shocks in each direction)
Sealing: Splashproof bushing options B3, D3, D8, L3, & L8, which have o-rings inside & outside the bushing, meet IP67 of IEC60529 Standards.

Installation

Mounting Torque: 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

Soldering: Wave Soldering (PC version) for Gold: See Profile A in Supplement section.
Manual Soldering for Gold: See Profile A in Supplement section.
Wave Soldering (PC version) for Silver: See Profile B in Supplement section.
Manual Soldering for Silver: See Profile B in Supplement section.
Note: Lever must be in OFF (center) position while soldering.
Cleaning: These devices are not process sealed. Hand clean locally using alcohol based solution.

Standards & Certifications

Flammability Standards: UL94V–0 for case
UL: **File No. E44145 - Recognized only when ordered with marking on switch.**
Add "/U" or "/CUL" before dash in part number to order UL recognized switch.
All models recognized at 6A @ 125V AC, 3A @ 250V AC or 0.4VA maximum @ 28V DC maximum.
CSA: **File No. 023535_0_000 - Certified only when ordered with marking on switch.**
Add "/C" before dash in part number to order CSA certified switch.
All models certified at 6A @ 125V AC or 3A @ 250V AC or 0.4VA maximum @ 28V maximum.

Distinctive Characteristics

Antirotation design, standard on noncylindrical levers, mates toggle and bushing; bottom of toggle has two flatted 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.

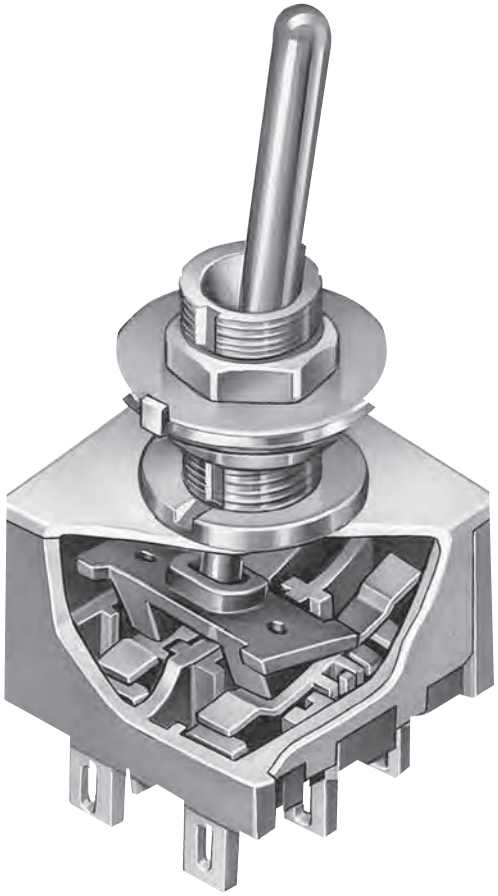
Molded diallyl phthalate case has a UL flammability rating of 94V-0.

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

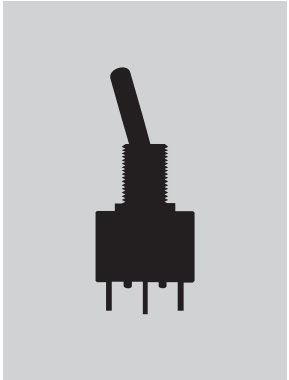
Prominent external insulating barriers increase insulation resistance and dielectric strength.

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

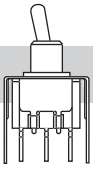
Clinching of frame to case well above base and terminals provides 1,500V dielectric strength.



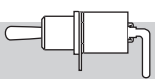
Actual Size



Bushing Mount Page A52



Bracket PC Mount Page A64



Angle PC Mount Page A70

Series M

Bushing Mount Miniature Toggles

TYPICAL SWITCH

M20 | 1 | 3 | S | S1

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 (available in colors A, B & C only)
D	.840″ (21.3mm) Color Capped Cone

Specify cap color for toggles C & D 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
S4	6mm .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
D4	6mm .350″ (8.9mm) Threaded with D Flat
D3	.350″ (8.9mm) Threaded Splashproof with D Flat (combines only with S, S2 & S3)
D8	6mm .350″ (8.9mm) Threaded Splash-proof with D Flat (combines only with S, S2 & S3)

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
L4	6mm .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
L8	6mm .295″ (7.5mm) Threaded Splash-proof with D Flat for Lever Lock

IMPORTANT:

Switches are supplied without UL, cULus & CSA marking unless specified.
UL, cULus & CSA recognized only when ordered with marking on the switch.
Specific models, ratings, & ordering instructions are noted on the General Specifications page.

ORDERING EXAMPLE

W 01 — □ □

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

For Small Bat Toggles	
B	For S Bat Toggle
C	Conical Cap for S Bat Toggle
For Large Bat Toggles	
R	For B Toggle
V	For B2 Toggle

Cap for Locking Lever

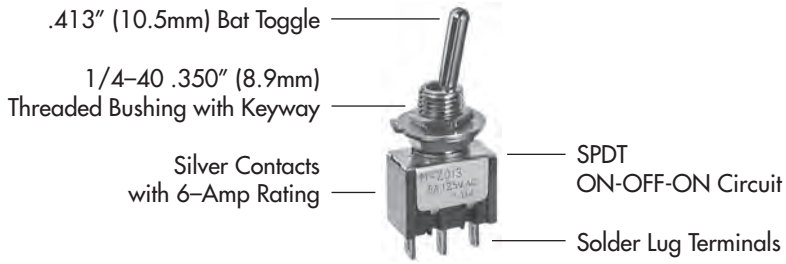
No Code	Nickel Plated Supplied with Switch
A	Black
C	Red
G	Blue

Cap Colors

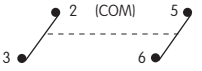
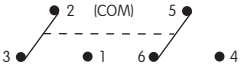
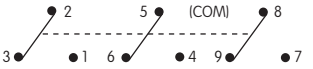
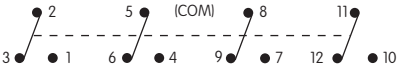
A	Black
B	White
C	Red
E	Yellow
F	Green
G	Blue

DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

M2013SS1W01

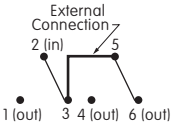
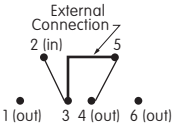
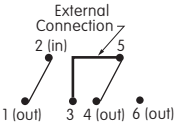
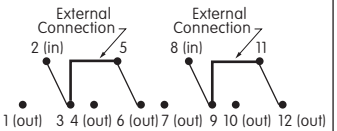
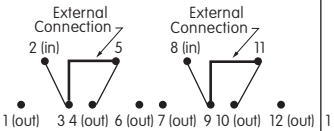
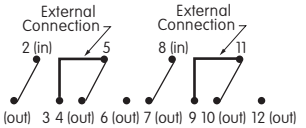


POLES & CIRCUITS

Pole	Model	Toggle Position ( ) = Momentary: Down	Center	Up	Connected Terminals: Down	Center	Up	Throw & Schematics
		Keyway			Keyway			Note: Terminal numbers are not actually on the switch.
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 

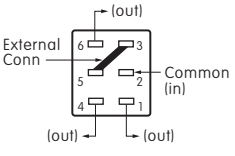
For 3 Throw (3-On)

Connected Terminals & Schematic

Pole	Model	Down	Center	Up	Down	Center	Up
SP	**M2024** **M2026** **M2027**	ON (ON) ON	ON ON ON	ON (ON) (ON)	 2-3 5-6	 2-3 5-4	 2-1 5-4
DP	**M2044** **M2046** **M2047**	ON (ON) ON	ON ON ON	ON (ON) (ON)	 2-3 5-6 8-9 11-12	 2-3 5-4 8-9 11-10	 2-1 5-4 8-7 11-10

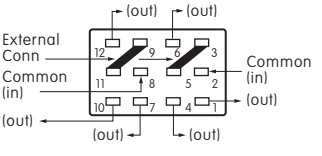
The SP3T model utilizes a double pole base.

External connection must be made during field installation.



The DP3T model utilizes a four pole base.

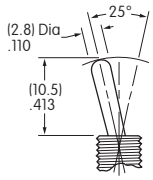
External connection must be made during field installation.



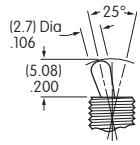
SMALL TOGGLES

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".

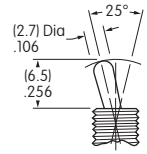
S .413" (10.5mm) Bat



S2 .200" (5.08mm) Bat

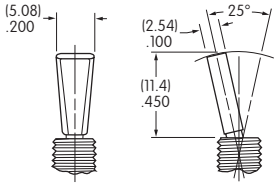


S3 .256" (6.5mm) Bat

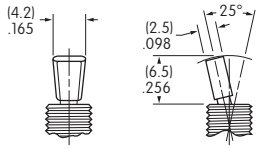


Standard Material & Finish: Brass with Bright Chrome
Contact factory for optional finishes.

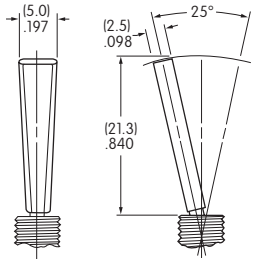
E .450" (11.4mm) Flatted



E2 .256" (6.5mm) Flatted



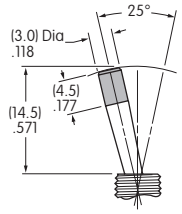
E4 .840" (21.3mm) Flatted



Only Available in 1- & 2-Pole

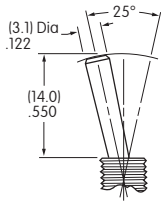
C .571" (14.5mm) Color Tipped Cone Supplied with Cap AT445

Colors: A B C
Material: Polycarbonate

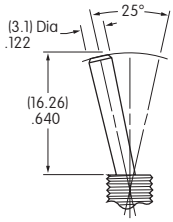


Only Available in 1- & 2-Pole

Q .550" (14.0mm) Cone

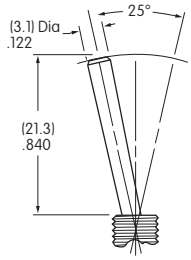


Q2 .640" (16.26mm) Cone



Only Available in 1- & 2-Pole

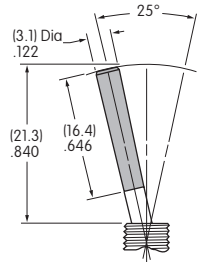
Q4 .840" (21.3mm) Cone



Only Available in 1- & 2-Pole

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

Colors: A B C E F G
Material: Polyethylene

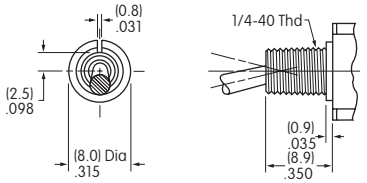


Only Available in 1- & 2-Pole

Cap Colors Available: A Black · B White · C Red · E Yellow · F Green · G Blue

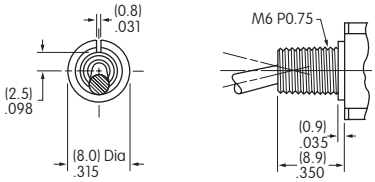
SMALL BUSHINGS

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



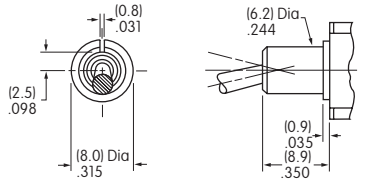
Maximum Panel Thickness with Standard Hardware: .102" (2.6mm)

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

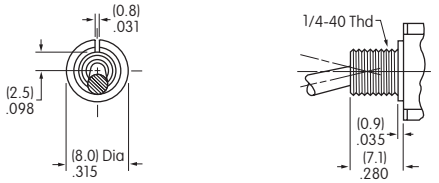


Maximum Panel Thickness with Standard Hardware: .102" (2.6mm)

S2 — .350" (8.9mm) Smooth with Keyway

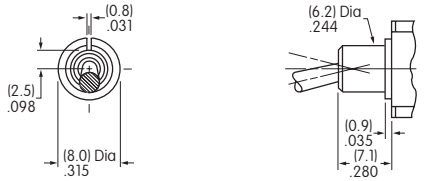


A1 — 1/4-40 .280" (7.1mm) Threaded with Keyway



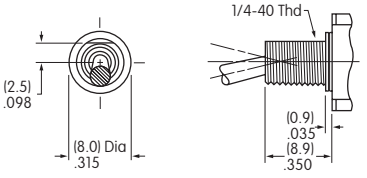
When using this bushing, toggle length is increased by .070". Maximum Panel Thickness with Standard Hardware: .031" (0.8mm)

A2 — .280" (7.1mm) Smooth with Keyway



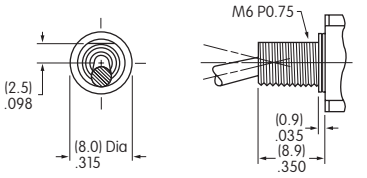
When using this bushing, toggle length is increased by .070".

D1 — 1/4-40 .350" (8.9mm) Threaded with D Flat



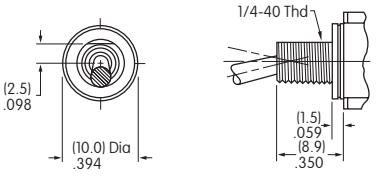
Maximum Panel Thickness with Standard Hardware: .102" (2.6mm)

D4 — 6mm/.350" (8.9mm) Threaded with D Flat



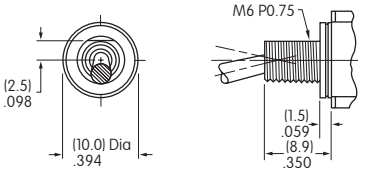
Maximum Panel Thickness with Standard Hardware: .102" (2.6mm)

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



D3 combines only with S, S2 & S3 toggles. Maximum Panel Thickness with Standard Hardware: .193" (4.9mm)

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

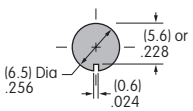


D8 combines only with S, S2 & S3 toggles. Maximum Panel Thickness with Standard Hardware: .193" (4.9mm)

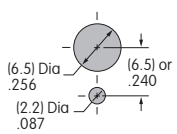
Standard Hardware Supplied for Small Bushings

	Bushing Codes	S1/S4	A1	D1/D4	D3/D8	L1/L4	L3/L8
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

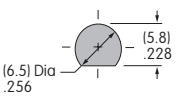
For S1, S2, A1, A2 or S4 Bushing with Keyway & for L1 or L4 Bushing



For S1, A1 or S4 Bushing with Locking Ring & for L1 or L4 Bushing



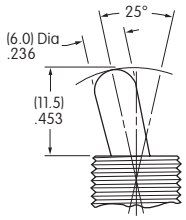
For D1, D4, D3 or D8 Bushing with D Flat & for L3 or L8 Bushing



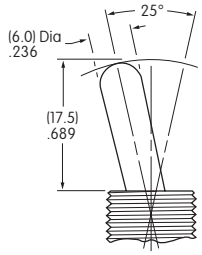
LARGE TOGGLES

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

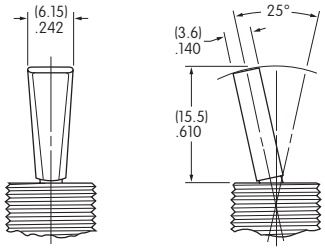
B **.453" (11.5mm) Large Bat**



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



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

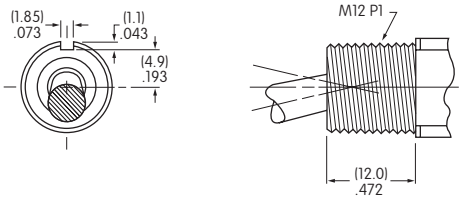


Standard Material & Finish: Brass with Bright Chrome

Optional Finishes: Contact factory for satin chrome or black.

LARGE BUSHINGS

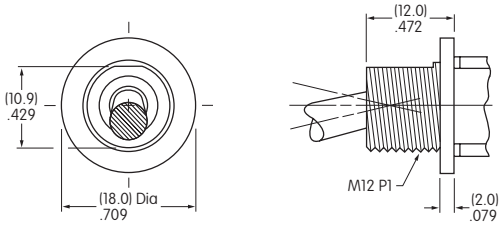
B1 **Large .472" (12.0mm) Threaded with Keyway**



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**

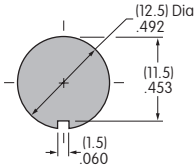


Maximum Panel Thickness with Standard Hardware: .256" (6.5mm)

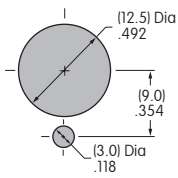
Standard Hardware for B3:
1 hex face nut AT503M and 1 o-ring AT401P

Panel Cutouts

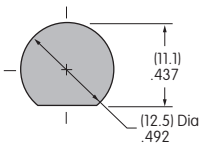
For B1 Bushing with Keyway



For B1 Bushing with Locking Ring

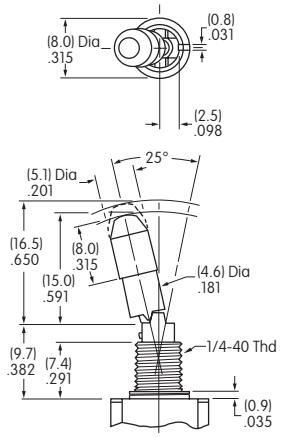


For B3 Bushing with D Flat

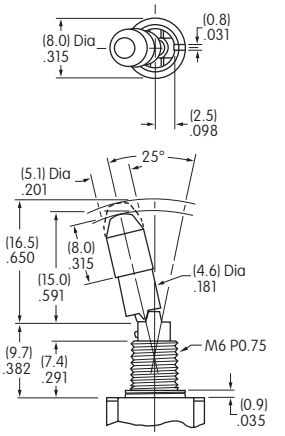


LOCKING LEVER & BUSHINGS

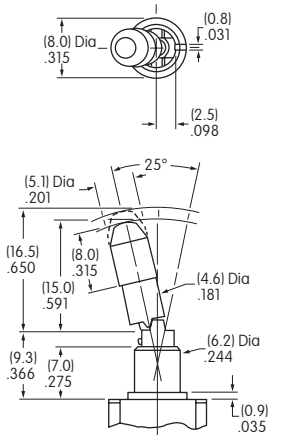
LL1 1/4-40 .291" (7.4mm) Threaded with Keyway



LL4 6mm/.291" (7.4mm) Threaded with Keyway

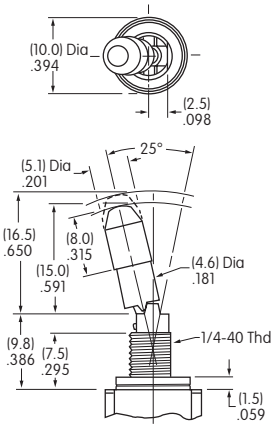


LL2 Smooth with Keyway

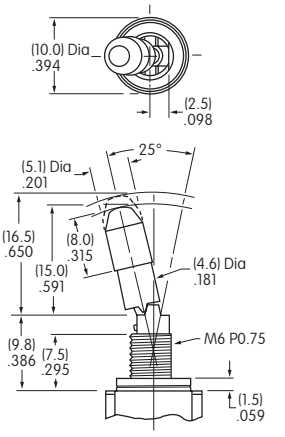


Maximum Panel Thickness with Standard Hardware: .047" (1.2mm)
Standard Hardware for L1 & L4: 2 hex nuts AT513H or AT513M,
1 locking ring AT507H or AT507M, and 1 lockwasher AT509

LL3 1/4-40 .295" (7.5mm) Threaded Splashproof with D Flat



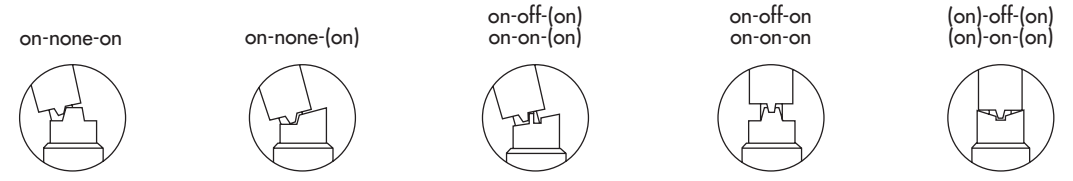
LL8 6mm/.295" (7.5mm) Threaded Splashproof with D Flat



Maximum Panel Thickness with Standard Hardware: .047" (1.2mm)
Standard Hardware for L3 and L8: 1 hex nut AT513H or AT513M and 1 o-ring AT516

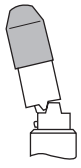
Lever Material & Finish: Brass with Chrome Plating

Locking Mechanism



No Code **Supplied with Cap AT427**

Cap Material:
Brass with Nickel Plating



Color Codes for Optional Anodized Aluminum Caps

A Black C Red G Blue

CONTACT MATERIALS & RATINGS

W	**Silver over Silver**	**Power Level**	**6A @ 125V AC & 3A @ 250V AC**
G	**Gold over Brass or Copper**	**Logic Level**	**6A @ 125V AC & 3A @ 250V AC**

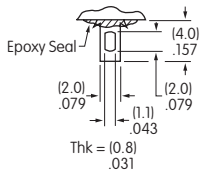
Note: See Supplement section to find complete explanation of operating range.

A	**Gold over Silver**	**Power Level or Logic Level**	**6A @ 125V AC or 0.4VA maximum @ 28V AC/DC maximum**

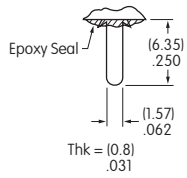
Note: This dual rated option is suitable when two or more identical switches are used in logic and in power circuits within the same application. See Supplement section to find complete explanation of dual rating and operating range.

TERMINALS

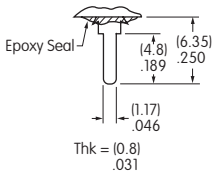
01 **Solder Lug**

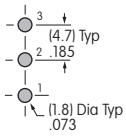


02 **.062" (1.57mm) Wide Quick Connect**

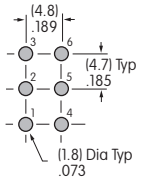


03 **.250" (6.35mm) Straight PC**

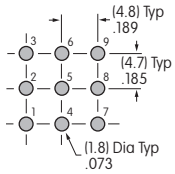




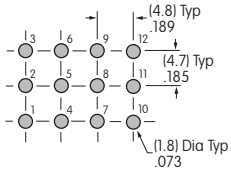
Single Pole



Double Pole



Three Pole



Four Pole

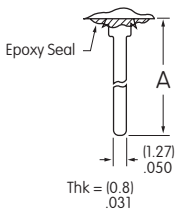
05 **.425" (10.8mm) Wirewrap or Extended PC**

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.

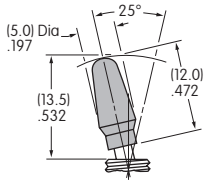


Dimension A = terminal lengths as shown beside the terminal codes at the left.

OPTIONAL CAPS & CAP COLORS

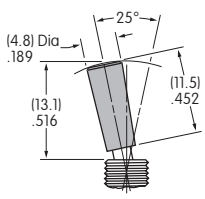
B *** AT415 Lever Cap for S Bat Toggle**

Material: Polyethylene



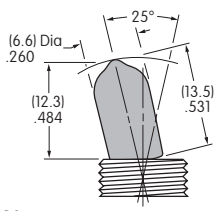
C *** AT444 Conical Cap for S Bat Toggle**

Material: Polyethylene



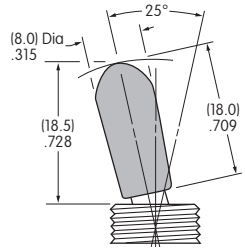
R **AT434 Lever Cap for B Toggle**

Material: Polyvinyl Chloride



V **AT406 Lever Cap for B2 Toggle**

Material: Polyvinyl Chloride



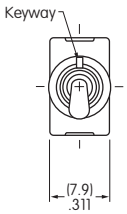
* AT415 and AT444 for use with S toggles only, not S2 or S3 toggles.

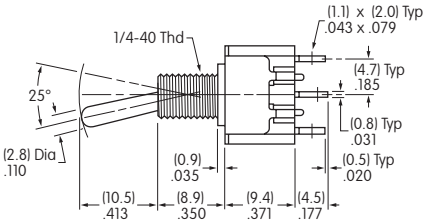
Cap Colors Available: **A** Black **B** White **C** Red **E** Yellow **F** Green **G** Blue

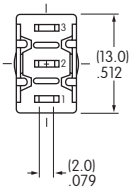
TYPICAL SWITCH DIMENSIONS

Solder Lug

Single Pole





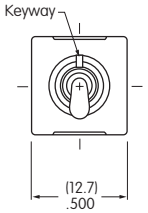


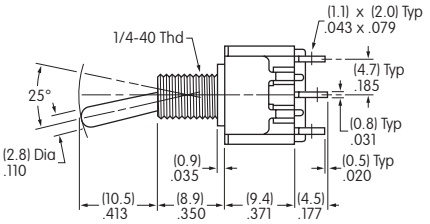
M2012SS1W01

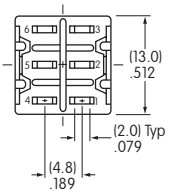
M2011 model does not have terminal 1.

Solder Lug

Double Pole





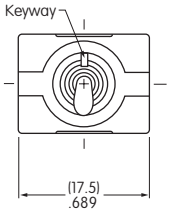


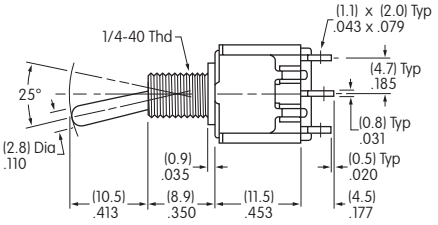
M2022SS1W01

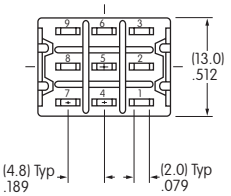
M2021 model does not have terminals 1 & 4.

Solder Lug

Three Pole



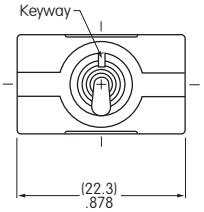


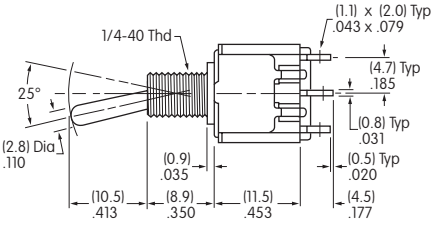


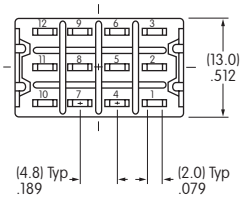
M2032SS1W01

Solder Lug

Four Pole



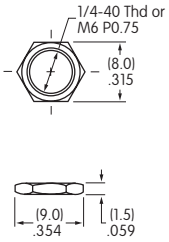




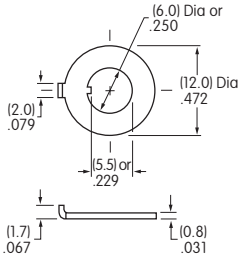
M2042SS1W01

STANDARD HARDWARE FOR SMALL & LARGE BUSHINGS

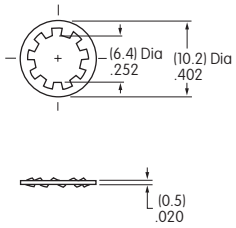
AT513H for Inch
AT513M for Metric
Hex Nut
Brass/Nickel



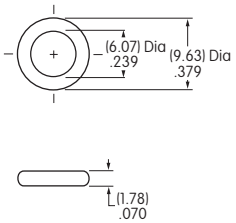
AT507H for Inch
AT507M for Metric
Locking Ring
Steel with Zinc/Chromate



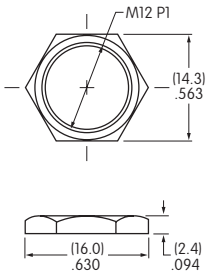
AT509
Lockwasher
Steel with Zinc/Chromate
(not supplied with splashproof models)



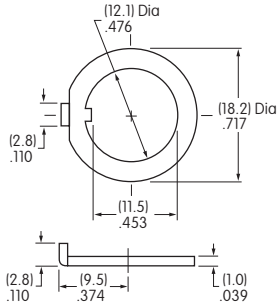
AT516
O-ring for
Splashproof Models
Nitrile Butadiene Rubber



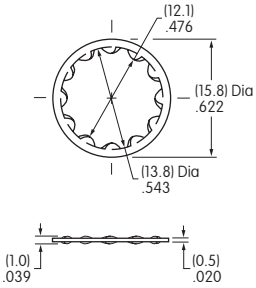
AT503M
Hex Face Nut
Brass/Chrome



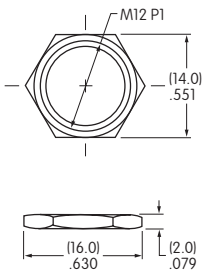
AT506M
Locking Ring
Steel with Zinc/Chromate



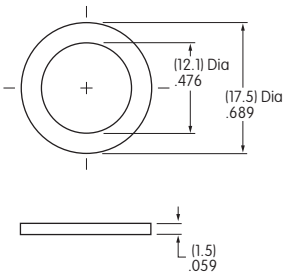
AT508
Lockwasher
Steel with Zinc/Chromate
(not supplied with splashproof models)



AT527M
Hex Nut
Steel with
Nickel Plating



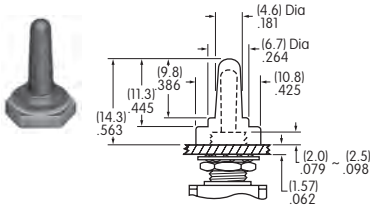
AT401P
O-ring for Splashproof Models
Nitrile butadiene rubber



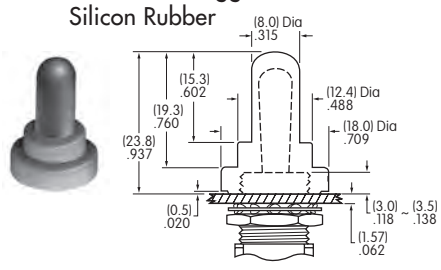
OPTIONAL SPLASHPROOF BOOTS

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

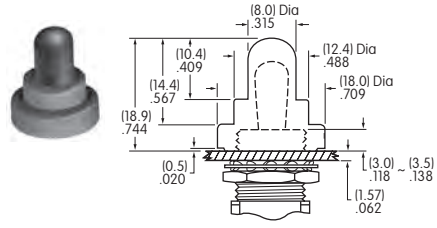
AT428 (M-metric H-Inch)
.445" (11.3mm)
Boot for S Toggle
Silicon Rubber



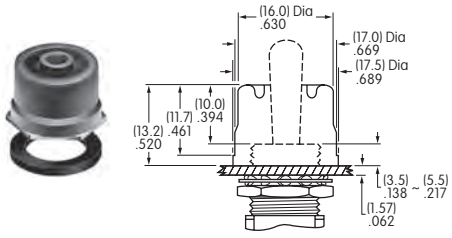
AT402
.760" (19.3mm)
Boot for B2 Toggle
Silicon Rubber



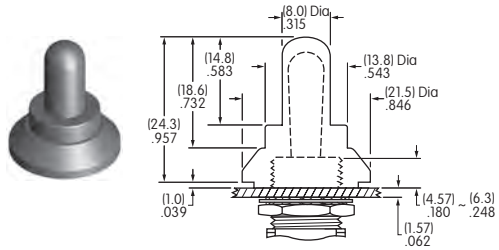
AT402S
.567" (14.4mm)
Boot for B Toggle
Silicon Rubber



AT401A/H/S
.461" (11.7mm)
Boot, Nut and O-ring for B2 Toggle
More details in Accessories section



AT4181
.732" (18.6mm)
Boot, Nut and O-ring for B2 Toggle
More details in Accessories section



Series M

Bracket PC Mount Miniature Toggles

TYPICAL SWITCH

M20 2 2 S S2

Poles

1	SPDT
2	DPDT SP3T

Circuits

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

*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

Toggle dimensions are based on use with a .350″ (8.9mm) bushing; add .070″ (1.78mm) to toggle length when combining with a .280″ (7.1mm) bushing

Small Bushings

A2	.280″ (7.1mm) Smooth with Keyway
S2	.350″ (8.9mm) Smooth with Keyway
A1	.280″ (7.1mm) Threaded with Keyway
S1	.350″ (8.9mm) Threaded with Keyway

Deduct bracket thickness of .020″ (0.51mm) from above dimensions

Locking Lever

L	.201″ (5.1mm) Dia. Locking Lever

Bushing For Locking Levers

L2	Smooth with Keyway for Lever Lock

Standard Toggle & Bushing Combinations:

SS2 & S2A2

IMPORTANT:

Switches are supplied without UL, cULus & CSA marking unless specified. **UL, cULus & CSA recognized only when ordered with marking on the switch.** Specific models, ratings & ordering instructions are noted on the General Specifications page.

ORDERING EXAMPLE

G 13 — B C

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

With Bracket	
13	.250″ (6.35mm) Straight PC with .465″ (11.8mm) Bracket
15	.425″ (10.8mm) Straight PC with .630″ (16.0mm) Bracket
17	.964″ (24.5mm) Straight PC with 1.150″ (29.2mm) Bracket
With Reinforced Bracket	
23	.250″ (6.35mm) Straight PC with .465″ (11.8mm) Bracket
25	.425″ (10.8mm) Straight PC with .630″ (16.0mm) Bracket
26	.750″ (19.05mm) Straight PC with .953″ (24.2mm) Bracket

Optional Caps

B	For S Bat Toggle
C	Conical Cap for S Bat Toggle

Cap for Locking Lever

No Code	Nickel Plated Supplied with Switch
A	Black
C	Red
G	Blue

Cap Colors

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

DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

M2022SS2G13-BC

Red Cap on .413″ (10.5mm) Bat Toggle

.350″ (8.9mm) Smooth Bushing with Keyway

Gold Contacts with 0.4VA Rating

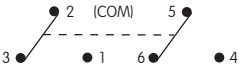
DPDT ON-NONE-ON Circuit

.250″ (6.35mm) Straight PC Terminals with Bracket .465″ (11.8mm) Long

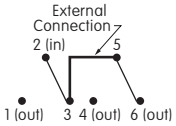
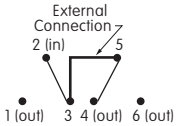
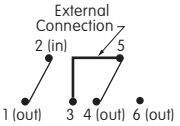
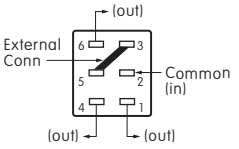
Series M

Bracket PC Mount Miniature Toggles

POLES & CIRCUITS

Pole	Model	Toggle Position ( ) = Momentary: Down	Center	Up	Connected Terminals: Down	Center	Up	Throw & Schematics
		Keyway			Keyway			Note: Terminal numbers are not actually on the switch.
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	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 

For 3 Throw (3-On)

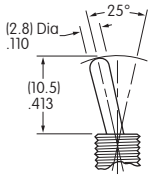
Pole	Model	Connected Terminals & Schematics: Down	Center	Up	External Connection
SP	M2024 M2026 M2027	ON (ON) ON	ON ON ON	ON (ON) (ON)	**The SP3T model utilizes a double pole base.**
					External connection must be made during field installation. 
		2-3 5-6	2-3 5-4	2-1 5-4	

SMALL TOGGLES

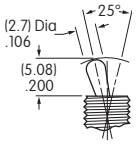
Important:
Toggle length changes based on bushing selected. All illustrations are shown with .350" (8.9mm) long bushing. When using a .280" (7.1mm) long bushing, toggle length increases .070" (1.78mm).

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

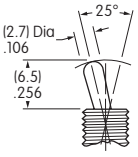
S .413" (10.5mm) Bat



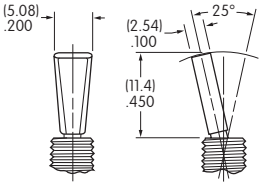
S2 .200" (5.08mm) Bat



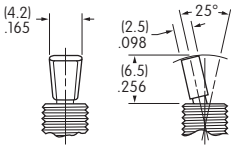
S3 .256" (6.5mm) Bat



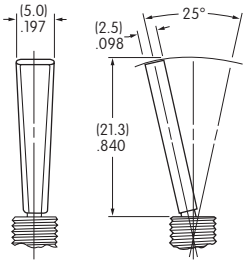
E .450" (11.4mm) Flatted



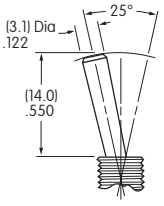
E2 .256" (6.5mm) Flatted



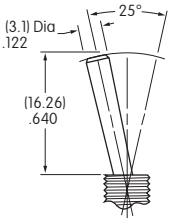
E4 .840" (21.3mm) Flatted



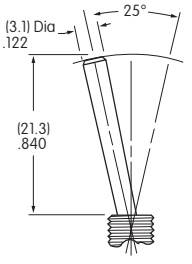
Q .550" (14.0mm) Cone



Q2 .640" (16.26mm) Cone

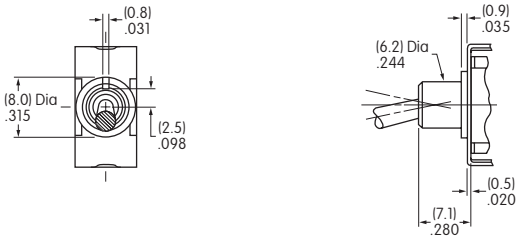


Q4 .840" (21.3mm) Cone



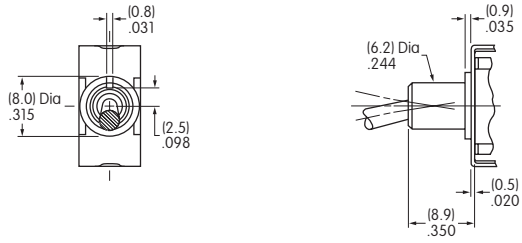
SMALL BUSHINGS

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

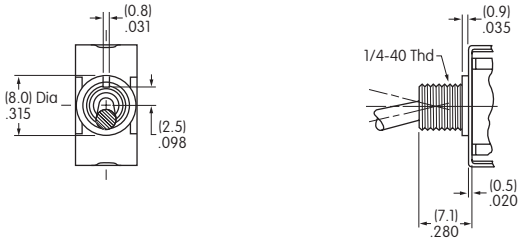


When using this bushing, toggle length is increased by .070" (1.78mm).

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

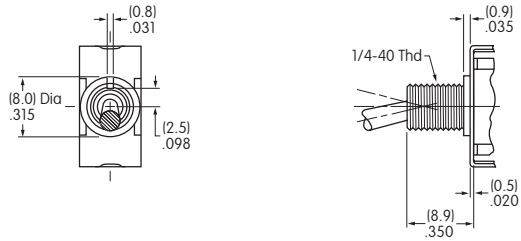


A1 **.280" (7.1mm) Threaded with Keyway**



When using this bushing, toggle length is increased by .070" (1.78mm). Maximum Panel Thickness with Standard Hardware: .031" (0.8mm)

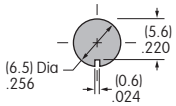
S1 **.350" (8.9mm) Threaded with Keyway**



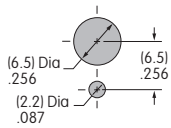
Maximum Panel Thickness with Standard Hardware: .102" (2.6mm)

Panel Cutouts

For A2, S2, A1, or S1 Bushing with Keyway



For A1 or S1 Bushing with Locking Ring



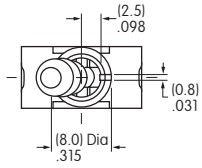
Standard Hardware:

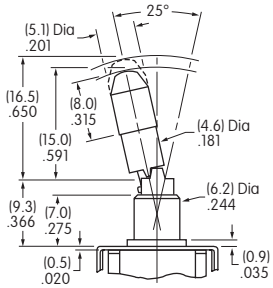
2 Hex Nuts (AT513H)
1 Lockwasher (AT509)
1 Locking Ring (AT507H)

For dimensions, see Accessories & Hardware section.

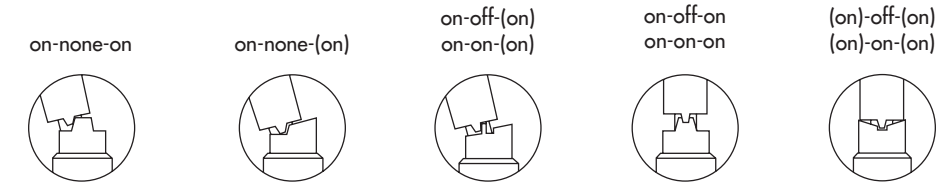
LOCKING LEVER & BUSHING

LL2 **Smooth with Keyway**

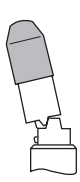




Locking Mechanism



No Code



Cap for Locking Lever

Supplied with Cap AT427
Material & Finish:
Brass with Nickel Plating

Lever Material & Finish:
Brass with Chrome Plating

Color Codes for Optional Anodized Aluminum Caps

A Black
C Red
G Blue

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

Straight PC Mount with Bracket

13 .250" (6.35mm) Terminal with .465" (11.8mm) Bracket

15 .425" (10.8mm) Terminal with .630" (16.0mm) Bracket

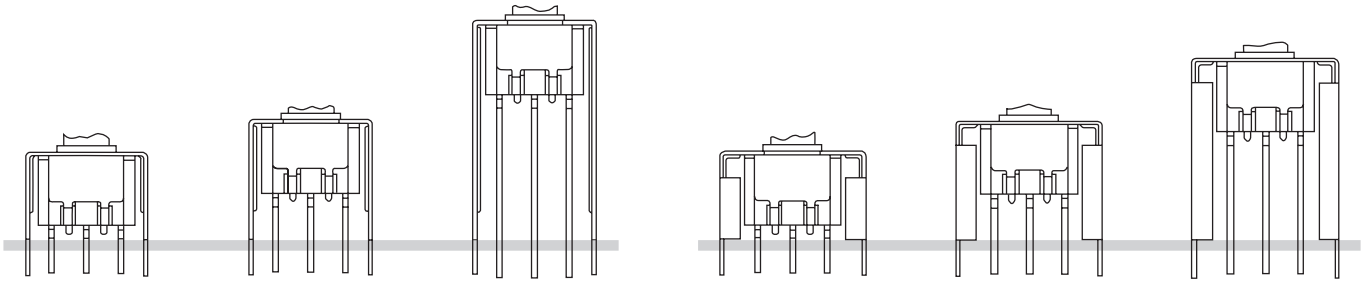
17 .964" (24.5mm) Terminal with 1.150" (29.2mm) Bracket

Straight PC Mount with Reinforced Bracket

23 .250" (6.35mm) Terminal with .465" (11.8mm) Bracket

25 .425" (10.8mm) Terminal with .630" (16.0mm) Bracket

26 .750" (19.05mm) Terminal with .953" (24.2mm) Bracket

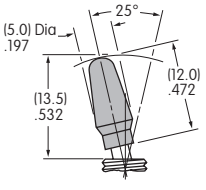


PCB footprints are on the following Typical Switch Dimension page.

OPTIONAL CAPS & CAP COLORS

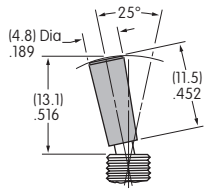
B * AT415 for S Bat Toggle

Material: Polyethylene



C * AT444 Conical Cap for S Bat Toggle

Material: Polyethylene

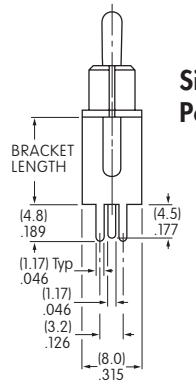


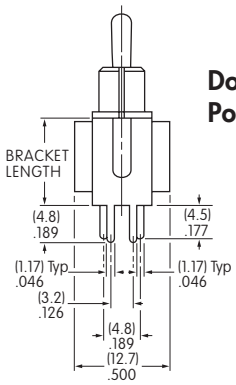
* AT415 and AT444 for use with S toggles only, not S2 or S3 toggles.

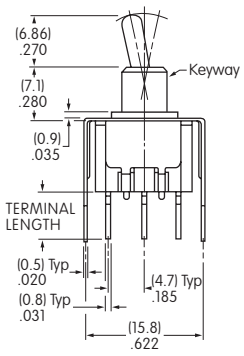
Cap Colors Available: A Black, B White, C Red, E Yellow, F Green, G Blue

TYPICAL SWITCH DIMENSIONS

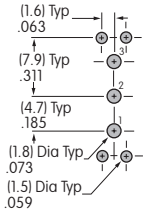
Straight PC • Bracket

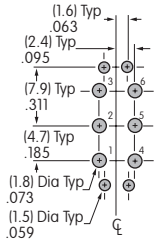






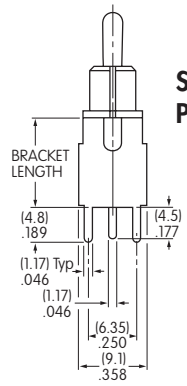
M2012S2A2G13

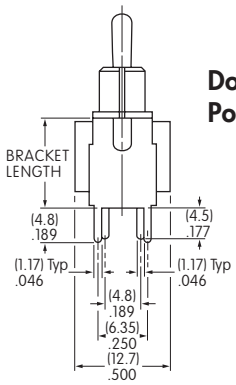


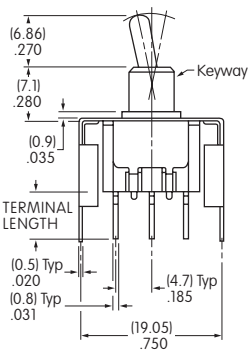


Terminal Code:	Terminal Length:	Bracket Length:
13	.250″ (6.35mm)	.465″ (11.8mm)
15	.425″ (10.8mm)	.630″ (16.0mm)
17	.964″ (24.5mm)	1.150″ (29.2mm)

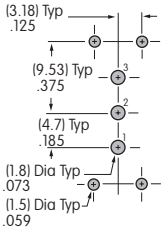
Straight PC • Reinforced Bracket

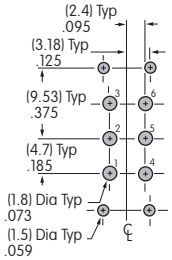






M2012S2A2G23





Terminal Code:	Terminal Length:	Bracket Length:
23	.250″ (6.35mm)	.465″ (11.8mm)
25	.425″ (10.8mm)	.630″ (16.0mm)
26	.750″ (19.05mm)	.953″ (24.2mm)

Series M

Angle PC Mount Miniature Toggles

TYPICAL SWITCH

M20 — 1 — 2 — S2 — A2

Poles

1	SPDT
2	DPDT SP3T
3	3PDT
*4	4PDT DP3T

*4-pole available on vertical models only.

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

Toggle dimensions are based on use with a .350″ (8.9mm) bushing; add .070″ (1.78mm) to toggle length when combining with a .280″ (7.1mm) bushing.

Small Bushings

A2	.280″ (7.1mm) Smooth with Keyway
S2	.350″ (8.9mm) Smooth with Keyway
A1	.280″ (7.1mm) Threaded with Keyway
S1	.350″ (8.9mm) Threaded with Keyway

Circuits

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

* 3-ON circuits available with double and four pole bases only

Locking Lever

L	.201″ (5.1mm) Dia. Locking Lever

Bushing For Locking Levers

L2	Smooth with Keyway for Lever Lock

Standard Toggle, Bushing, & Terminal Combinations:

S2A2G30, S2A2G40, SS2G30, SS2G40, LL2G30, & LL2G40

IMPORTANT:

Switches are supplied without UL, cULus & CSA marking unless specified.
UL, cULus & CSA recognized only when ordered with marking on the switch.
Specific models, ratings & ordering instructions are noted on the General Specifications page.

ORDERING EXAMPLE

G 40 — □ □

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

30	.150" (3.81mm) Right Angle PC (1-3 Pole)
32	Right Angle PCB (1 Pole & 0.4VA Rating Only)
40	.150" (3.81mm) Vertical PC (1-4 Pole)
45	.100" (2.54mm) Vertical PC (1-4 Pole)

Optional Caps

B	For S Bat Toggle
C	Conical Cap for S Bat Toggle

Cap for Locking Lever

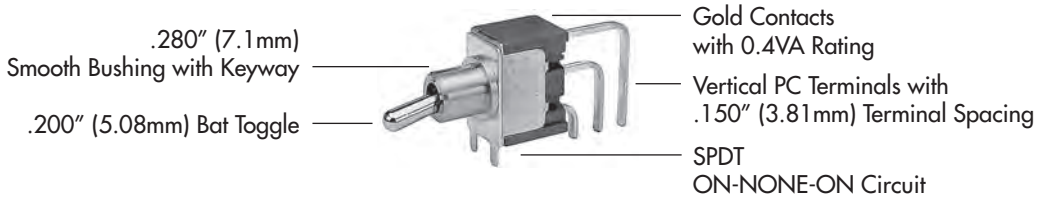
No Code	Nickel Plated Supplied with Switch
A	Black
C	Red
G	Blue

Cap Colors

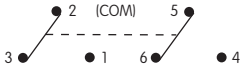
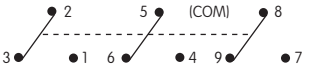
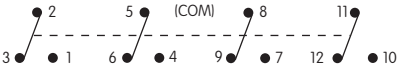
A	Black
B	White
C	Red
E	Yellow
F	Green
G	Blue

DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

M2012S2A2G40

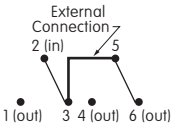
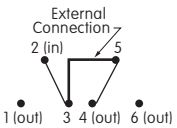
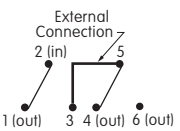
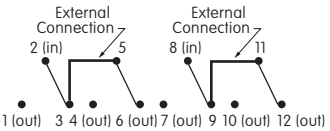
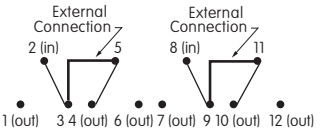
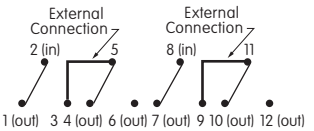


POLES & CIRCUITS

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

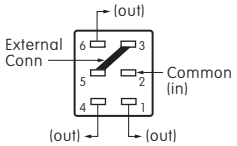
For 3 Throw (3-On)

Connected Terminals & Schematics

Pole	Model	Down	Center	Up	Down	Center	Up
SP	M2024	ON	ON	ON	 2-3 5-6	 2-3 5-4	 2-1 5-4
	M2026	(ON)	ON	(ON)			
	M2027	ON	ON	(ON)			
DP	M2044	ON	ON	ON	 2-3 5-6 8-9 11-12	 2-3 5-4 8-9 11-10	 2-1 5-4 8-7 11-10
	M2046	(ON)	ON	(ON)			
	M2047	ON	ON	(ON)			

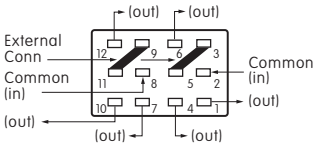
The SP3T model utilizes a double pole base.

External connection must be made during field installation.



The DP3T model utilizes a four pole base.

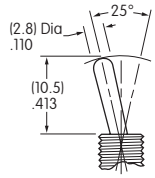
External connection must be made during field installation.



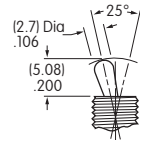
SMALL TOGGLES

Important:
Toggle length changes based on bushing selected. All illustrations are shown with .350" (8.9mm) long bushing. When using a .280" (7.1mm) long bushing, toggle length increases .070" (1.78mm).

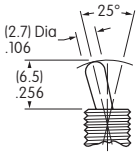
S **.413" (10.5mm) Bat**



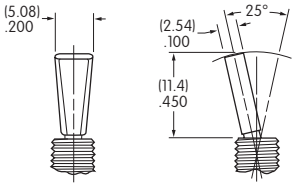
S2 **.200" (5.08mm) Bat**



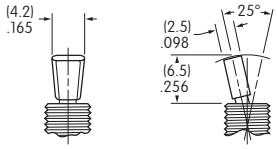
S3 **.256" (6.5mm) Bat**



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



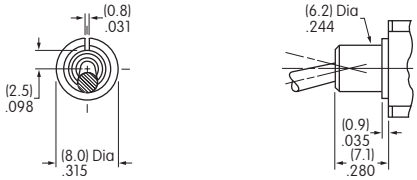
E2 **.256" (6.5mm) Flatted**



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

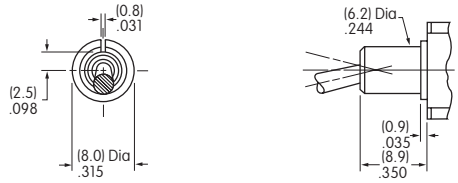
SMALL BUSHINGS

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

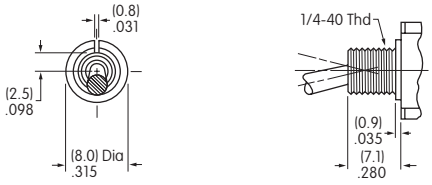


When using this bushing, toggle length is increased by .070" (1.78mm).

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

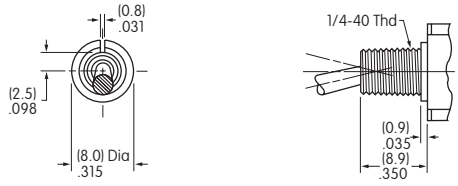


A1 **.280" (7.1mm) Threaded with Keyway**



When using this bushing, toggle length is increased by .070" (1.78mm). Maximum Panel Thickness with Standard Hardware: .031" (0.8mm)

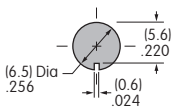
S1 **.350" (8.9mm) Threaded with Keyway**



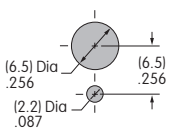
Maximum Panel Thickness with Standard Hardware: .102" (2.6mm)

Panel Cutouts

For A2, S2, A1 or S1 Bushing with Keyway



For A1 or S1 Bushing with Locking Ring

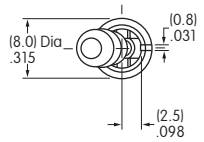


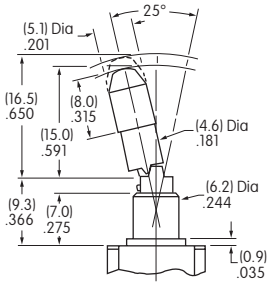
Standard Hardware:
2 Hex Nuts (AT513H)
1 Lockwasher (AT509)
1 Locking Ring (AT507H)

For dimensions, see Accessories & Hardware section.

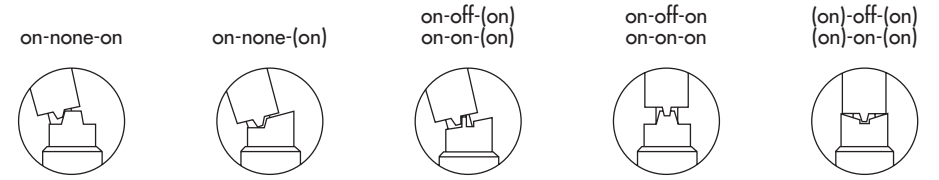
LOCKING LEVER & BUSHING

LL2 **Smooth with Keyway**



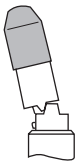


Locking Mechanism



2 positions lock | 1 position locks | 2 positions lock | 3 positions lock | 1 position locks

No Code **Cap for Locking Lever**



Supplied with Cap AT427
Material & Finish:
Brass with Nickel Plating

Lever Material & Finish:
Brass with Chrome Plating

Color Codes for Optional Anodized Aluminum Caps

A Black
C Red
G Blue

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**

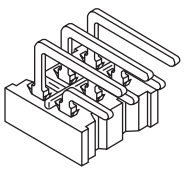
Note: See Supplement section to find complete explanation of operating range.

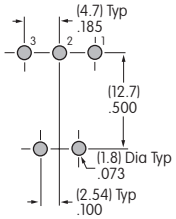
A	**Gold over Silver**	**Power Level or Logic Level**	**6A @ 125V AC or 0.4VA maximum @ 28V AC/DC maximum**

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.

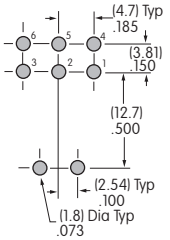
TERMINALS

30 **.150" (3.81mm) Right Angle PC (1-3 Pole)**

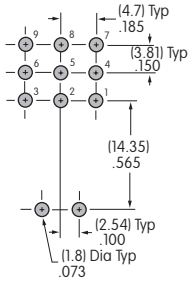




Single Pole

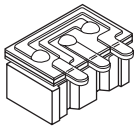


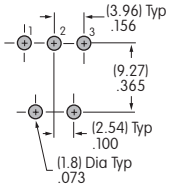
Double Pole



Three Pole

32 **Right Angle PCB with Reverse Circuit (1 Pole & 0.4VA Rating Only)**

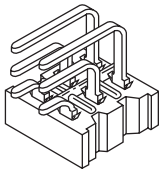


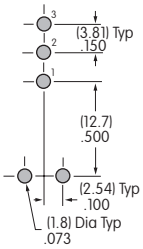


Terminal dimensions are shown on the Typical Switch Dimensions pages which follow.

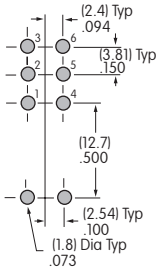
TERMINALS (Continued)

40 **.150" (3.81mm)**
Vertical PC (1-4 Pole)

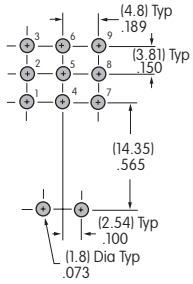




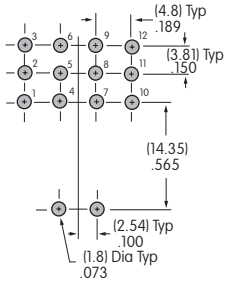
Single Pole



Double Pole

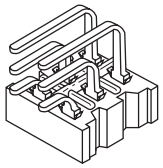


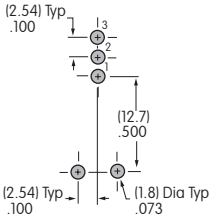
Three Pole



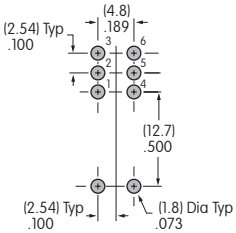
Four Pole

45 **.100" (2.54mm)**
Vertical PC (1-4 Pole)

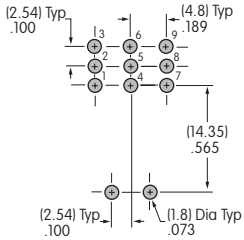




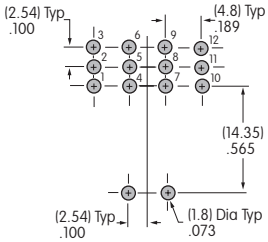
Single Pole



Double Pole



Three Pole



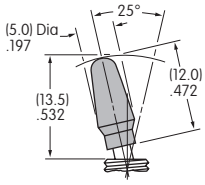
Four Pole

Terminal dimensions are shown on the Typical Switch Dimensions pages which follow.

OPTIONAL CAPS & CAP COLORS

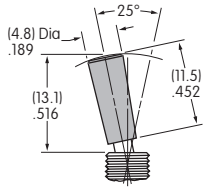
B *** AT415**
for S Bat Toggle

Material:
Polyethylene



C *** AT444**
Conical Cap for S Bat Toggle

Material:
Polyethylene



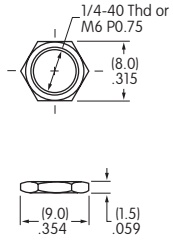
Colors Available

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

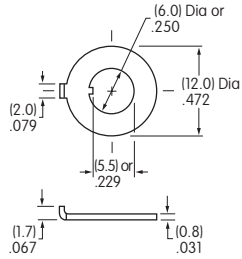
* AT415 and AT444 for use with S toggles only, not S2 or S3 toggles.

STANDARD HARDWARE

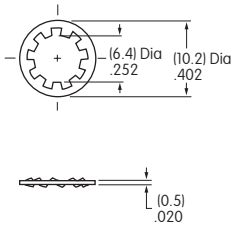
AT513H for Inch
AT513M for Metric
Hex Nut (2 per switch)
Brass/Nickel



AT507H for Inch
AT507M for Metric
Locking Ring (1 per switch)
Steel with Zinc/Chromate

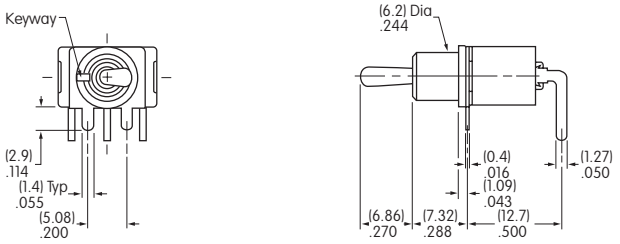


AT509
Lockwasher (1 per switch, none with splashproof)
Steel with Zinc/Chromate



TYPICAL SWITCH DIMENSIONS

.150" (3.81mm) Right Angle PC — Single Pole



M2012S2A2G30

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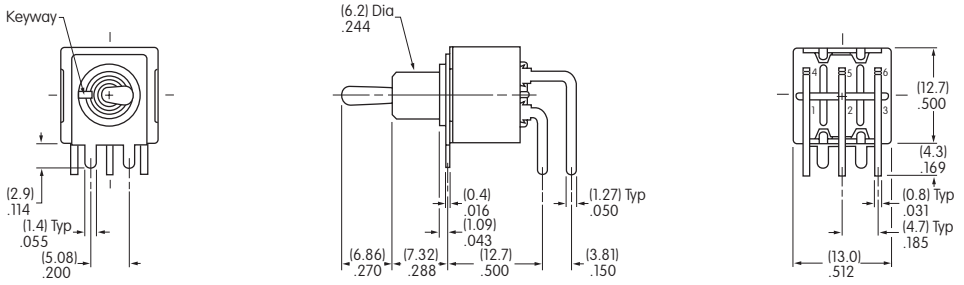
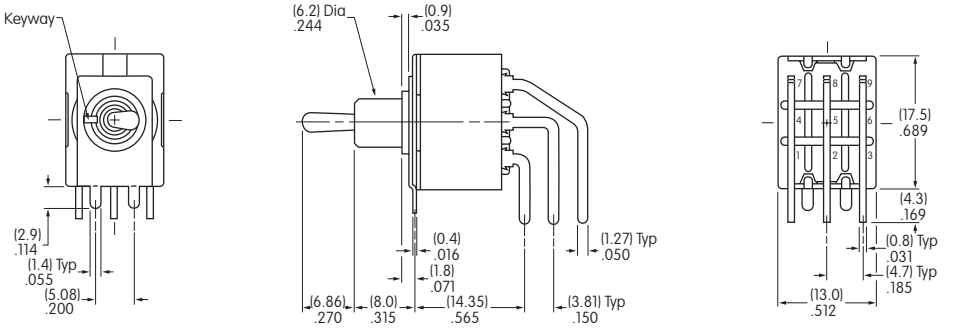


M2022S2A2G30

.150" (3.81mm) Right Angle PC — Three Pole

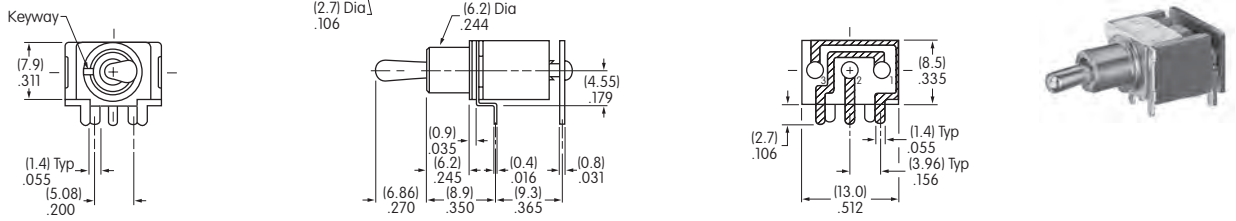


M2032S2A2G30

TYPICAL SWITCH DIMENSIONS

Single Pole • Reverse Circuit

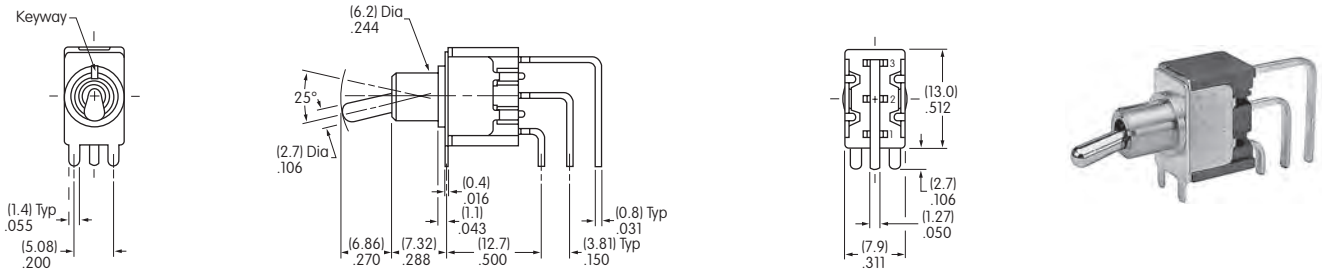
Right Angle PCB



M2012S2A2G32

Single Pole

.150" (3.81mm) Vertical PC



M2012S2A2G40

Double Pole

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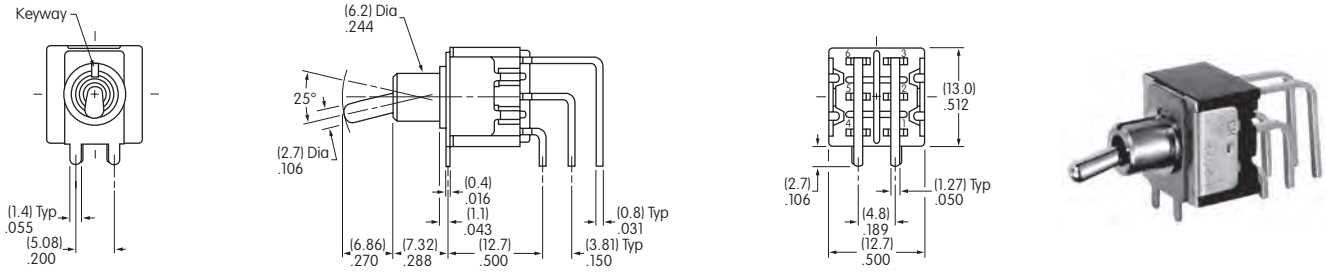
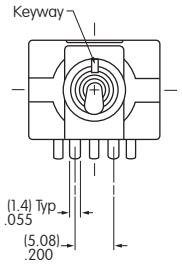


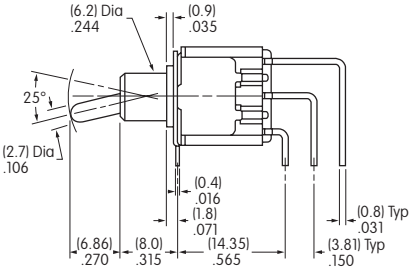
M2022S2A2G40

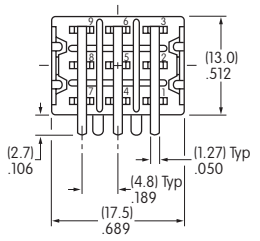
TYPICAL SWITCH DIMENSIONS

.150" (3.81mm) Vertical PC

Three Pole



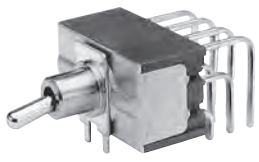


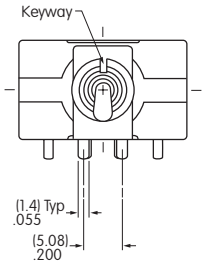


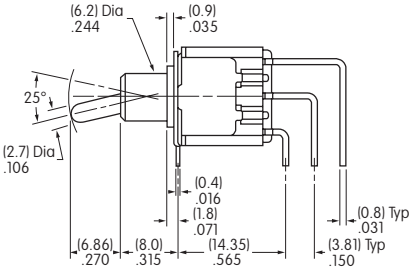
M2032S2A2G40

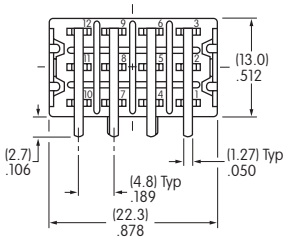
.150" (3.81mm) Vertical PC

Four Pole





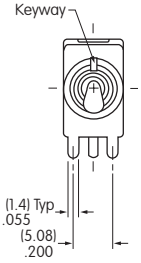


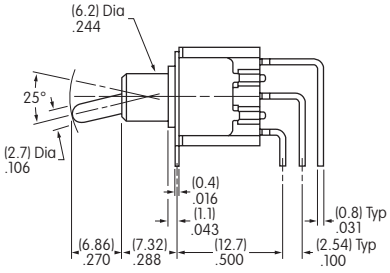


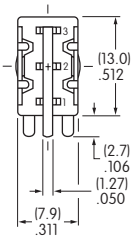
M2042S2A2G40

.100" (2.54mm) Vertical PC

Single Pole



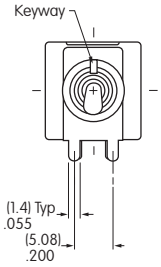


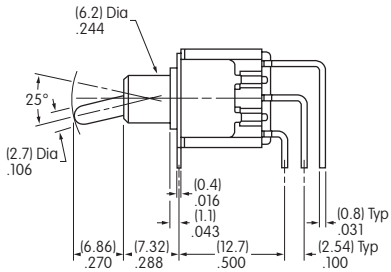


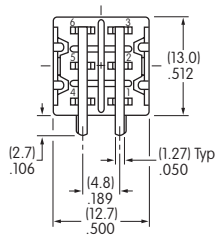
M2012S2A2G45

TYPICAL SWITCH DIMENSIONS

Double Pole — .100" (2.54mm) Vertical PC

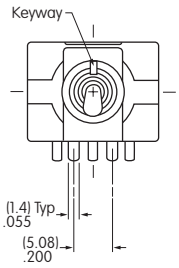


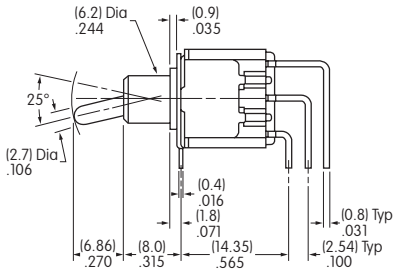


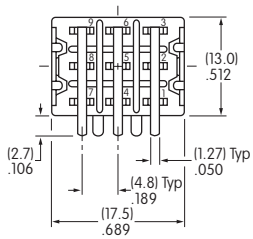


M2022S2A2G45

Three Pole — .100" (2.54mm) Vertical PC

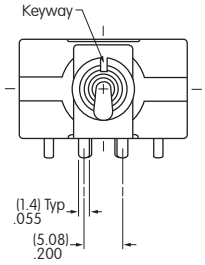


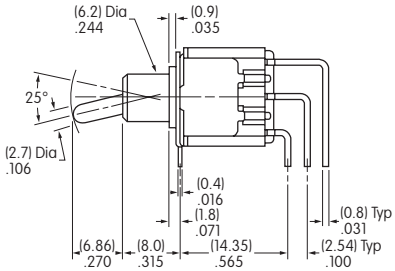


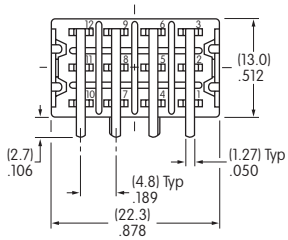


M2032S2A2G45

Four Pole — .100" (2.54mm) Vertical PC







M2042S2A2G45

General Specifications

Electrical Capacity (Resistive Load)

Power Level (silver): 6A @ 125V AC or 3A @ 250V AC or 3A @ 30V DC
Logic Level (gold): 0.4VA maximum @ 28V AC/DC maximum
(Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)
Note: Find additional explanation of operating range in Supplement section.

Other Ratings

Contact Resistance: 10 milliohms maximum for silver; 20 milliohms maximum for gold
Insulation Resistance: 1,000 megohms minimum @ 500V DC
Dielectric Strength: 1,000V AC minimum between contacts for 1 minute minimum;
1,500V AC minimum between contacts & case for 1 minute minimum
Mechanical Life: 50,000 operations minimum
Electrical Life: 25,000 operations minimum
Nominal Operating Force:

	On-to-On Position	Off-to-On Position
Single Pole	3.19N	3.92N
Double Pole	4.41N	7.06N

Angle of Throw: 20°

Materials & Finishes

Bushing: Brass with nickel plating
Housing: Stainless steel
Mounting Bracket: Steel with tin plating
Movable Contacts: Silver alloy or silver alloy with gold plating
Stationary Contacts: Silver with silver plating or copper or brass with gold plating
Lamp Contacts: Phosphor bronze
Base: Diallyl phthalate (UL94V-0)
Switch Terminals: Copper with silver or gold plating
Lamp Terminals: Brass with silver or gold plating

Environmental Data

Operating Temp Range: –10°C through +55°C (+14°F through +131°F)
Humidity: 90 ~ 95% humidity for 96 hours @ 40°C (104°F)
Vibration: 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
Shock: 50G (490m/s²) acceleration (tested in 6 right angled directions, with 5 shocks in each direction)

Installation

Mounting Torque: 1.47Nm (13 lb•in) for double nut; .67Nm (6 lb•in) for single nut
Soldering Time & Temp: Wave Soldering (PC version): See Profile B in Supplement section.
Manual Soldering: See Profile B in Supplement section.
Note: Lever must be in center position while soldering.
Cleaning: PC mountable device is not process sealed. Hand clean locally using alcohol based solution.

Standards & Certifications

Flammability Standards: UL94V-0 base
UL: **File No. E44145 - Recognized only when ordered with marking on switch.**
Add "/U" to end of part number to order UL recognized switch.
Single pole with synchronous circuits & single color LEDs & solder lug or PC recognized at 6A @ 125V AC.
CSA: **File No. 023535_0_000 - Certified only when ordered with marking on switch.**
Add "/C" to end of part number to order CSA certified switch.
All single pole with synchronous circuits & single color LEDs certified at 6A @ 125V AC.

Distinctive Characteristics

Industry's first LED illumination at tip of toggle switches.

Single color LEDs of red, yellow, and green, plus bicolor red/green, to meet varied design requirements.

LEDs can operate independently from or synchronously with switching operation.

Antijamming feature to protect contacts from damage due to excessive downward force on the toggle.

High torque bushing prevents the bushing from rotating or separating from the metal frame during installation.

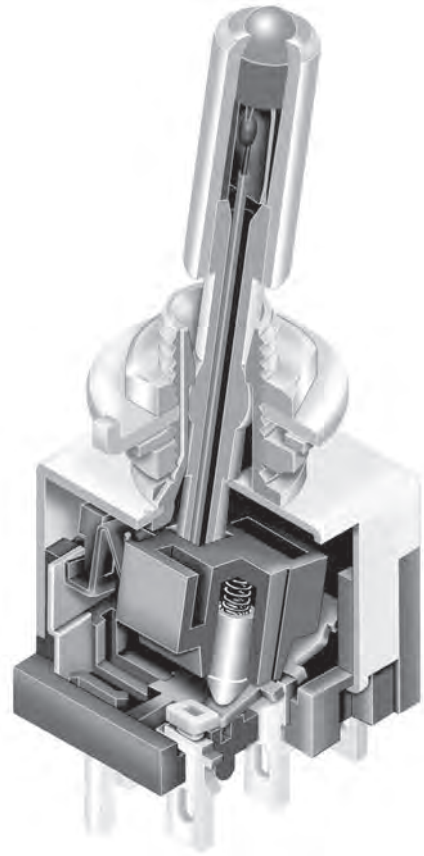
Stainless steel frame resists corrosion.

Silver contacts are of specially composed alloy for hardness.

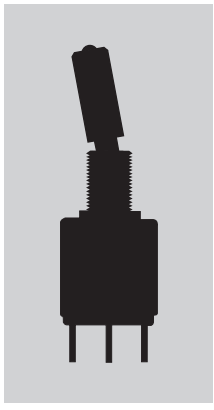
High insulating barriers protect against crossover in double pole devices.

Terminals are molded in and epoxy sealed to lock out flux, dust, and other contaminants.

1,500V dielectric strength between switch contacts and case is accomplished by clinching the frame away from the terminals.



Actual Size



Series M2100

LED Tipped Toggles

TYPICAL SWITCH ORDERING EXAMPLE

M21 [1] [2] [T] [C] [W] [01] [ ]

Poles

1	SPDT
* 2	DPDT

* Available only with Terminals 01, 02, 03

LED Circuits & Actuator Types

L	Isolated
T	Synchronous

Contact Materials & Ratings

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

Threaded Bushings

No Code	1/4–40 Thread (Inch)
/M	6mm Thread (Metric)

Circuits

2	ON	NONE	ON
3	ON	OFF	ON

LED Colors

Single Color	
C	Red
E	Yellow
F	Green
Bicolor	
CF	Red/Green

Terminals & Mounting Types

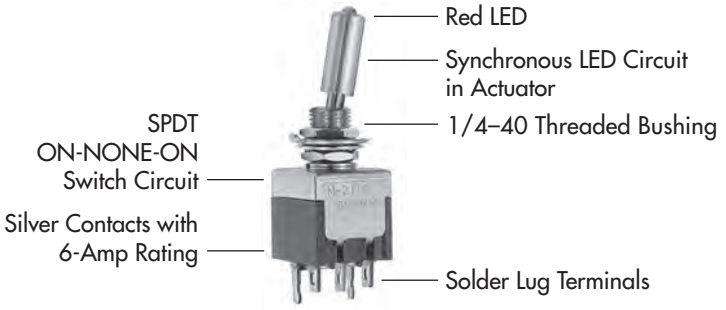
01	Solder Lug with Threaded Bushing
02	Quick Connect with Threaded Bushing
03	Straight PC with Threaded Bushing
30	Right Angle PC with Smooth Bushing (available with gold contacts only)

IMPORTANT:

Switches are supplied without UL & CSA marking unless specified.
UL & CSA recognized only when ordered with marking on the switch.
Specific models, ratings, & ordering instructions are noted on the General Specifications page.

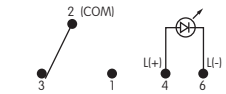
DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

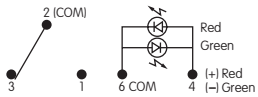
M2112TCW01

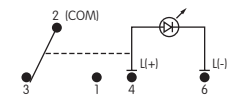


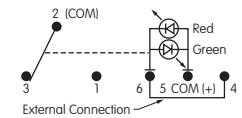
POLES & CIRCUITS & LED ILLUMINATION

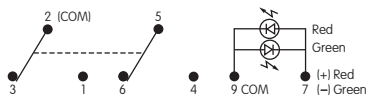
Model	Pole & Throw	Toggle Position & Terminal Numbers: Down (Keyway)	Center	Up	Schematics
					Notes: Terminal numbers are not actually on the switch. LEDs require an external power source.
M2112	**SPDT**	ON	NONE	ON	Isolated Single Color LED
Connected Power Terminals		2-3	NONE	2-1	
LED Circuit: **Isolated LEDs** (see schematics) Connected LED Terminals		ON 4-6	NONE NONE	ON 4-6	
LED Circuit: **Synchronous Single Color LED** Connected LED Terminals		ON 4-6	NONE NONE	OFF OPEN	Isolated Bicolor LED
LED Circuit: **Synchronous Bicolor LED** Connected LED Terminals		Red 5-6	NONE NONE	Green 5-4	
M2113	**SPDT**	ON	OFF	ON	Synchronous Single Color LED
Connected Power Terminals		2-3	OPEN	2-1	
LED Circuit: **Isolated LEDs** (see schematics) Connected LED Terminals		ON 4-6	ON 4-6	ON 4-6	
LED Circuit: **Synchronous Single Color LED** Connected LED Terminals		ON 4-6	OFF OPEN	ON 4-6	Synchronous Bicolor LED
LED Circuit: **Synchronous Bicolor LED** Connected LED Terminals		Red 5-6	OFF OPEN	Green 5-4	
M2122	**DPDT**	ON	NONE	ON	Isolated Single Color LED
Connected Power Terminals		2-3 5-6	NONE	2-1 5-4	
LED Circuit: **Isolated LEDs** (see schematics) Connected LED Terminals		ON 7-9	NONE NONE	ON 7-9	
LED Circuit: **Synchronous Single Color LED** Connected LED Terminals		ON 7-9	NONE NONE	OFF OPEN	Isolated Bicolor LED
LED Circuit: **Synchronous Bicolor LED** Connected LED Terminals		Red 8-9	NONE NONE	Green 8-7	
M2123	**DPDT**	ON	OFF	ON	Synchronous Single Color LED
Connected Power Terminals		2-3 5-6	OPEN	2-1 5-4	
LED Circuit: **Isolated LEDs** (see schematics) Connected LED Terminals		ON 7-9	ON 7-9	ON 7-9	
LED Circuit: **Synchronous Single Color LED** Connected LED Terminals		ON 7-9	OFF OPEN	ON 7-9	Synchronous Bicolor LED
LED Circuit: **Synchronous Bicolor LED** Connected LED Terminals		Red 8-9	OFF OPEN	Green 8-7	

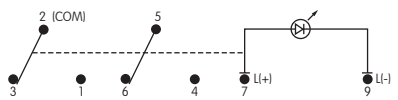


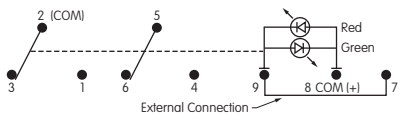












Series M2100

LED Tipped Toggles

LED COLORS & SPECIFICATIONS

The electrical specifications shown are determined at a basic temperature of 25°C. LED circuit is isolated and requires an external power source. If the source voltage exceeds the rated voltage, a ballast resistor is required. The resistor value can be calculated by using the formula in Supplement Section.

The LED is an integral part of the switch and not available separately. Bicolor LED is translucent white when unlit.		Single Color			Bicolor	
		C	E	F	CF	
	Color	Red	Yellow	Green	Red/Green	Units
Maximum Forward Current	I_{FM}	25	30	30	25	mA
Typical Forward Current	I_F	20	20	20	10	mA
Forward Voltage	V_F	2.1	2.1	2.1	1.7/2.0	V
Maximum Reverse Voltage	V_{RM}	4	4	4	——	V
Current Reduction Rate Above 25°C	ΔI_F	0.33	0.40	0.40	0.33/0.33	mA/°C
Ambient Temperature Range		−10° ~ +55°C				

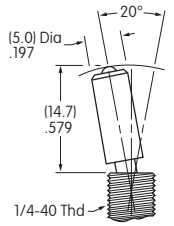
LED CIRCUIT, TOGGLE, & MOUNTING TYPE COMBINATIONS

L **Toggle with Isolated LED Circuit**

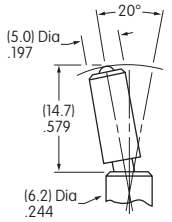
T **Toggle with Synchronous LED Circuit**

Finish: Brushed aluminum

Standard Hardware: 2 AT513H Hex Nuts, 1 AT507H Locking Ring, 1 AT509 Lockwasher Standard & optional hardware details in Accessories & Hardware section.

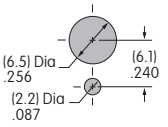


Threaded Bushing combines with Terminal codes 01, 02, & 03.

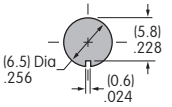


Smooth Bushing combines with Terminal code 30.

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



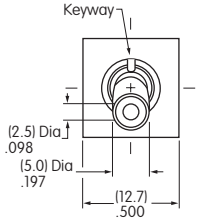
Max. Panel Thickness without Locking Ring .134" (3.4mm)



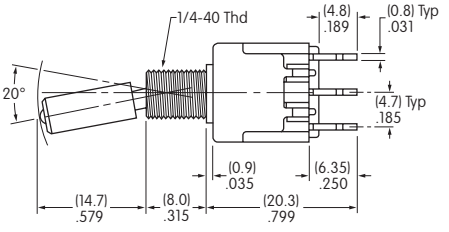
TYPICAL SWITCH DIMENSIONS

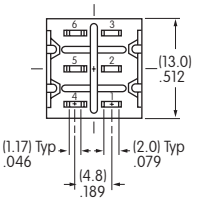
Solder Lug

M2112TCFW01



Single Pole

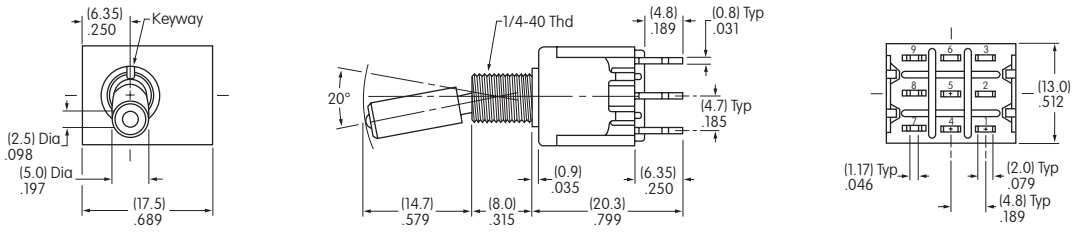




Single color LED switch does not have terminal 5.

TYPICAL SWITCH DIMENSIONS

Double Pole

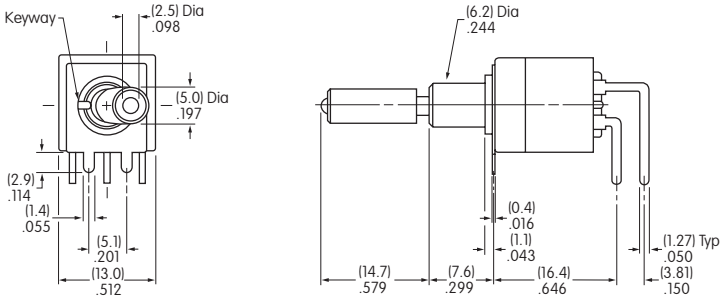


Solder Lug

Single color LED switch does not have terminal 8.

M2122TCFW01

Single Pole Only



Right Angle PC

Single color LED switch does not have terminal 5.

Gold contact material only

M2112TCFG30

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

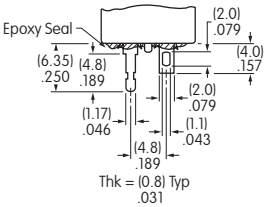
Complete explanation of operating range in Supplement section.

Series M2100

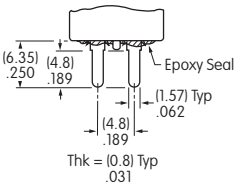
LED Tipped Toggles

TERMINALS

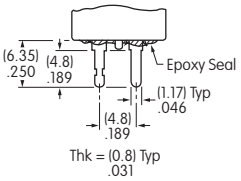
01 Solder Lug with Turret LED Terminal



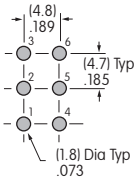
02 Quick Connect



03 Straight PC with Turret LED Terminal

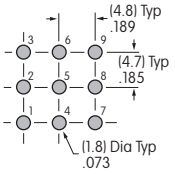


Single Pole



Single color LED & isolated bicolor LED switches do not have terminal 5.

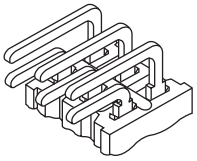
Double Pole



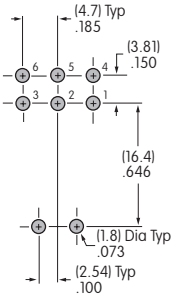
Single color LED & isolated bicolor LED switches do not have terminal 8.

30 Right Angle PC

LED terminals only available in brass with silver plating



Single Pole

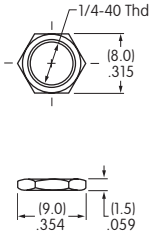


Single color LED & isolated bicolor LED switches do not have terminal 5.

STANDARD MOUNTING HARDWARE

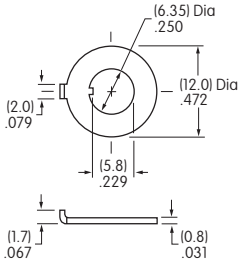
AT513H Hexagon Nut
(2 per switch)

Material:
Brass with nickel plating



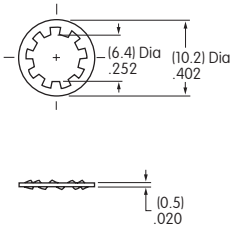
AT507H Locking Ring
(1 per switch)

Material:
Steel with chromate over zinc



AT509 Lockwasher
(1 per switch)

Material:
Steel with chromate over zinc



Optional Hardware: Knurled nuts, dress nuts, and ON-OFF plates are available; see details in Accessories & Hardware section.

General Specifications

Electrical Capacity (Resistive Load)

Power Level (silver): 6A @ 125V AC or 3A @ 250V AC;
4A @ 30V DC (On-On circuit) & 3A @ 30V DC (all other circuits)

Logic Level (gold): 0.4VA maximum @ 28V AC/DC maximum
(Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)

Logic/Power Level (gold over silver): Combines silver & gold ratings

Note: Find additional explanation of dual rating & operating range in Supplement section.

Other Ratings

Contact Resistance: 10 milliohms maximum for silver; 20 milliohms maximum for gold

Insulation Resistance: 1,000 megohms minimum @ 500V DC

Dielectric Strength: 1,000V AC minimum between contacts for 1 minute minimum;
1,500V AC minimum between contacts & case for 1 minute minimum

Mechanical Life: 100,000 operations minimum

Electrical Life: 25,000 operations minimum for silver; 50,000 operations minimum for gold

Contact Timing: Nonshorting (break-before-make)

Angle of Throw: 26°

Materials & Finishes

Toggle/Lever: Brass with nickel plating

Support Bracket: Brass with tin plating

Bushing/Housing: Glass fiber reinforced polyamide (UL94V-0)

Sealing Ring: Nitrile butadiene rubber

Base: Glass fiber reinforced polyamide (UL94V-0)

Movable Contacts: Silver alloy with silver plating (code W); copper or phosphor bronze with gold plating (code G);
or silver alloy with gold plating (code A)

Stationary Contacts: Silver alloy with silver plating (code W); copper or brass with gold plating (code G);
or silver alloy with gold plating (code A)

Terminals: Copper or brass with silver or gold plating

Environmental Data

Operating Temp Range: –30°C through +85°C (–22°F through +185°F)

Humidity: 90 ~ 95% humidity for 96 hours @ 40°C (104°F)

Vibration: 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

Shock: 50G (490m/s^2) acceleration (tested in 6 right angled directions, with 5 shocks in each direction)

PCB Processing

Soldering: Wave Soldering Recommended: See Profile B in Supplement section.
Manual Soldering: See Profile B in Supplement section.

Cleaning: Automated cleaning. See Cleaning specifications in Supplement section.

Standards & Certifications

Flammability Standards: UL94V-0 rated bushing/housing & base

UL: **File No. E44145 - Recognized only when ordered with marking on switch.**
Add "/U" or "/CUL" before first dash in part number to order UL recognized switch.
All models recognized at 6A @ 125V AC, 3A @ 250V AC, & 4A @ 30V DC or 0.4A @ 28V DC.

CSA: **File No. 023535_0_000 - Certified only when ordered with marking on switch.**
Add "/C" to end of part number to order CSA certified switch.
All models certified at 6A @ 125V AC, 3A @ 250V AC, & 4A @ 30V DC.

Distinctive Characteristics

Antijamming actuator design protects against mechanism damage from downward force on the toggle.

Single unit construction of the bushing and top of the housing gives protection from cleaning fluids or other liquids.

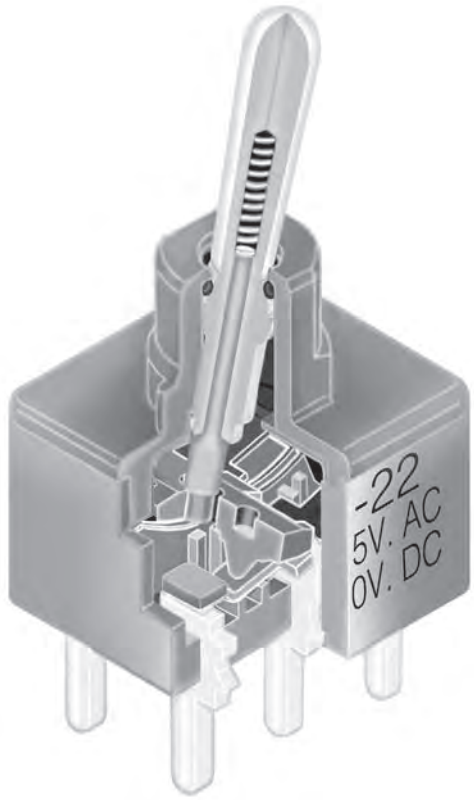
O-ring surrounding actuator at top of bushing interior prevents liquids from reaching switch mechanism.

Ultrasonic welding of upper and lower housing seals out contaminants and allows automated soldering and cleaning.

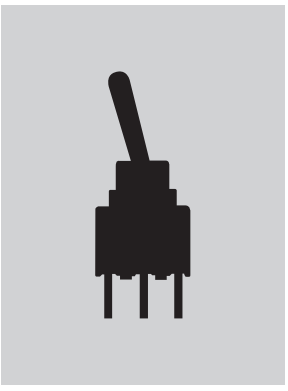
Terminals are epoxy sealed to prevent entry of flux, solvents, and other contaminants.

Bracketed models have crimped legs to ensure secure PC mounting and prevent dislodging during automated soldering.

Logic level and power capabilities are available to suit varying applications.



Actual Size



TYPICAL SWITCH ORDERING EXAMPLE

M2T 1 2 S A5 G 03

Poles

1	SPDT
2	DPDT

Bushing

A5	.250″ (6.35mm) Double Flatted

PC Terminals

03	Straight
13	Straight with .460″ (11.7mm) Bracket
30	.150″ (3.81mm) Right Angle
40	.150″ (3.81mm) Vertical
05	.390″ (9.9mm) Extended PC
06	.728″ (18.5mm) Extended PC
07	.945″ (24.0mm) Extended PC

Circuits

2	ON	NONE	ON
3	ON	OFF	ON
5	ON	NONE	(ON)
8	(ON)	OFF	(ON)
9	ON	OFF	(ON)

( ) = Momentary

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

Actuators

S	.500″ (12.7mm) Bat Lever (standard combination with code 03 straight terminals)
S4	.300″ (7.62mm) Bat Lever (standard combinations with codes 13, 30 & 40 bracketed terminals)

IMPORTANT:

Switches are supplied without UL, cULus & CSA marking unless specified. **UL, cULus & CSA recognized only when ordered with marking on the switch.** Specific models, ratings & ordering instructions are noted on the General Specifications page.

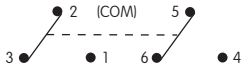
DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

M2T12SA5G03

POLES & CIRCUITS

Pole	Model	Toggle Position ( ) = Momentary: Down	Center	Up	Connected Terminals: Down	Center	Up	Throw & Schematics
SP	**M2T12** **M2T13** **M2T15** **M2T18** **M2T19**	ON ON ON (ON) ON	NONE OFF NONE OFF OFF	ON ON (ON) (ON) (ON)	2-3	OPEN	2-1	SPDT
DP	**M2T22** **M2T23** **M2T25** **M2T28** **M2T29**	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

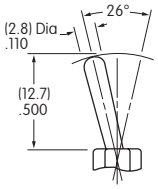
Note: Terminal numbers are not actually on the switch.



ACTUATORS

S **.500" (12.7mm) Bat Lever**

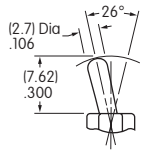
Material:
Nickel over Brass



Standard Combinations: S Bat Lever with straight terminals (code 03) with silver or gold contacts.

S4 **.300" (7.62mm) Bat Lever**

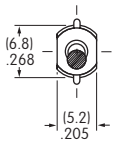
Material:
Nickel over Brass

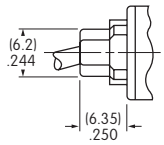


Standard Combinations: S4 Bat Lever with bracketed terminals (codes 13, 30, 40) with silver or gold contacts.

BUSHING

A5 **.250" (6.35mm) Double Flatted**





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**

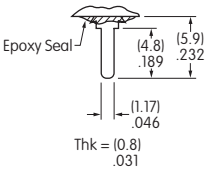
Complete explanation of operating range in Supplement section.

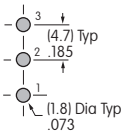
A	**Gold over Silver**	**Power Level or Logic Level**	**6A @ 125V AC or 0.4VA maximum @ 28V AC/DC maximum**

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 for complete explanation of dual rating and operating range.

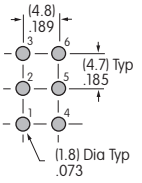
PC TERMINALS

03 Straight



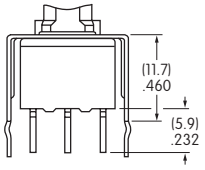


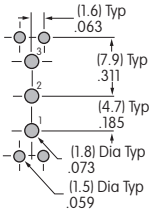
Single Pole



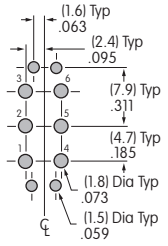
Double Pole

13 Straight with .460" (11.7mm) Bracket



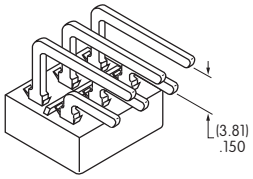


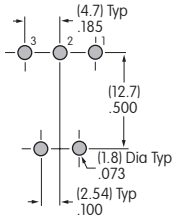
Single Pole



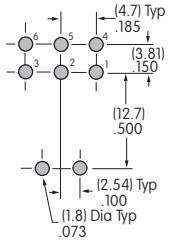
Double Pole

30 .150" (3.81mm) Right Angle



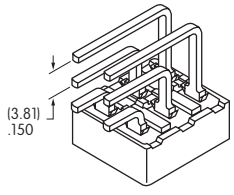


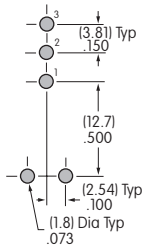
Single Pole



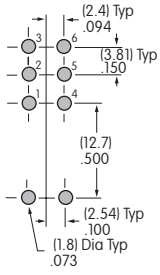
Double Pole

40 .150" (3.81mm) Vertical





Single Pole

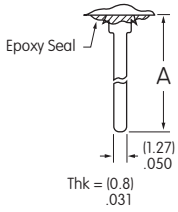


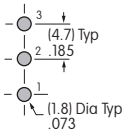
Double Pole

05 .390" (9.9mm) Extended PC

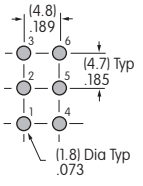
06 .728" (18.5mm) Extended PC

07 .945" (24.0mm) Extended PC





Single Pole

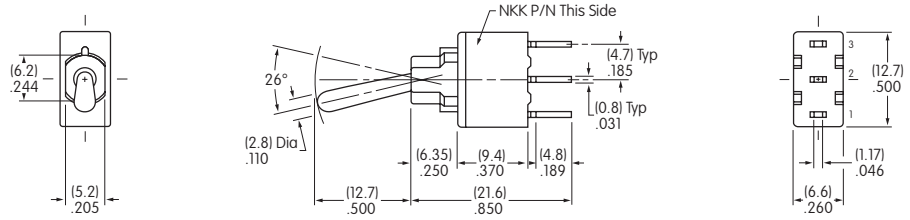


Double Pole

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

TYPICAL SWITCH DIMENSIONS

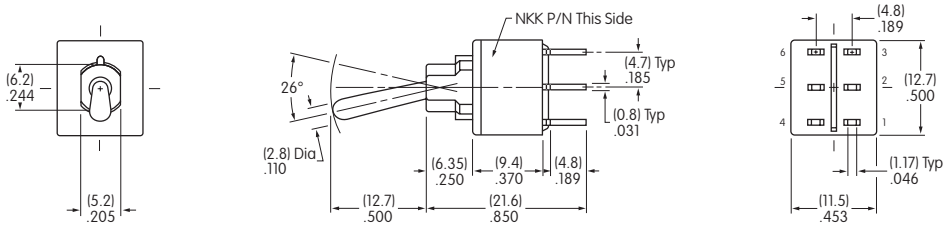
Single Pole — Straight PC



Actuator in Down Position

M2T12SA5G03

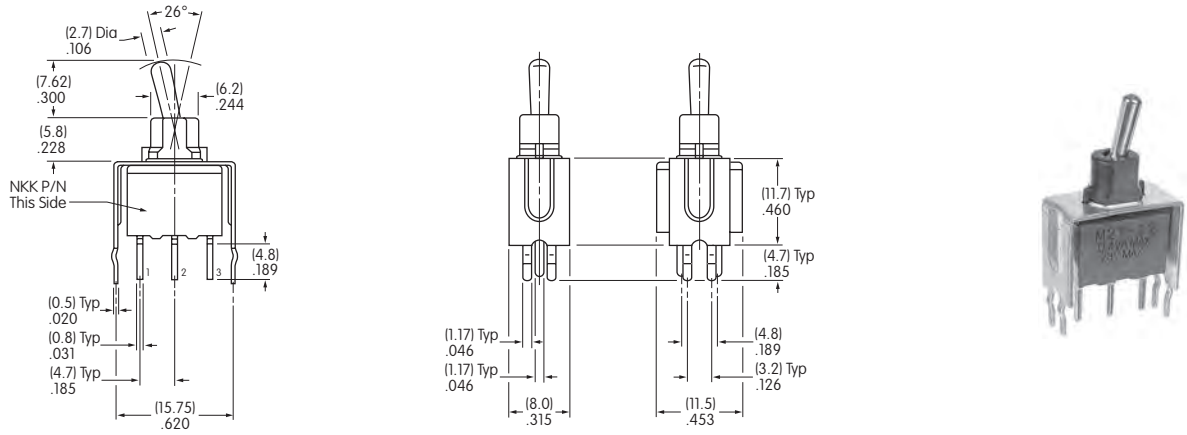
Double Pole — Straight PC



Actuator in Down Position

M2T22SA5G03

Single & Double Pole — Straight PC • Bracket



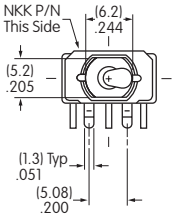
Actuator in Down Position

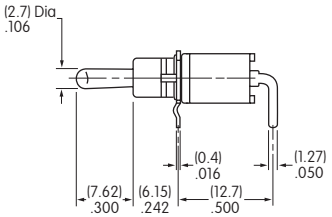
M2T12S4A5G13

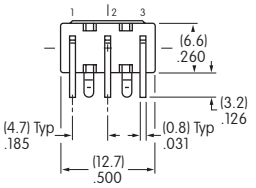
TYPICAL SWITCH DIMENSIONS

Right Angle PC

Single Pole





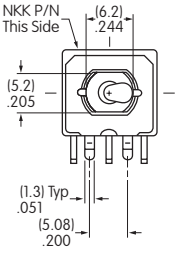


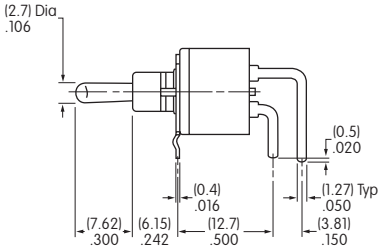
M2T12S4A5G30

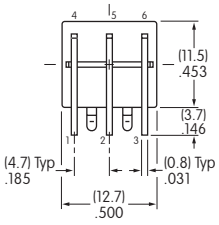
Actuator in Down Position

Right Angle PC

Double Pole





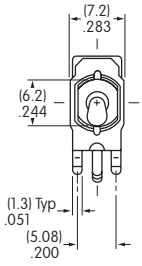


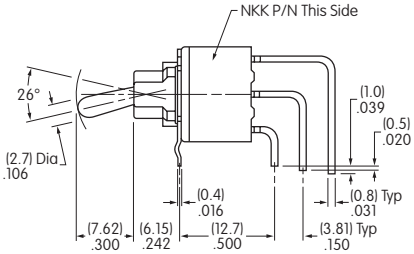
M2T22S4A5G30

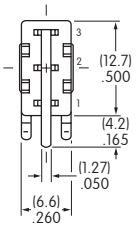
Actuator in Down Position

Vertical PC

Single Pole







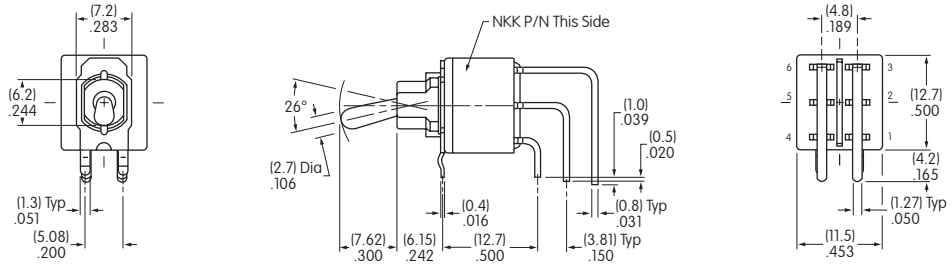
M2T12S4A5G40

Actuator in Down Position

TYPICAL SWITCH DIMENSIONS

Double Pole

Vertical PC



Actuator in Down Position

M2T22S4A5G40

HANDLING PRECAUTION

When an application employs M2T model with silver contacts, 5 to 6A @ 125V AC, and the switch will be actuated 100 or more times per day, note these instructions:

Peel off the film seal on the switch body situated over the part number after cleaning.

General Specifications

Electrical Capacity

Resistive Load: 10A @ 125V AC or 6A @ 250V AC
Motor Load: 400W @ 125V AC
Lamp Load: 2A @ 125V AC for On-Off-On circuit & 3A @ 125V AC for other circuits

Other Ratings

Contact Resistance: 10 milliohms maximum
Insulation Resistance: 1,000 megohms minimum @ 500V DC
Dielectric Strength: 2,000V AC minimum between contacts for 1 minute minimum;
4,000V AC minimum between contacts & case for 1 minute minimum
Mechanical Life: 100,000 operations minimum
Electrical Life: 25,000 operations minimum
Angle of Throw: 25°

Materials & Finishes

Toggle Cap: Polypropylene
Lever: Brass with chrome plating
Bushing: Brass with nickel plating
Frame: Stainless steel
Case/Base: Diallyl phthalate resin (UL94V-0)
Movable Contacts: Silver alloy with silver plating
Stationary Contacts: Pure silver with silver plating
Terminals: Copper with silver plating

Environmental Data

Operating Temp Range: –10°C through +85°C (+14°F through +185°F)
Humidity: 90 ~ 95% humidity for 96 hours @ 40°C (104°F)
Vibration: 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
Shock: 50G (490m/s^2) acceleration (tested in 6 right angled directions, with 5 shocks in each direction)

Installation

Soldering Time & Temp: Wave Soldering Recommended (Straight PC): See Profile A in Supplement section.
Manual Soldering: See Profile A in Supplement section.
Cleaning: These devices are not process sealed. Hand clean locally using alcohol based solution.

Standards & Certifications

Flammability Standards: UL94V-0 rated case/base
UL: **File No. E44145 - Recognized only when ordered with marking on switch.**
Add "/U" or "/CUL" to end of part number to order UL recognized switch.
All models recognized at 10A @ 125V AC & 6A @ 250V AC.

CSA: **File No. 023535_0_000 - Certified only when ordered with marking on switch.**
Add "/C" to end of part number to order CSA certified switch.
All models certified at 10A @ 125V AC & 6A @ 250V AC.

VDE: **License No. 119174**
All models approved at 10A @ 125V AC & 6A @ 250V AC.
Marking on switch is standard. All models meet EN 61058-1 standard.

Distinctive Characteristics

Meets EN 61058-1 standard.

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

Stainless steel frame resists corrosion and increases environmental safety.

Case/base of heat resistant resin meets UL94V-0 flammability standard.

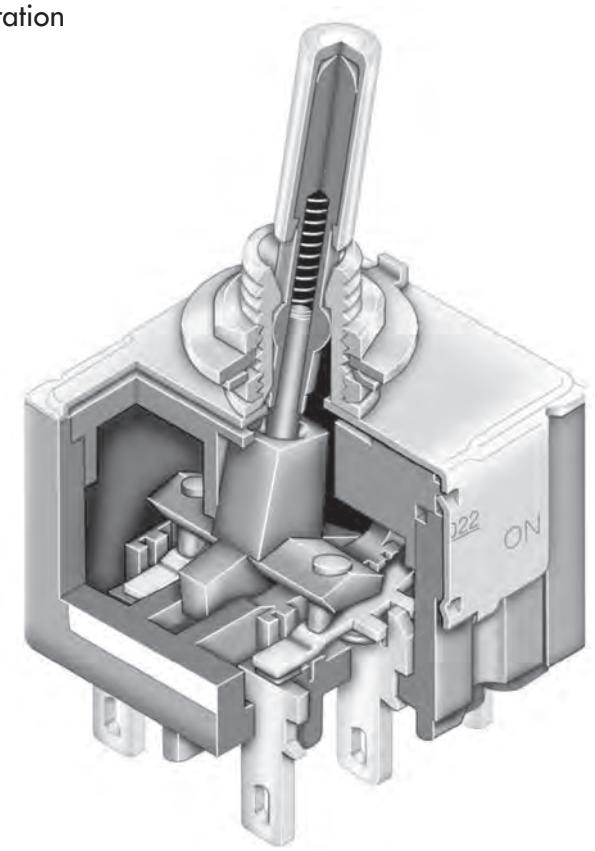
Contacts of special silver alloy resist arcing and guarantee stable electrical contact and long life.

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

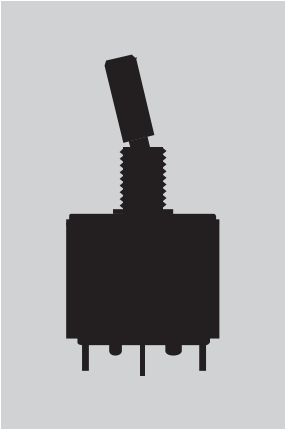
Prominent external insulating barriers increase insulation resistance and dielectric strength.

Epoxy sealed terminals prevent entry of flux, solvents, and other contaminants.

Clinching of the frame to the case well above the base and terminals provides 4,000V dielectric strength.



Actual Size



TYPICAL SWITCH ORDERING EXAMPLE

P20 | 22 | B | [ ]

Poles & Circuits

11	SPST	ON	NONE	OFF
12	SPDT	ON	NONE	ON
13	SPDT	ON	OFF	ON
21	DPST	ON	NONE	OFF
22	DPDT	ON	NONE	ON
23	DPDT	ON	OFF	ON

Toggles & Bushings

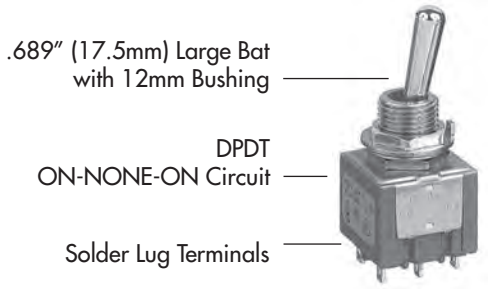
No Code	.512″ (13.0mm) White Cap with 6mm Bushing
E	.450″ (11.4mm) Flatted with 6mm Bushing
B	.689″ (17.5mm) Large Bat with 12mm Bushing
D	.748″ (19.0mm) White Capped Column with 12mm Bushing

Terminals

No Code	Solder Lug
P	Straight PC
Z	.187″ (4.75mm) Quick Connect

DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

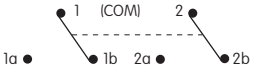
P2022B



IMPORTANT:

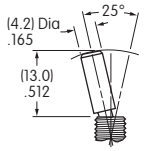
VDE is marked on all models. Switches are supplied without UL, cULus & CSA marking unless specified. **UL, cULus & CSA recognized only when ordered with marking on the switch.** Specific models, ratings, & ordering instructions are noted on the General Specifications page.

POLES & CIRCUITS

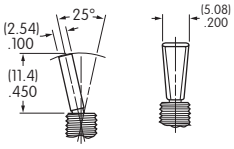
		Toggle Position			Connected Terminals			Throw & Schematics
Pole	**Model**	**Down** Keyway	**Center**	**Up**	**Down** Keyway	**Center**	**Up**	Note: Terminal numbers are on the switch.
SP	**P2011**	ON	NONE	OFF	1-1b	OPEN	OPEN	SPST 
SP	**P2012** **P2013**	ON ON	NONE OFF	ON ON	1-1b	OPEN	1-1a	SPDT 
DP	**P2021**	ON	NONE	OFF	1-1b 2-2b	OPEN	OPEN	DPST 
DP	**P2022** **P2023**	ON ON	NONE OFF	ON ON	1-1b 2-2b	OPEN	1-1a 2-2a	DPDT 

TOGGLES & BUSHINGS

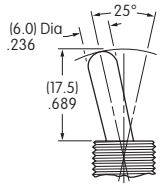
No Code .512" (13.0mm) White Cap with 6mm Bushing



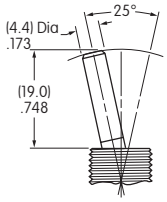
E .450" (11.4mm) Flatted with 6mm Bushing



B .689" (17.5mm) Large Bat with 12mm Bushing

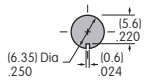


D .748" (19.0mm) White Capped Column with 12mm Bushing

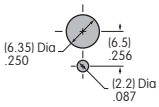


Panel Cutouts

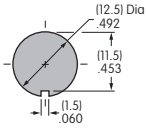
Panel Thickness with Keyway .134" (3.4mm) maximum



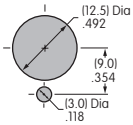
Panel Thickness with Locking Ring .102" (2.6mm) maximum



Panel Thickness with Keyway .256" (6.5mm) maximum



Panel Thickness with Locking Ring .217" (5.5mm) maximum

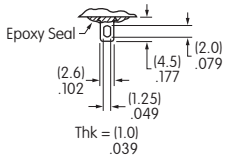


Standard Hardware

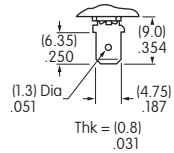
For 6mm Bushing: 1 Locking Ring AT507M, 1 Internal Tooth Lockwasher AT509, 2 Hex Nuts AT513M
For 12mm Bushing: 1 Hex Face Nut AT503M, 1 Locking Ring AT506M, 1 Internal Tooth Lockwasher AT508, 1 Hex Mounting Nut AT527M
Optional Splashproof Boot Assemblies (for code B): AT401 & AT4181 boots plus hex nut & o-ring; see Accessories & Hardware section.

TERMINALS

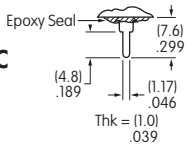
No Code Solder Lug



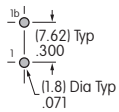
Z .187" (4.75mm) Quick Connect



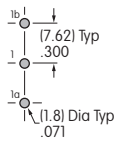
P Straight PC



SPST



SPDT



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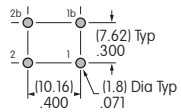
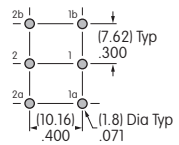


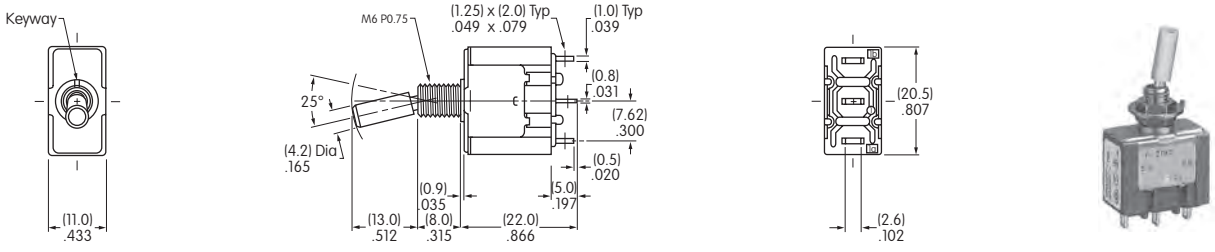
DPDT



TYPICAL SWITCH DIMENSIONS

P2011, P2012, P2013

6mm Bushing

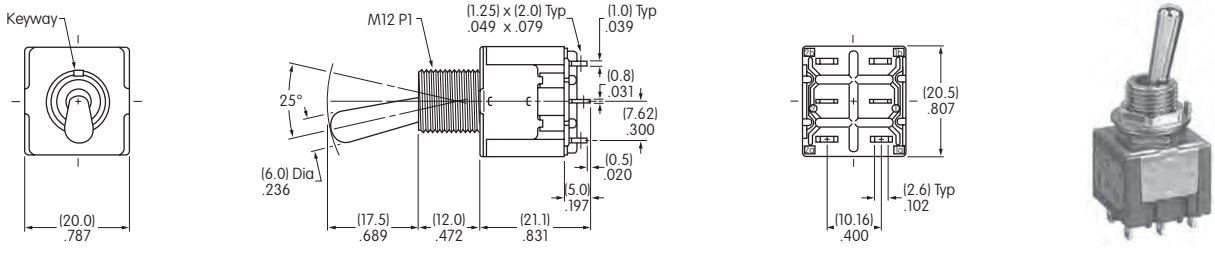


P2011 models do not have terminal 1a.

P2012

P2021B, P2022B, P2023B

12mm Bushing



P2021 models do not have terminals 1a & 2a.

P2022B

Contents for Standard Size Toggles

GENERAL SPECIFICATIONS FOR S100s

Electrical Capacity (Resistive & Inductive Load)

Power Level: Shown in the following table

Other Ratings

Contact Resistance: 10 milliohms maximum
Insulation Resistance: 200 megohms minimum @ 500V DC
Dielectric Strength: 1,500V AC minimum for 1 minute minimum
Mechanical Life: 30,000 operations minimum
Electrical Life: 10,000 operations minimum
Operating Temp Range: –10°C through +70°C (+14°F through +158°F)

Materials & Finishes

Toggle: Brass with chrome plating
Bushing: Brass with chrome or nickel plating
Case: Phenolic resin
Case Cover: Steel with zinc plating
Movable Contactor Plate: Copper with silver plating
Movable & Stationary Contacts: Silver alloy plus copper with silver plating
Terminals: Copper with silver plating

Environmental Data

Operating Temp Range: –10°C through +70°C (+14°F through +158°F)

Installation

Mounting Torque: 2.94Nm (26 lb•in) for double nut
Soldering Time & Temperature: Manual Soldering: See Profile A in Supplement section.

Standards & Certifications

CSA: **File No. 023535_0_000 - Certified only when ordered with marking on switch.**
Add "/C" to end of part number to order CSA certified switch.
Certified at 5A @ 125V AC & 2A @ 250V AC.

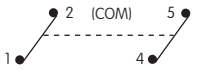
DOUBLE POLE WITH SOLDER LUG

Model	*Approvals		Pole & Throw	Toggle Position/Connected Terminals: Down	Center	Up	Electrical Capacity: Resistive AC 125V	Resistive AC 250V	Resistive DC 30V	Inductive AC 125V PF 0.6	Angle of Throw
				Keyway							
S114	—	✓	DPST	ON 2-1 5-4	NONE	OFF —	5A	2A	5A	3A	25°
S116	—	✓	DPDT	ON 2-1 5-4	NONE	ON 2-3 5-6	5A	2A	5A	3A	25°
S116R	—	—	DPDT	ON 2-1 5-4	NONE	ON 2-3 5-6	5A	2A	5A	3A	25°

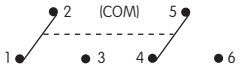
* CSA certified only when ordered with marking on switch (see General Specs)

Throw & Schematics:

DPST



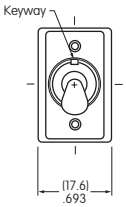
DPDT

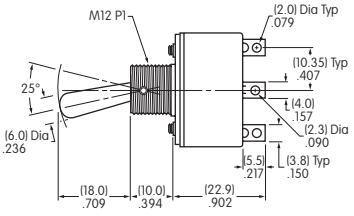


Note: Terminal numbers are actually on the switch

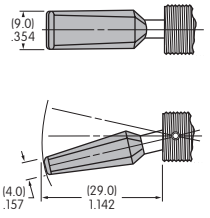
Notes: Standard Hardware: AT504M Knurled Nut, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section.
Optional Splashproof Boot Assemblies (only for bat lever models): AT401 & AT4181 boots plus hex nut and o-ring. See Accessories & Hardware section.

S116



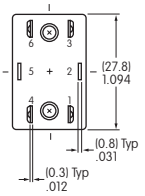


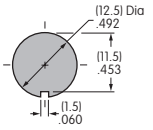
S114 & S116



S114 does not have terminals 3 & 6

S116R Black Polyamide Paddle





Maximum Panel Thickness: .158" (4.0mm)

GENERAL SPECIFICATIONS FOR S1 ~ S29

Electrical Capacity (Resistive & Inductive Load)

Power Level: Shown in the following tables

Other Ratings

Contact Resistance: 10 milliohms maximum
Insulation Resistance: 1,000 megohms minimum @ 500V DC
Dielectric Strength: 2,000V AC minimum for 1 minute minimum
Mechanical Life: 30,000 operations minimum for S5AW, S8AW, S9AW, S25AW, S28AW, S29AW
50,000 operations minimum for all other models
Electrical Life: 25,000 operations minimum
Angle of Throw (α): Shown in tables on following pages

Materials & Finishes

Toggle: Brass with chrome plating
Bushing: Brass with chrome plating
Case: Phenolic resin
Case Cover: Steel with zinc plating
Movable Contactor: Copper with silver plating
Movable Contacts: Silver alloy capped on copper with silver plating
Stationary Contacts: Silver alloy capped on copper with silver plating
Terminals: Brass with tin plating

Environmental Data

Operating Temp Range: –30°C through +70°C (–22°F through +158°F) for Splashproof models;
–10°C through +70°C (+14°F through +158°F) for all other models
Sealing: Splashproof & lever lock panel seal models meet IP67 standard

Installation

Mounting Torque: 1.47Nm (13 lb•in) for single nut on AW & AL models
2.94Nm (26 lb•in) for double nut on other models
Maximum Panel Thickness: Shown beneath panel cutout in switch dimension drawings
Soldering Time & Temperature: Manual Soldering: See Profile A in Supplement section.

Standards & Certifications

UL: **File No. E44145 - Recognized only when ordered with marking on switch.**
Add "/U" or "/CUL" to end of part number to order UL recognized switch.
UL or cULus recognition designated beside part numbers on following pages.
See Supplement section to find UL or cULus rating details.

CSA: **File No. 023535_0_000 - Certified only when ordered with marking on switch.**
Add "/C" to end of part number to order CSA certified switch.
CSA certification designated beside part numbers on following pages.
See Supplement section to find CSA rating details.

SINGLE POLE WITH SOLDER LUG

* UL, cULus & CSA recognized only when ordered with marking on switch (see General Specs)					Toggle Position/Connected Terminals					Electrical Capacity				
	*Approvals				Down		Center	Up		Resistive			Inductive	
Model				Pole & Throw	Keyway					AC 125V	AC 250V	DC 30V	AC 125V PF 0.6	Angle of Throw
S1A	✓	✓	✓	SPST	ON	1-3	NONE	OFF	—	15A	6A	20A	8A	25°
S2A	✓	✓	✓	SPDT	ON	2-3	NONE	ON	2-1	15A	6A	20A	8A	25°
S3A	✓	✓	✓	SPDT	ON	2-3	OFF	ON	2-1	15A	6A	20A	8A	25°

Throw & Schematics:

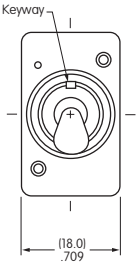
SPST

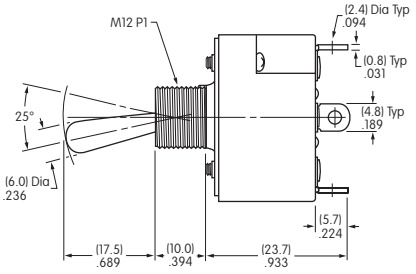
SPDT

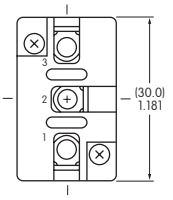
Note: Terminal numbers are actually on the switch

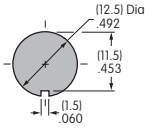
Notes: Standard Hardware: AT504M Knurled Nut, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section.
Optional Splashproof Boot Assemblies: AT401 & AT4181 boots plus hex nut & o-ring. See Accessories & Hardware section.

S2A









S1A does not have terminal 2

Maximum Panel Thickness: .158" (4.0mm)

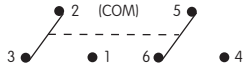
DOUBLE POLE WITH SOLDER LUG

* UL, cULus & CSA recognized only when ordered with marking on switch (see General Specs)					Toggle Position/Connected Terminals					Electrical Capacity				
	*Approvals				Down		Center	Up		Resistive			Inductive	
Model				Pole & Throw	Keyway					AC 125V	AC 250V	DC 30V	AC 125V PF 0.6	α = Angle of Throw
S21A	—	—	—	DPST	ON	1-3 4-6	NONE	OFF	—	15A	15A	15A	8A	21°
S6A	✓	✓	✓	DPDT	ON	2-3 5-6	NONE	ON	2-1 5-4	20A	10A	20A	8A	21°
S7A	—	—	✓	DPDT	ON	2-3 5-6	OFF	ON	2-1 5-4	20A	10A	20A	8A	28°

Throw & Schematics:

DPST

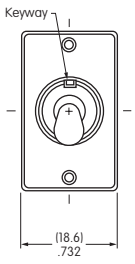
DPDT

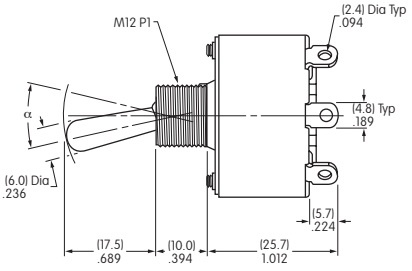


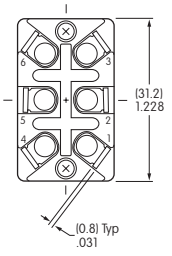
Note: Terminal numbers are actually on the switch

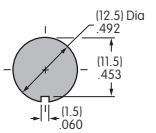
Notes: Standard Hardware: AT504M Knurled Nut, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section.
Optional Splashproof Boot Assemblies: AT401 & AT4181 boots plus hex nut & o-ring. See Accessories & Hardware section.

S6A









S21A does not have terminals 2 & 5

Maximum Panel Thickness: .158" (4.0mm)

SINGLE POLE WITH QUICK CONNECT

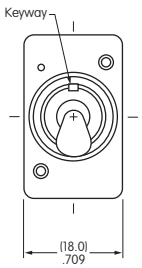
Model	Approvals		Pole & Throw	Toggle Position/Connected Terminals: Down		Center		Up		Electrical Capacity: Resistive AC 125V	Resistive AC 250V	Resistive DC 30V	Inductive AC 125V PF 0.6	Angle of Throw
S1F	—	—	SPST	ON	1-3	NONE		OFF	—	15A	6A	20A	8A	25°
S2F	—	—	SPDT	ON	2-3	NONE		ON	2-1	15A	6A	20A	8A	25°
S3F	—	—	SPDT	ON	2-3	OFF		ON	2-1	15A	6A	20A	8A	25°

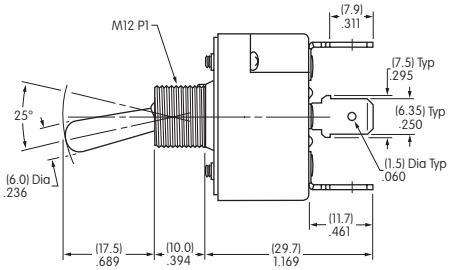
Throw & Schematics: SPST 

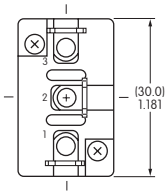
SPDT 

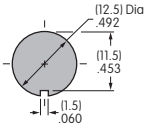
Note: Terminal numbers are actually on the switch

Notes: Standard Hardware: AT504M Knurled Nut, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section.
Optional Splashproof Boot Assemblies: AT401 & AT4181 boots plus hex nut & o-ring. See Accessories & Hardware section.









S1F does not have terminal 2

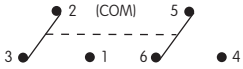
Maximum Panel Thickness: .158" (4.0mm)

S2F

DOUBLE POLE WITH QUICK CONNECT

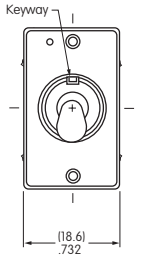
Model	Approvals		Pole & Throw	Toggle Position/Connected Terminals: Down		Center		Up		Electrical Capacity: Resistive AC 125V	Resistive AC 250V	Resistive DC 30V	Inductive AC 125V PF 0.6	α = Angle of Throw
S21F	—	—	DPST	ON	1-3 4-6	NONE		OFF	—	15A	15A	15A	8A	21°
S6F	—	—	DPDT	ON	2-3 5-6	NONE		ON	2-1 5-4	20A	10A	20A	8A	21°
S7F	—	—	DPDT	ON	2-3 5-6	OFF		ON	2-1 5-4	20A	10A	20A	8A	28°

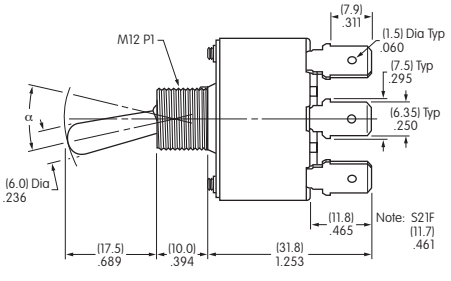
Throw & Schematics: DPST 

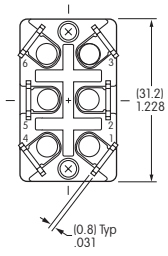
DPDT 

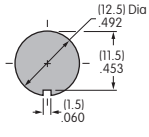
Note: Terminal numbers are actually on the switch

Notes: Standard Hardware: AT504M Knurled Nut, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section.
Optional Splashproof Boot Assemblies: AT401 & AT4181 boots plus hex nut & o-ring. See Accessories & Hardware section.









S21F does not have terminals 2 & 5

Maximum Panel Thickness: .158" (4.0mm)

S6F

SINGLE POLE SOLDER LUG WITH PANEL SEAL

Model	Approvals	Pole & Throw	Toggle Position/Connected Terminals ( ) = Momentary: Down (Keyway)	Center	Up	Electrical Capacity: Resistive AC 125V	AC 250V	DC 30V	α = Angle of Throw
S1AW	— —	SPST	ON 1-3	NONE	OFF —	15A	6A	20A	24°
S2AW	— —	SPDT	ON 2-3	NONE	ON 2-1	15A	6A	20A	24°
S3AW	— —	SPDT	ON 2-3	OFF	ON 2-1	15A	6A	20A	28°
S5AW	— —	SPDT	ON 2-3	NONE	(ON) 2-1	15A	6A	20A	20°
S8AW	— —	SPDT	(ON) 2-3	OFF	(ON) 2-1	15A	6A	20A	24°
S9AW	— —	SPDT	ON 2-3	OFF	(ON) 2-1	15A	6A	20A	24°

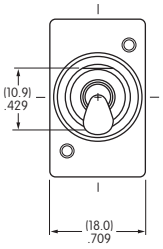
Throw & Schematics: SPST 

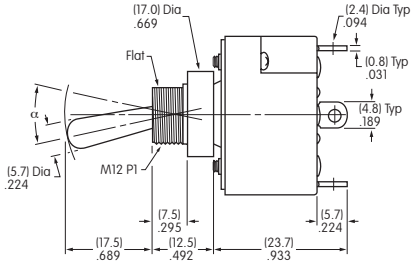
SPDT 

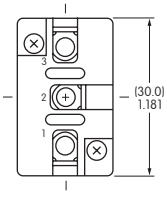
Note: Terminal numbers are actually on the switch

Notes: Standard Hardware: AT503M Face Hex Nut, AT508 Lockwasher, AT537 O-ring. See Accessories & Hardware section.
For **.250" Quick Connect terminals**, add "F" to end of part number. See **Quick Connect terminal** dimensions on previous page.
For further information, contact factory.

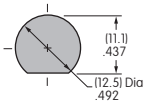
S2AW







S1AW does not have terminal 2

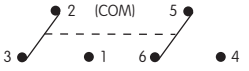


Maximum Panel Thickness: .158" (4.0mm)

DOUBLE POLE SOLDER LUG WITH PANEL SEAL

Model	Approvals	Pole & Throw	Toggle Position/Connected Terminals ( ) = Momentary: Down (Keyway)	Center	Up	Electrical Capacity: Resistive AC 125V	AC 250V	DC 30V	α = Angle of Throw
S21AW	— —	DPST	ON 1-3 4-6	NONE	OFF —	15A	15A	15A	22°
S6AW	— —	DPDT	ON 2-3 5-6	NONE	ON 2-1 5-4	20A	10A	20A	22°
S7AW	— —	DPDT	ON 2-3 5-6	OFF	ON 2-1 5-4	20A	10A	20A	28°
S25AW	— —	DPDT	ON 2-3 5-6	NONE	(ON) 2-1 5-4	15A	6A	20A	20°
S28AW	— —	DPDT	(ON) 2-3 5-6	OFF	(ON) 2-1 5-4	15A	6A	20A	22°
S29AW	— —	DPDT	ON 2-3 5-6	OFF	(ON) 2-1 5-4	15A	6A	20A	22°

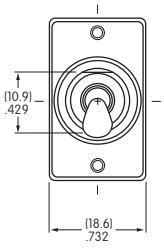
Throw & Schematics: DPST 

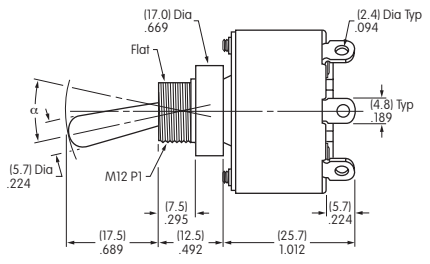
DPDT 

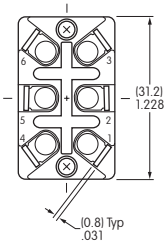
Note: Terminal numbers are actually on the switch

Notes: Standard Hardware: AT503M Face Hex Nut, AT508 Lockwasher, AT537 O-ring. See Accessories & Hardware section.
For **.250" Quick Connect terminals**, add "F" to end of part number. See **Quick Connect terminal** dimensions on previous page.
For further information, contact factory.

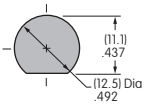
S6AW







S21AW does not have terminals 2 & 5



Maximum Panel Thickness: .158" (4.0mm)

SINGLE POLE SOLDER LUG WITH LOCKING LEVER & PANEL SEAL

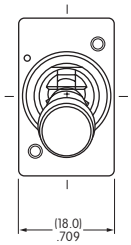
Model	Approvals	Pole & Throw	Toggle Position/Connected Terminals: Down	Center	Up	Electrical Capacity: Resistive AC 125V	Resistive AC 250V	Resistive DC 30V	Inductive AC 125V PF 0.6	α = Angle of Throw
S1AL	— —	SPST	ON 1-3	NONE	OFF —	15A	6A	20A	8A	24°
S2AL	— —	SPDT	ON 2-3	NONE	ON 2-1	15A	6A	20A	8A	24°
S3AL	— —	SPDT	ON 2-3	OFF	ON 2-1	15A	6A	20A	8A	28°

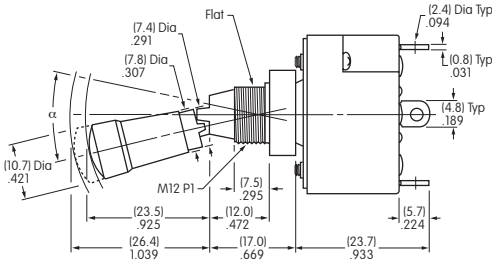
Throw & Schematics: SPST 

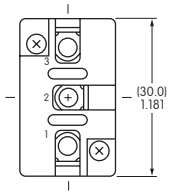
SPDT 

Note: Terminal numbers are actually on the switch

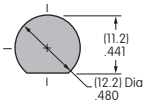
Notes: Standard Hardware: AT503M Face Hex Nut, AT508 Lockwasher, AT537 O-ring. See Accessories & Hardware section.







S1AL does not have terminal 2



Maximum Panel Thickness: .158" (4.0mm)

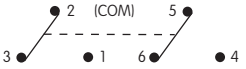
S2AL

DOUBLE POLE SOLDER LUG WITH LOCKING LEVER & PANEL SEAL

* UL & cULus recognized only when ordered with marking on switch (see General Specs)

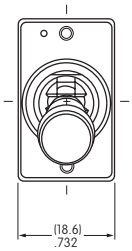
Model	*Approvals	Pole & Throw	Toggle Position/Connected Terminals: Down	Center	Up	Electrical Capacity: Resistive AC 125V	Resistive AC 250V	Resistive DC 30V	Inductive AC 125V PF 0.6	α = Angle of Throw
S21AL	— —	DPST	ON 1-3 4-6	NONE	OFF —	15A	15A	15A	8A	22°
S6AL	✓ ✓	DPDT	ON 2-3 5-6	NONE	ON 2-1 5-4	20A	10A	20A	8A	22°
S7AL	— —	DPDT	ON 2-3 5-6	OFF	ON 2-1 5-4	20A	10A	20A	8A	28°

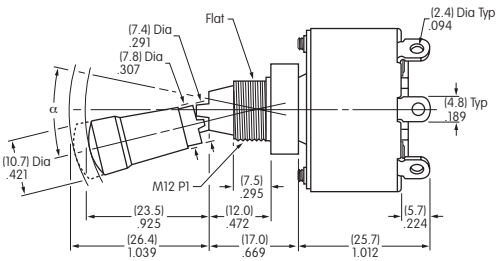
Throw & Schematics: DPST 

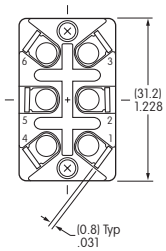
DPDT 

Note: Terminal numbers are actually on the switch

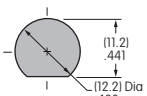
Notes: Standard Hardware: AT503M Face Hex Nut, AT508 Lockwasher, AT537 O-ring. See Accessories & Hardware section.







S21AL does not have terminals 2 & 5



Maximum Panel Thickness: .158" (4.0mm)

S6AL

GENERAL SPECIFICATIONS FOR S301 ~ S339

Electrical Capacity (Resistive & Inductive Load)

Power Level: Shown in the following tables

Other Ratings

Contact Resistance: 10 milliohms maximum
Insulation Resistance: 1,000 megohms minimum @ 500V DC
Dielectric Strength: 2,000V AC minimum for 1 minute minimum
Mechanical Life: 50,000 operations minimum
Electrical Life: 6,000 operations minimum for S331F; 15,000 operations minimum for all other S331s; 25,000 operations minimum for all others
Angle of Throw (α): Shown on following tables

Materials & Finishes

Toggle: PBT for flatted lever; brass with chrome plating for all others
Bushing: Brass with chrome plating
Case: Melamine phenol
Case Cover: Steel with zinc plating
Movable Contactor: Copper with silver plating
Movable & Stationary Contacts: Silver alloy capped on copper with silver plating
Terminals: Brass with tin plating

Environmental Data

Operating Temperature Range: –10°C ~ +70°C (+14°F ~ +158°F)

Installation

Mounting Torque: 2.94Nm (26 lb•in) for double nut; 1.47Nm (13 lb•in) for single nut
Soldering Time & Temperature: Manual Soldering: See Profile A in Supplement section.

Standards & Certifications

UL: **File No. E44145 - Recognized only when ordered with marking on switch.**
Add "/U" or "/CUL" to end of part number to order UL recognized switch.
UL or cULus recognition designated beside part numbers on following pages.
See Supplement section to find UL or cULus rating details.

CSA: **File No. 023535_0_000 - Certified only when ordered with marking on switch.**
Add "/C" to end of part number to order CSA certified switch.
CSA certification designated beside part numbers on following pages.
See Supplement section to find CSA rating details

SINGLE POLE WITH SOLDER LUG

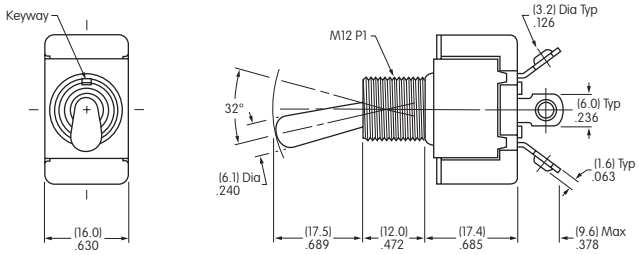
Model	*Approvals	Pole & Throw	Toggle Position/Connected Terminals ( ) = Momentary: Down	Center	Up	Electrical Capacity: Resistive AC 125V	Resistive AC 250V	Resistive DC 30V	Inductive AC 125V PF 0.6	Angle of Throw
S301	✓ ✓ ✓	SPST	ON 1-3	NONE	OFF —	15A	6A	20A	10A	32°
S302	✓ ✓ ✓	SPDT	ON 2-3	NONE	ON 2-1	15A	6A	20A	10A	32°
S303	✓ ✓ ✓	SPDT	ON 2-3	OFF	ON 2-1	15A	6A	20A	10A	32°
S305	— — ✓	SPDT	ON 2-3	NONE	(ON) 2-1	15A	6A	20A	8A	32°
S308	— — ✓	SPDT	(ON) 2-3	OFF	(ON) 2-1	15A	6A	20A	8A	32°
S309	— — ✓	SPDT	ON 2-3	OFF	(ON) 2-1	15A	6A	20A	8A	32°

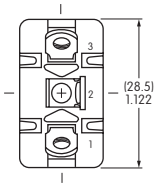
* UL, cULus & CSA recognized only when ordered with marking on switch (see General Specs)

Throw & Schematics: SPST 1 3 INTERNAL CONNECTION; SPDT 3 2 (COM) 1

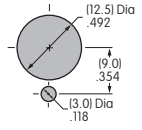
Note: Terminal numbers are actually on the switch

Notes: Standard Hardware: AT503M Face Hex Nut, AT506M Locking Ring, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section. Optional Splashproof Boot Assemblies: AT401 & AT4181 boots plus hex nut & o-ring. See Accessories & Hardware section.





S301 does not have terminal 2



Maximum Panel Thickness: .185" (4.7mm)

S301

DOUBLE POLE WITH SOLDER LUG

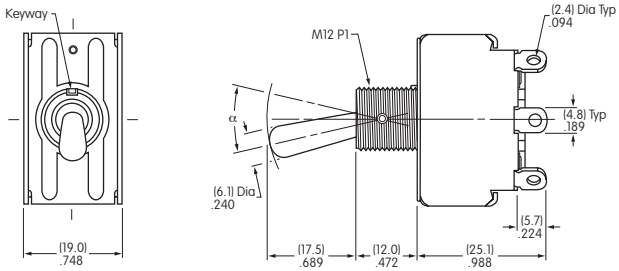
Model	*Approvals	Pole & Throw	Toggle Position/Connected Terminals ( ) = Momentary: Down	Center	Up	Electrical Capacity: Resistive AC 125V	Resistive AC 250V	Resistive DC 30V	Inductive AC 125V PF 0.6	α = Angle of Throw
S331	✓ ✓ ✓	DPST	ON 1-3 4-6	NONE	OFF —	25A	25A	25A	10A	25°
S332	✓ ✓ ✓	DPDT	ON 2-3 5-6	NONE	ON 2-1 5-4	25A	15A	25A	10A	25°
S333	✓ ✓ ✓	DPDT	ON 2-3 5-6	OFF	ON 2-1 5-4	25A	15A	25A	10A	30°
S335	✓ ✓ ✓	DPDT	ON 2-3 5-6	NONE	(ON) 2-1 5-4	15A	6A	20A	8A	25°
S338	✓ ✓ —	DPDT	(ON) 2-3 5-6	OFF	(ON) 2-1 5-4	15A	6A	20A	8A	25°
S339	✓ ✓ —	DPDT	ON 2-3 5-6	OFF	(ON) 2-1 5-4	15A	6A	20A	8A	25°

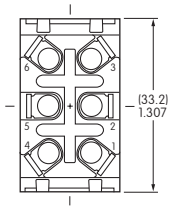
* UL, cULus & CSA recognized only when ordered with marking on switch (see General Specs)

Throw & Schematics: DPST 1 3 4 6 INTERNAL CONNECTION; DPDT 3 2 (COM) 5 1 6 4

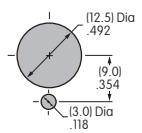
Note: Terminal numbers are actually on the switch

Notes: Standard Hardware: AT503M Face Hex Nut, AT506M Locking Ring, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section. Optional Splashproof Boot Assemblies: AT401 & AT4181 boots plus hex nut & o-ring. See Accessories & Hardware section.





S331 does not have terminals 2 & 5



Maximum Panel Thickness: .185" (4.7mm)

S331

DOUBLE POLE WITH SOLDER LUG & FLATTED LEVER

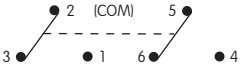
* UL & cULus recognized only when ordered with marking on switch (see General Specs)

Model	*Approvals	Pole & Throw	Toggle Position/Connected Terminals ( ) = Momentary: Down	Center	Up	Electrical Capacity: Resistive AC 125V	Resistive AC 250V	Resistive DC 30V	Inductive AC 125V PF 0.6	α = Angle of Throw
S331R	✓ ✓ —	DPST	ON 1-3 4-6	NONE	OFF —	25A	25A	25A	10A	25°
S332R	✓ ✓ —	DPDT	ON 2-3 5-6	NONE	ON 2-1 5-4	25A	15A	25A	10A	25°
S333R	✓ ✓ —	DPDT	ON 2-3 5-6	OFF	ON 2-1 5-4	25A	15A	25A	10A	30°
S338R	✓ ✓ —	DPDT	(ON) 2-3 5-6	OFF	(ON) 2-1 5-4	15A	6A	20A	8A	25°
S339R	✓ ✓ —	DPDT	ON 2-3 5-6	OFF	(ON) 2-1 5-4	15A	6A	20A	8A	25°

Throw & Schematics:

DPST

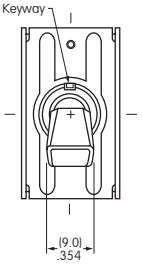
DPDT

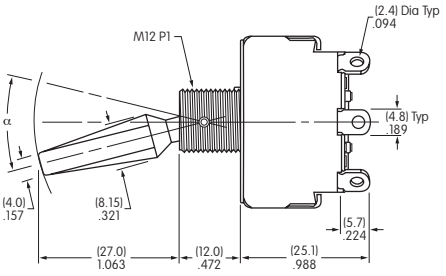


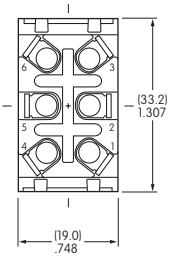
Note: Terminal numbers are actually on the switch

Notes: Standard Hardware: AT504M Knurled Nut, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section.

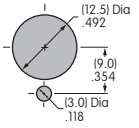
S331R







S331R does not have terminals 2 & 5

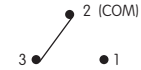


Maximum Panel Thickness: .220" (5.6mm)

SINGLE POLE WITH SCREW LUG

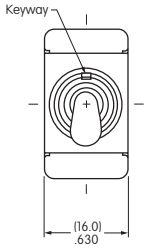
* UL, cULus & CSA recognized only when ordered with marking on switch (see General Specs)				Toggle Position/Connected Terminals ( ) = Momentary						Electrical Capacity				
	*Approvals				Down		Center	Up		Resistive			Inductive	
Model				Pole & Throw	Keyway					AC 125V	AC 250V	DC 30V	AC 125V PF 0.6	α = Angle of Throw
S301T	✓	✓	✓	SPST	ON	1-3	NONE	OFF	—	15A	6A	20A	10A	32°
S302T	✓	✓	✓	SPDT	ON	2-3	NONE	ON	2-1	15A	6A	20A	10A	32°
S303T	✓	✓	✓	SPDT	ON	2-3	OFF	ON	2-1	15A	6A	20A	10A	32°
S305T	—	—	✓	SPDT	ON	2-3	NONE	(ON)	2-1	15A	6A	20A	8A	32°
S308T	—	—	✓	SPDT	(ON)	2-3	OFF	(ON)	2-1	15A	6A	20A	8A	32°
S309T	—	—	✓	SPDT	ON	2-3	OFF	(ON)	2-1	15A	6A	20A	8A	32°

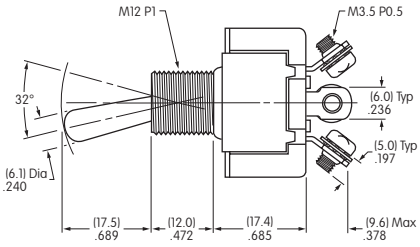
Throw & Schematics: SPST 

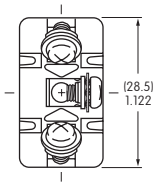
SPDT 

Note: Terminal numbers are actually on the switch

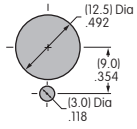
Notes: Standard Hardware: AT503M Face Hex Nut, AT506M Locking Ring, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section. Optional Splashproof Boot Assemblies: AT401 & AT4181 boots plus hex nut & o-ring. See Accessories & Hardware section.







S301T does not have terminal 2



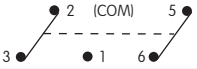
Maximum Panel Thickness: .185" (4.7mm)

S301T

DOUBLE POLE WITH SCREW LUG

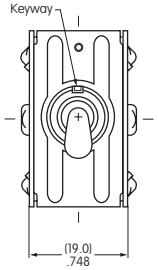
* UL & cULus recognized only when ordered with marking on switch (see General Specs)				Toggle Position/Connected Terminals ( ) = Momentary						Electrical Capacity				
	*Approvals				Down		Center	Up		Resistive			Inductive	
Model				Pole & Throw	Keyway					AC 125V	AC 250V	DC 30V	AC 125V PF 0.6	α = Angle of Throw
S331T	✓	✓	—	DPST	ON	1-3 4-6	NONE	OFF	—	15A	15A	15A	10A	25°
S332T	✓	✓	—	DPDT	ON	2-3 5-6	NONE	ON	2-1 5-4	15A	15A	15A	10A	25°
S333T	✓	✓	—	DPDT	ON	2-3 5-6	OFF	ON	2-1 5-4	15A	15A	15A	10A	30°
S335T	✓	✓	—	DPDT	ON	2-3 5-6	NONE	(ON)	2-1 5-4	15A	6A	20A	8A	25°
S338T	✓	✓	—	DPDT	(ON)	2-3 5-6	OFF	(ON)	2-1 5-4	15A	6A	20A	8A	25°
S339T	✓	✓	—	DPDT	ON	2-3 5-6	OFF	(ON)	2-1 5-4	15A	6A	20A	8A	25°

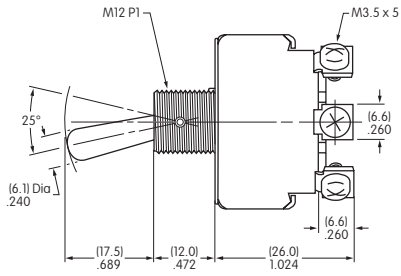
Throw & Schematics: DPST 

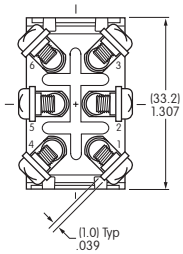
DPDT 

Note: Terminal numbers are actually on the switch

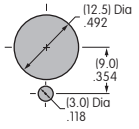
Notes: Standard Hardware: AT503M Face Hex Nut, AT506M Locking Ring, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section. Optional Splashproof Boot Assemblies: AT401 & AT4181 boots plus hex nut & o-ring. See Accessories & Hardware section.







S331T does not have terminals 2 & 5



Maximum Panel Thickness: .185" (4.7mm)

S331T

SINGLE POLE WITH QUICK CONNECT

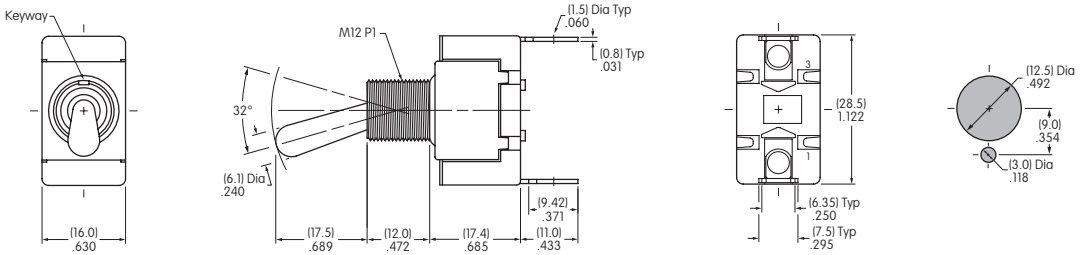
* UL, cULus & CSA recognized only when ordered with marking on switch (see General Specs)				Toggle Position/Connected Terminals			Electrical Capacity				
	*Approvals				Down	Center	Up	Resistive			Inductive	α =
Model				Pole & Throw	Keyway			AC 125V	AC 250V	DC 30V	AC 125V PF 0.6	Angle of Throw
S301F	✓	✓	✓	SPST	ON 1-3	NONE	OFF —	15A	6A	20A	10A	32°

Throw & Schematics: SPST

Note: Terminal numbers are actually on the switch

Notes: Standard Hardware: AT503M Face Hex Nut, AT506M Locking Ring, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section.
Optional Splashproof Boot Assemblies: AT401 & AT4181 boots plus hex nut & o-ring. See Accessories & Hardware section.

S301F



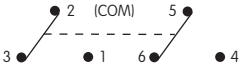
Maximum Panel Thickness: .185" (4.7mm)

DOUBLE POLE WITH QUICK CONNECT

* UL & cULus recognized only when ordered with marking on switch (see General Specs)				Toggle Position/Connected Terminals ( ) = Momentary			Electrical Capacity				
	*Approvals				Down	Center	Up	Resistive			Inductive	α =
Model				Pole & Throw	Keyway			AC 125V	AC 250V	DC 30V	AC 125V PF 0.6	Angle of Throw
S331F	✓	✓	—	DPST	ON 1-3 4-6	NONE	OFF —	25A	25A	25A	10A	25°
S332F	✓	✓	—	DPDT	ON 2-3 5-6	NONE	ON 2-1 5-4	25A	15A	25A	10A	25°
S333F	✓	✓	—	DPDT	ON 2-3 5-6	OFF	ON 2-1 5-4	25A	15A	25A	10A	30°
S335F	✓	✓	—	DPDT	ON 2-3 5-6	NONE	(ON) 2-1 5-4	15A	6A	20A	8A	25°

Throw & Schematics: DPST

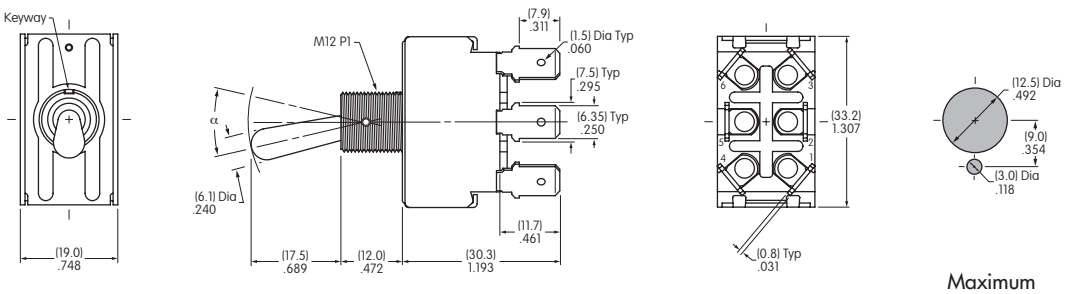
DPDT



Note: Terminal numbers are actually on the switch

Notes: Standard Hardware: AT503M Face Hex Nut, AT506M Locking Ring, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section.
Optional Splashproof Boot Assemblies: AT401 & AT4181 boots plus hex nut & o-ring. See Accessories & Hardware section.

S332F



S331F does not have terminals 2 & 5

Maximum Panel Thickness: .185" (4.7mm)

GENERAL SPECIFICATIONS FOR S31 ~ S49

Electrical Capacity (Resistive & Inductive Load)

Power Level: Shown in the following tables

Other Ratings

Contact Resistance: 10 milliohms maximum
Insulation Resistance: 1,000 megohms minimum @ 500V DC
Dielectric Strength: 2,000V AC minimum for 1 minute minimum
Mechanical Life: 50,000 operations minimum
Electrical Life: 25,000 operations minimum
Angle of Throw (α): Shown on following tables

Materials & Finishes

Toggle: PBT resin for flatted lever; brass with chrome plating for all others
Bushing: Brass with chrome plating
Case: Phenolic resin
Case Cover: Steel with chromate plating over zinc plating
Movable Contactor: Copper with silver plating
Movable Contacts: Silver alloy capped on copper with silver plating
Stationary Contacts: Silver alloy capped on copper with silver plating
Terminals: Brass with tin plating

Environmental Data

Operating Temp Range: –10°C through +70°C (+14°F through +158°F)

Installation

Mounting Torque: 2.94Nm (26 lb•in) for double nut
Maximum Panel Thickness: Shown beneath panel cutout in switch dimension drawings
Soldering Time & Temperature: Manual Soldering: See Profile A in Supplement section.

Standards & Certifications

UL: **File No. E44145 - Recognized only when ordered with marking on switch.**
Add "/U" or "/CUL" to end of part number to order UL recognized switch.
UL or cULus recognition designated beside part numbers on following pages.
See Supplement section to find UL or cULus rating details.

CSA: **File No. 023535_0_000 - Certified only when ordered with marking on switch.**
Add "/C" to end of part number to order CSA certified switch.
CSA certification designated beside part numbers on following pages.
See Supplement section to find CSA rating details.

Series S

Medium/High Capacity Standard Size Toggles

THREE POLE WITH SOLDER LUG

Model	*Approvals	Pole & Throw	Toggle Position/Connected Terminals ( ) = Momentary: Down	Center	Up	Electrical Capacity: Resistive AC 125V	Resistive AC 250V	Resistive DC 30V	Inductive AC 125V PF 0.6	α = Angle of Throw
S31	✓ ✓ ✓	3PST	ON 1-3 4-6 7-9	NONE	OFF —	25A	9A	20A	10A	25°
S32	✓ ✓ ✓	3PDT	ON 2-3 5-6 8-9	NONE	ON 2-1 5-4 8-7	25A	9A	20A	10A	25°
S33	✓ ✓ ✓	3PDT	ON 2-3 5-6 8-9	OFF	ON 2-1 5-4 8-7	25A	9A	20A	10A	30°
S35	✓ ✓ ✓	3PDT	ON 2-3 5-6 8-9	NONE	(ON) 2-1 5-4 8-7	15A	6A	20A	8A	25°
S38	✓ ✓ ✓	3PDT	(ON) 2-3 5-6 8-9	OFF	(ON) 2-1 5-4 8-7	15A	6A	15A	8A	25°
S39	✓ ✓ ✓	3PDT	ON 2-3 5-6 8-9	OFF	(ON) 2-1 5-4 8-7	15A	6A	15A	8A	25°

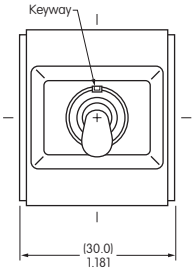
* UL, cULus & CSA recognized only when ordered with marking on switch (see General Specs)

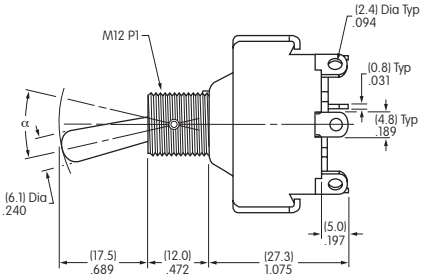
Throw & Schematics:

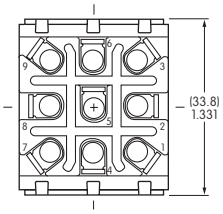
Note: Terminal numbers are on the switch

Notes: Standard Hardware: AT503M Face Hex Nut, AT506M Locking Ring, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section.
Optional Splashproof Boot Assemblies: AT401 & AT4181 boots plus hex nut & o-ring. See Accessories & Hardware section.

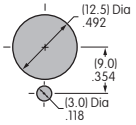
S32







S31 does not have terminals 2, 5, & 8



Maximum Panel Thickness: .181" (4.6mm)

FOUR POLE WITH SOLDER LUG

Model Suffix R = Flatted Lever	*Approvals	Pole & Throw	Toggle Position/Connected Terminals ( ) = Momentary: Down	Center	Up	Electrical Capacity: Resistive AC 125V	Resistive AC 250V	Resistive DC 30V	Inductive AC 125V PF 0.6	α = Angle of Throw
S41/S41R	✓ ✓ ✓	4PST	ON 1-3 4-6 7-9 10-12	NONE	OFF —	25A	9A	20A	10A	25°
S42/S42R	✓ ✓ ✓	4PDT	ON 2-3 5-6 8-9 11-12	NONE	ON 2-1 5-4 8-7 11-10	25A	9A	20A	10A	25°
S43/S43R	✓ ✓ ✓	4PDT	ON 2-3 5-6 8-9 11-12	OFF	ON 2-1 5-4 8-7 11-10	25A	9A	20A	10A	30°
S45 –	✓ ✓ —	4PDT	ON 2-3 5-6 8-9 11-12	NONE	(ON) 2-1 5-4 8-7 11-10	15A	6A	20A	8A	25°
S48/S48R	✓ ✓ —	4PDT	(ON) 2-3 5-6 8-9 11-12	OFF	(ON) 2-1 5-4 8-7 11-10	15A	6A	20A	8A	25°
S49/S49R	✓ ✓ —	4PDT	ON 2-3 5-6 8-9 11-12	OFF	(ON) 2-1 5-4 8-7 11-10	15A	6A	20A	8A	25°

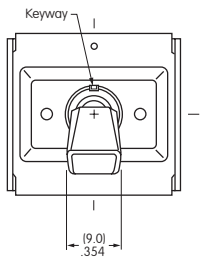
* UL, cULus & CSA recognized only when ordered with marking on switch (see General Specs)

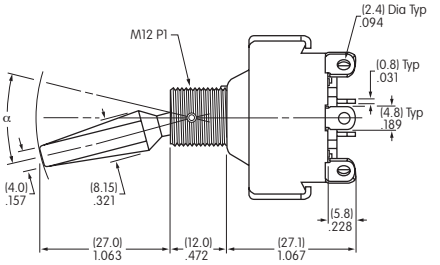
Throw & Schematics:

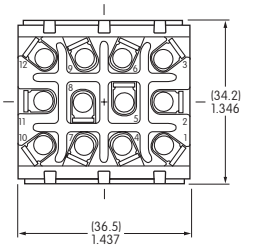
Note: Terminal numbers are on the switch

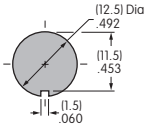
Notes: Standard Hardware for **Bat Lever**: AT503M Face Hex Nut, AT506M Locking Ring, AT508 Lockwasher, AT527M Backup Hex Nut;
for **Flatted Lever** (R): AT504M Knurled Face Nut, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section.
Optional Splashproof Boot Assemblies (only for bat lever models): AT401 & AT4181 boots plus hex nut and o-ring. See Accessories & Hardware section.

S42R

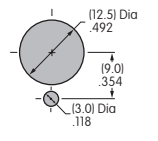








Max. Panel Thickness: .220" (5.6mm)



Max. Panel Thickness: .181" (4.6mm)

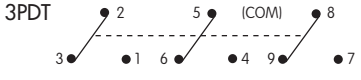
Bat lever dimensions are same as on S30 models above. S41 and S41R do not have terminals 2, 5, 8, & 11.

THREE POLE WITH SCREW LUG

Model	*Approvals	Pole & Throw	Toggle Position/Connected Terminals: Down	Center	Up	Electrical Capacity: Resistive AC 125V	Resistive AC 250V	Resistive DC 30V	Inductive AC 125V PF 0.6	Inductive AC 250V PF 0.6	α = Angle of Throw
S31T	✓ ✓ ✓	3PST	ON 1-3 4-6 7-9	NONE	OFF —	25A	9A	20A	10A	5A	25°
S32T	✓ ✓ ✓	3PDT	ON 2-3 5-6 8-9	NONE	ON 2-1 5-4 8-7	25A	9A	20A	10A	5A	25°
S33T	✓ ✓ ✓	3PDT	ON 2-3 5-6 8-9	OFF	ON 2-1 5-4 8-7	25A	9A	20A	10A	5A	30°

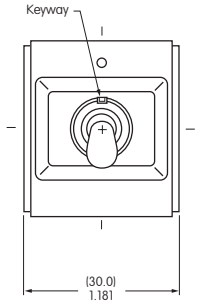
* UL, cULus & CSA recognized only when ordered with marking on switch (see General Specs)

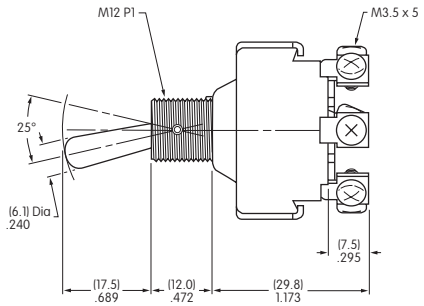
Throw & Schematics:

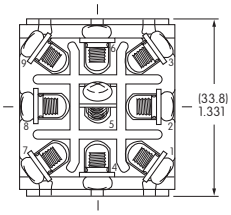


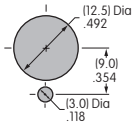
Note: Terminal numbers are on the switch

Notes: Standard Hardware: AT503M Face Hex Nut, AT506M Locking Ring, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section.
Optional Splashproof Boot Assemblies: AT401 & AT4181 boots plus hex nut & o-ring. See Accessories & Hardware section.









S31T does not have terminals 2, 5, & 8

Maximum Panel Thickness: .181" (4.6mm)

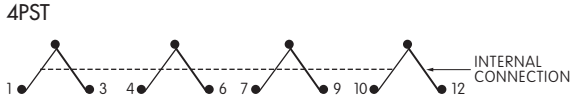
S32T

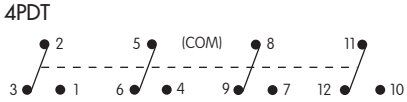
FOUR POLE WITH SCREW LUG

Model	*Approvals	Pole & Throw	Toggle Position/Connected Terminals: Down	Center	Up	Electrical Capacity: Resistive AC 125V	Resistive AC 250V	Resistive DC 30V	Inductive AC 125V PF 0.6	Inductive AC 250V PF 0.6	α = Angle of Throw
S41T	✓ ✓ ✓	4PST	ON 1-3 4-6 7-9 10-12	NONE	OFF —	25A	9A	20A	10A	5A	25°
S42T	✓ ✓ ✓	4PDT	ON 2-3 5-6 8-9 11-12	NONE	ON 2-1 5-4 8-7 11-10	25A	9A	20A	10A	5A	25°
S43T	✓ ✓ ✓	4PDT	ON 2-3 5-6 8-9 11-12	OFF	ON 2-1 5-4 8-7 11-10	25A	9A	20A	10A	5A	30°

* UL, cULus & CSA recognized only when ordered with marking on switch (see General Specs)

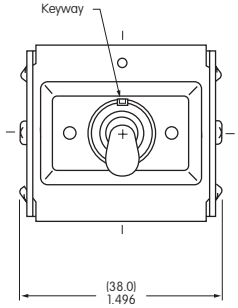
Throw & Schematics:

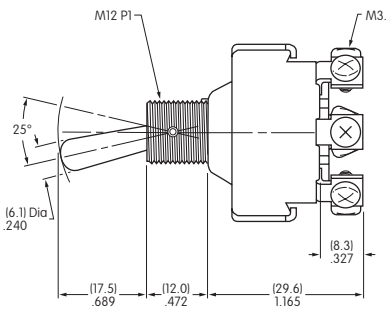


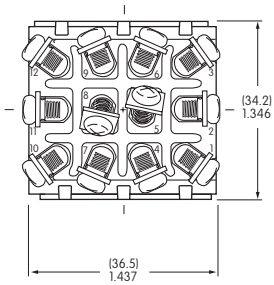


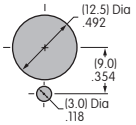
Note: Terminal numbers are on the switch

Notes: Standard Hardware: AT503M Face Hex Nut, AT506M Locking Ring, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section.
Optional Splashproof Boot Assemblies: AT401 & AT4181 boots plus hex nut & o-ring. See Accessories & Hardware section.









S41T does not have terminals 2, 5, 8, & 11

Maximum Panel Thickness: .181" (4.6mm)

S42T

THREE POLE WITH QUICK CONNECT

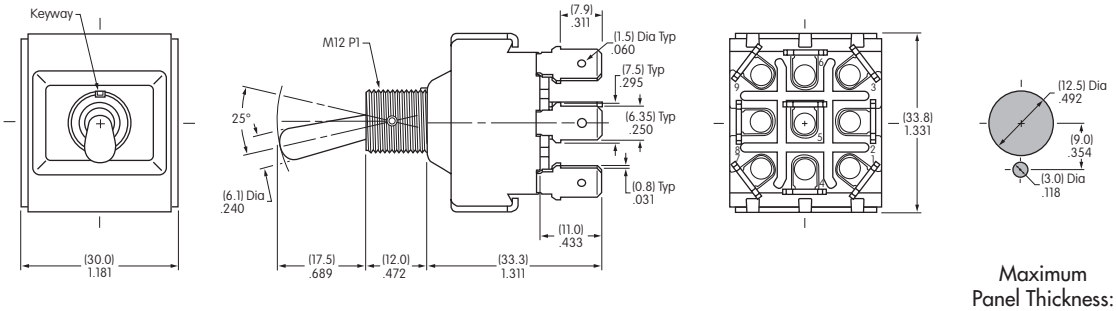
* UL, cULus & CSA recognized only when ordered with marking on switch (see General Specs)					Toggle Position/Connected Terminals			Electrical Capacity				
	*Approvals				Down	Center	Up	Resistive			Inductive	
Model				Pole & Throw	Keyway			AC 125V	AC 250V	DC 30V	AC 125V PF 0.6	α = Angle of Throw
S31F	✓	✓	✓	3PST	ON 1-3 4-6 7-9	NONE	OFF —	25A	9A	20A	10A	25°
S32F	✓	✓	✓	3PDT	ON 2-3 5-6 8-9	NONE	ON 2-1 5-4 8-7	25A	9A	20A	10A	25°
S33F	✓	✓	✓	3PDT	ON 2-3 5-6 8-9	OFF	ON 2-1 5-4 8-7	25A	9A	20A	10A	30°

Throw & Schematics:

Note: Terminal numbers are on the switch

Notes: Standard Hardware: AT503M Face Hex Nut, AT506M Locking Ring, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section.
Optional Splashproof Boot Assemblies: AT401 & AT4181 boots plus hex nut & o-ring. See Accessories & Hardware section.

S32F



S31F does not have terminals 2, 5, & 8

Maximum Panel Thickness: .181" (4.6mm)

FOUR POLE WITH QUICK CONNECT

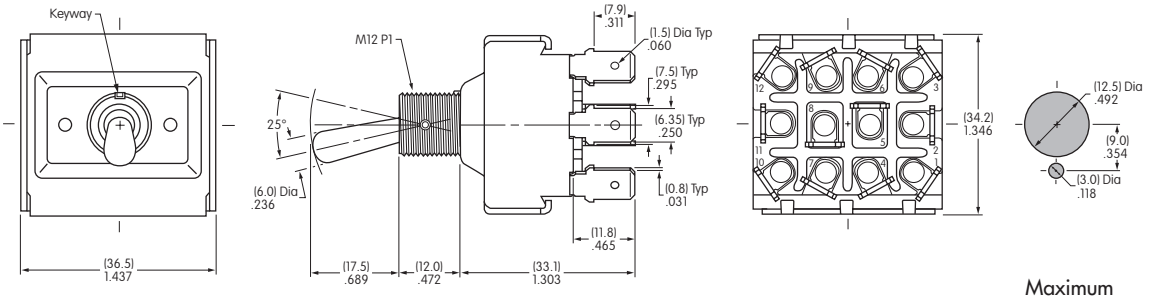
* UL, cULus & CSA recognized only when ordered with marking on switch (see General Specs)					Toggle Position/Connected Terminals			Electrical Capacity				
	*Approvals				Down	Center	Up	Resistive			Inductive	
Model				Pole & Throw	Keyway			AC 125V	AC 250V	DC 30V	AC 125V PF 0.6	α = Angle of Throw
S41F	✓	✓	✓	4PST	ON 1-3 4-6 7-9 10-12	NONE	OFF —	25A	9A	20A	10A	25°
S42F	✓	✓	✓	4PDT	ON 2-3 5-6 8-9 11-12	NONE	ON 2-1 5-4 8-7 11-10	25A	9A	20A	10A	25°
S43F	✓	✓	✓	4PDT	ON 2-3 5-6 8-9 11-12	OFF	ON 2-1 5-4 8-7 11-10	25A	9A	20A	10A	30°

Throw & Schematics:

Note: Terminal numbers are on the switch

Notes: Standard Hardware: AT503M Face Hex Nut, AT506M Locking Ring, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section.
Optional Splashproof Boot Assemblies: AT401 & AT4181 boots plus hex nut & o-ring. See Accessories & Hardware section.

S42F



S41F does not have terminals 2, 5, 8, & 11

Maximum Panel Thickness: .181" (4.6mm)

GENERAL SPECIFICATIONS FOR S421 ~ S429

Electrical Capacity (Resistive & Inductive Load)

Power Level: Shown in the following tables

Other Ratings

Contact Resistance: 10 milliohms maximum
Insulation Resistance: 1,000 megohms minimum @ 500V DC
Dielectric Strength: 2,000V AC minimum for 1 minute minimum
Mechanical Life: 50,000 operations minimum
Electrical Life: 15,000 operations minimum
Angle of Throw (α): Shown in tables on following pages

Materials & Finishes

Toggle: Brass with chrome plating
Bushing: Brass with chrome plating
Case: Melamine phenol
Case Cover: Steel with chromate plating over zinc plating
Movable Contactor: Copper with silver plating
Movable Contacts: Silver alloy capped on copper with silver plating
Stationary Contacts: Silver alloy capped on copper with silver plating
Terminals: Brass with tin plating

Environmental Data

Operating Temp Range: –10°C through +70°C (+14°F through +158°F)

Installation

Mounting Torque: 2.94Nm (26 lb•in) for double nut
Maximum Panel Thickness: Shown beneath panel cutout in switch dimension drawings
Soldering Time & Temperature: Manual Soldering: See Profile A in Supplement section.

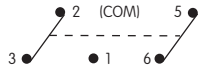
DOUBLE POLE WITH SOLDER LUG

Model	Approvals	Pole & Throw	Toggle Position/Connected Terminals ( ) = Momentary: Down (Keyway)	Center	Up	Electrical Capacity: Resistive AC 125V	Resistive AC 250V	Inductive PF 0.75 - 0.8 AC 125V	Inductive PF 0.75 - 0.8 AC 250V	Motor Load AC 125V	α = Angle of Throw
S421	— —	DPST	ON 1-3 4-6	NONE	OFF —	25A	25A	25A	25A	750W	24°
S422	— —	DPDT	ON 2-3 5-6	NONE	ON 2-1 5-4	25A	25A	25A	25A	750W	24°
S423	— —	DPDT	ON 2-3 5-6	OFF	ON 2-1 5-4	25A	25A	25A	25A	750W	28°
S425	— —	DPDT	ON 2-3 5-6	NONE	(ON) 2-1 5-4	15A	15A	15A	15A	400W	24°
S428	— —	DPDT	(ON) 2-3 5-6	OFF	(ON) 2-1 5-4	15A	15A	15A	15A	400W	24°
S429	— —	DPDT	ON 2-3 5-6	OFF	(ON) 2-1 5-4	15A	15A	15A	15A	400W	24°

Throw & Schematics:

DPST

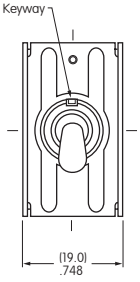
DPDT

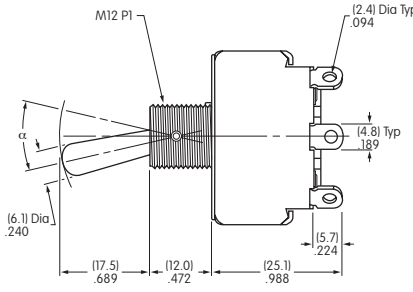


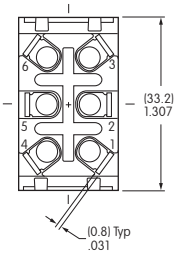
Note: Terminal numbers are on the switch

Notes: Standard Hardware: AT503M Face Hex Nut, AT506M Locking Ring, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section.
Optional Splashproof Boot Assemblies: AT401 & AT4181 boots plus hex nut & o-ring. See Accessories & Hardware section.

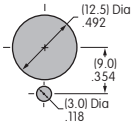
S422







S421 does not have terminals 2 & 5



Maximum Panel Thickness: .185" (4.7mm)

DOUBLE POLE WITH SCREW LUG

Model	Approvals	Pole & Throw	Toggle Position/Connected Terminals ( ) = Momentary: Down (Keyway)	Center	Up	Electrical Capacity: Resistive AC 125V	Resistive AC 250V	Inductive PF 0.75 - 0.8 AC 125V	Inductive PF 0.75 - 0.8 AC 250V	Motor Load AC 125V	α = Angle of Throw
S421T	— —	DPST	ON 1-3 4-6	NONE	OFF —	20A	20A	20A	20A	750W	24°
S422T	— —	DPDT	ON 2-3 5-6	NONE	ON 2-1 5-4	20A	20A	20A	20A	750W	24°
S423T	— —	DPDT	ON 2-3 5-6	OFF	ON 2-1 5-4	20A	20A	20A	20A	750W	28°
S425T	— —	DPDT	ON 2-3 5-6	NONE	(ON) 2-1 5-4	15A	15A	15A	15A	400W	24°
S428T	— —	DPDT	(ON) 2-3 5-6	OFF	(ON) 2-1 5-4	15A	15A	15A	15A	400W	24°
S429T	— —	DPDT	ON 2-3 5-6	OFF	(ON) 2-1 5-4	15A	15A	15A	15A	400W	24°

Throw & Schematics:

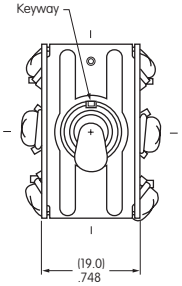
DPST

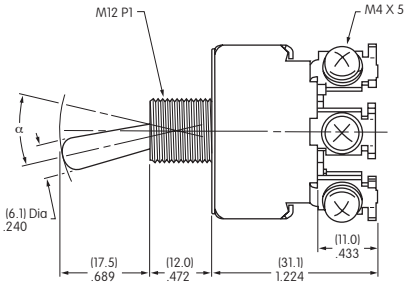
DPDT

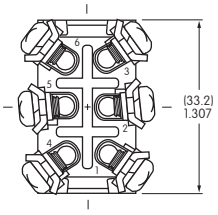
Note: Terminal numbers are on the switch

Notes: Standard Hardware: AT503M Face Hex Nut, AT506M Locking Ring, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section.
Optional Splashproof Boot Assemblies: AT401 & AT4181 boots plus hex nut & o-ring. See Accessories & Hardware section.

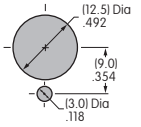
S423T







S421T does not have terminals 2 & 5



Maximum Panel Thickness: .185" (4.7mm)

GENERAL SPECIFICATIONS FOR S800s ~ S732

Electrical Capacity (Resistive & Inductive Load)

Power Level: Shown in the following tables

Other Ratings

Contact Resistance: 10 milliohms maximum
Insulation Resistance: 1,000 megohms minimum @ 500V DC
Dielectric Strength: 2,000V AC minimum for 1 minute minimum for S800s & S800Ds
3,000V AC minimum for 1 minute minimum for S732
Mechanical Life: 50,000 operations minimum
Electrical Life: 10,000 operations minimum for S800Ds
25,000 operations minimum for S800s & S732

Materials & Finishes

Toggle: Brass with nickel plating for S732
Brass with chrome plating for S800s & S800Ds
Bushing: Brass with chrome plating
Case: Phenolic resin for S732; melamine phenol for S800s
Case Cover: Steel with chromate plating over zinc plating
Movable Contactor Plate: Copper with silver plating
Movable & Stationary Contacts: Silver alloy capped on copper with silver plating
Common Terminals: Brass
Contact Terminals: Brass with silver or nickel plating

Environmental Data

Operating Temp Range: –10°C through +70°C (+14°F through +158°F)

Installation

Mounting Torque: 2.94Nm (26 lb•in) for double nut
Maximum Panel Thickness: Shown beneath panel cutout in switch dimension drawings

Standards & Certifications

UL: **File No. E44145 - Recognized only when ordered with marking on switch.**
Add "/U" or "/CUL" to end of part number to order UL recognized switch.
UL or cULus recognition designated beside part numbers on following pages.
See Supplement section to find UL or cULus rating details.

CSA: **File No. 023535_0_000 - Certified only when ordered with marking on switch.**
Add "/C" to end of part number to order CSA certified switch.
CSA certification designated beside part numbers on following pages.
See Supplement section to find CSA rating details.

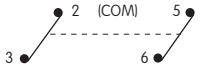
DOUBLE POLE WITH SCREW LUG

* UL, cULus & CSA recognized only when ordered with marking on switch (see General Specs)

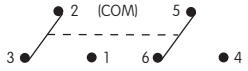
Model	*Approvals	Pole & Throw	Toggle Position/Connected Terminals: Down	Center	Up	Electrical Capacity: Resistive AC 125V	Resistive AC 250V	Resistive DC 30V	Resistive DC 125V	Inductive AC 125V PF 0.6	Inductive AC 250V PF 0.6	Motor Load AC 125V
S821	✓ ✓ ✓	DPST	ON 2-3 5-6	NONE	OFF —	30A	30A	30A	1A	30A	15A	750W
S822	✓ ✓ ✓	DPDT	ON 2-3 5-6	NONE	ON 2-1 5-4	30A	30A	30A	1A	30A	15A	—
S823	✓ ✓ ✓	DPDT	ON 2-3 5-6	OFF	ON 2-1 5-4	30A	30A	30A	1A	30A	15A	—

Throw & Schematics:

DPST



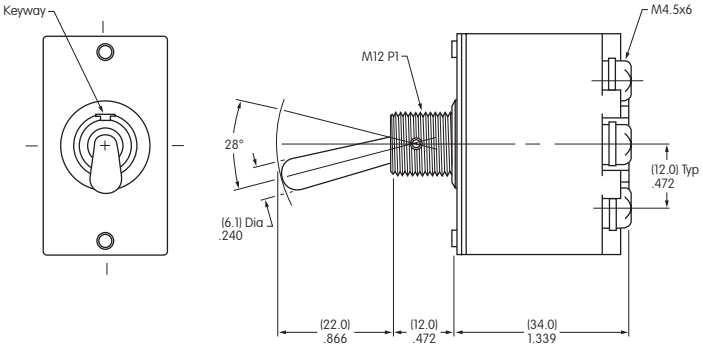
DPDT



Note: Terminal numbers are on the switch

Notes: Standard Hardware: AT503M Face Hex Nut, AT506M Locking Ring, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section.
Optional Splashproof Boot Assembly: AT401 boot plus hex nut & o-ring. See Accessories & Hardware section.

S822



S821 does not have terminals 1 & 4

Maximum Panel Thickness: .177" (4.5mm)

THREE POLE WITH SCREW LUG

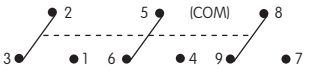
* UL, cULus & CSA recognized only when ordered with marking on switch (see General Specs)

Model	*Approvals	Pole & Throw	Toggle Position/Connected Terminals: Down	Center	Up	Electrical Capacity: Resistive AC 125V	Resistive AC 250V	Resistive DC 30V	Resistive DC 125V	Inductive AC 125V PF 0.6	Inductive AC 250V PF 0.6
S831	✓ ✓ ✓	3PST	ON 2-3 5-6 8-9	NONE	OFF —	30A	30A	30A	1A	30A	15A
S832	✓ ✓ ✓	3PDT	ON 2-3 5-6 8-9	NONE	ON 2-1 5-4 8-7	30A	30A	30A	1A	30A	15A
S833	✓ ✓ ✓	3PDT	ON 2-3 5-6 8-9	OFF	ON 2-1 5-4 8-7	30A	30A	30A	1A	30A	15A

Throw & Schematics:

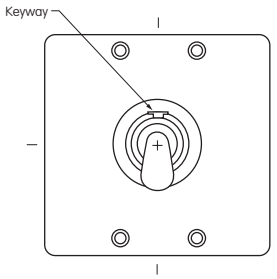
3PST

3PDT

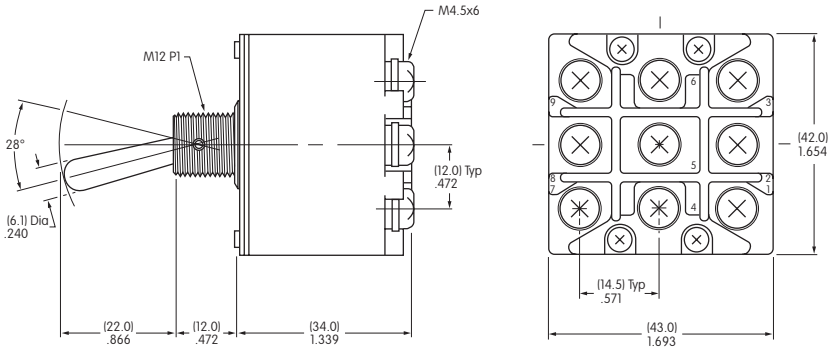


Note: Terminal numbers are on the switch

Notes: Standard Hardware: AT503M Face Hex Nut, AT506M Locking Ring, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section.
Optional Splashproof Boot Assembly: AT401 boot plus hex nut & o-ring. See Accessories & Hardware section.



S833



S831 does not have terminals 1, 4 & 7

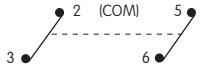
Maximum Panel Thickness: .177" (4.5mm)

DOUBLE POLE WITH SCREW LUG & FLATTED LEVER

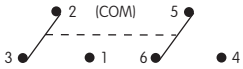
* UL, cULus & CSA recognized only when ordered with marking on switch (see General Specs)			Toggle Position/Connected Terminals			Electrical Capacity								
	*Approvals			Down	Center	Up	Resistive					Inductive L/R = 3ms			
Model		Pole & Throw	Keyway				DC 30V	DC 48V	DC 125V	DC 250V	DC 400V	DC 24V	DC 48V	DC 125V	DC 250V
S821D	✓ ✓ ✓	DPST	ON 2-3 5-6		NONE	OFF —	30A	30A	20A	15A	4A (10A)	15A	10A	6A	3A
S822D	✓ ✓ ✓	DPDT	ON 2-3 5-6		NONE	ON 2-1 5-4	30A	30A	20A	15A	4A	15A	10A	6A	3A
S823D	✓ ✓ ✓	DPDT	ON 2-3 5-6		OFF	ON 2-1 5-4	30A	30A	15A	7.5A	—	15A	10A	6A	3A

( ) capacity is due to wiring. Refer to instructions below.

Throw & Schematics: DPST

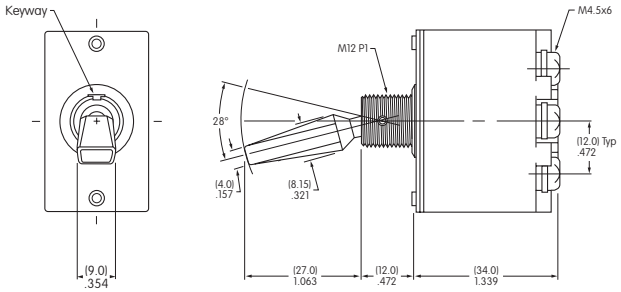


DPDT

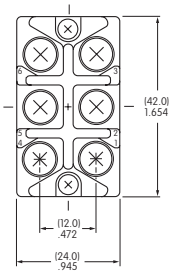


Note: Terminal numbers are on the switch

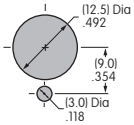
Notes: Standard Hardware: AT503M Face Hex Nut, AT506M Locking Ring, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section.



Double Pole



S821D does not have terminals 1 & 4



Maximum Panel Thickness: .177" (4.5mm)

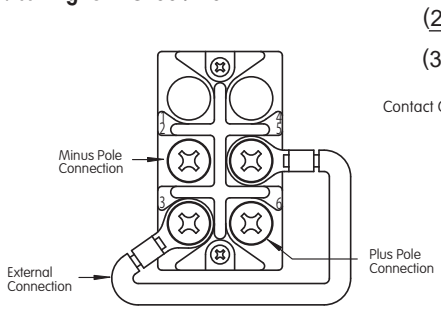
S822D

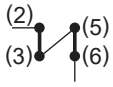
400V DC WIRING INSTRUCTIONS

1. DC Switch Use

- Middle terminal shall be the minus pole when using DC circuit. Switch case is marked with (+) and (–).
- Do not store near (5cm) highly magnetic items.
- If actuation is interrupted when switching from ON to OFF, arcing may continue and switch could be burned.

2. Wiring for DC400V 10A

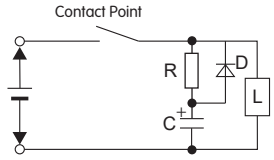




Contact Connection Position

3. Inductive Load

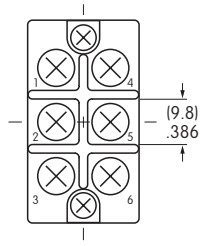
Inductive loads produce an arc caused by counter-electromotive force when opening the circuit. Recommend inserting spark elimination circuit. Contact factory for details.



(Patent Pending)

4. Compressed Terminal Connection

When connecting screw terminal with compressed terminal, select compressed terminal using drawing below.

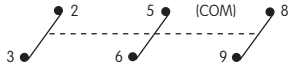


THREE POLE WITH SCREW LUG & FLATTED LEVER

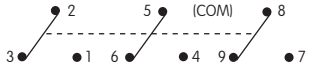
* UL, cULus & CSA recognized only when ordered with marking on switch (see General Specs)				Toggle Position/Connected Terminals			Electrical Capacity							
	*Approvals						Resistive				Inductive L/R = 3ms			
Model				Pole & Throw	Down (Keyway)	Center	Up	DC 30V	DC 48V	DC 125V	DC 250V	DC 24V	DC 48V	DC 125V	DC 250V
S831D	✓	✓	✓	3PST	ON 2-3 5-6 8-9	NONE	OFF —	30A	30A	15A	7.5A	15A	10A	6A	3A
S832D	✓	✓	✓	3PDT	ON 2-3 5-6 8-9	NONE	ON 2-1 5-4 8-7	30A	30A	15A	7.5A	15A	10A	6A	3A
S833D	✓	✓	✓	3PDT	ON 2-3 5-6 8-9	OFF	ON 2-1 5-4 8-7	30A	30A	15A	7.5A	15A	10A	6A	3A

Throw & Schematics:

3PST

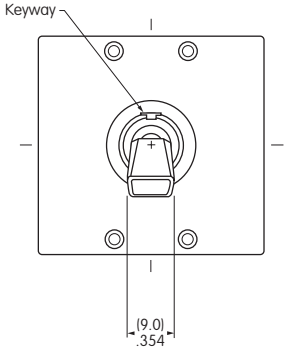


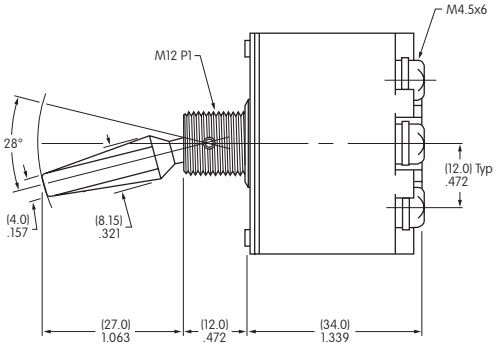
3PDT



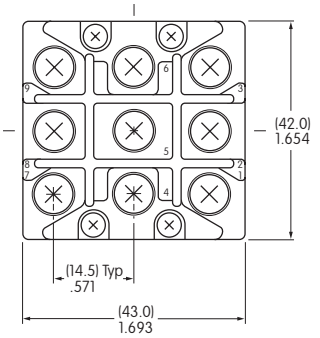
Note: Terminal numbers are on the switch

Notes: Standard Hardware: AT503M Face Hex Nut, AT506M Locking Ring, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section.



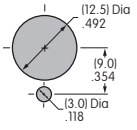


Three Pole



S831D does not have terminals 1, 4 & 7.
Positive (+) must be connected to end terminals & negative to common terminals.

S832D



Maximum Panel Thickness: .177" (4.5mm)

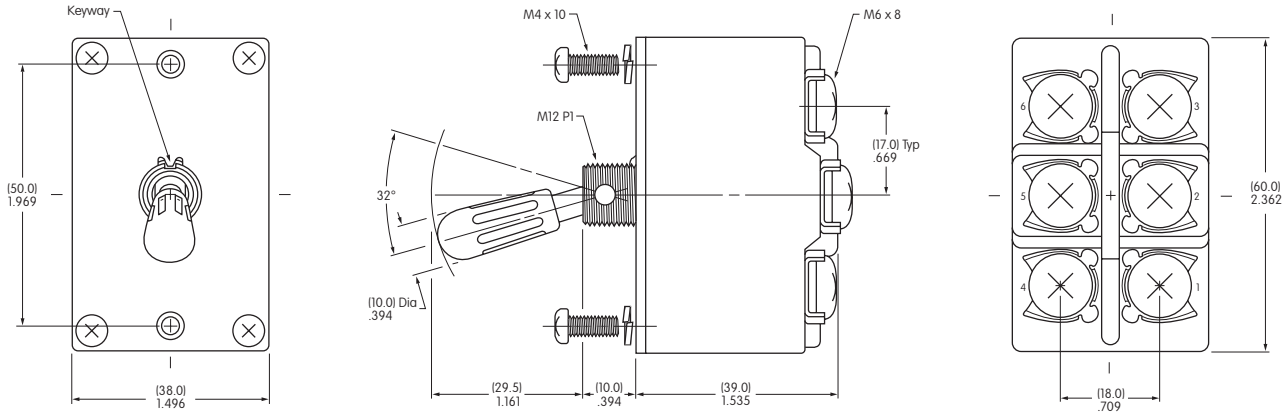
DOUBLE POLE WITH SCREW LUG

Model	Approvals	Pole & Throw	Toggle Position/Connected Terminals: Down (Keyway)	Center	Up	Electrical Capacity: Resistive AC 125V	Resistive AC 250V	Resistive DC 30V	Inductive AC 125V PF 0.6
S732	— —	DPDT	ON 2-3 5-6	NONE	ON 2-1 5-4	50A	30A	50A	25A

Throw & Schematics: DPDT — 2 (COM) 5 / 3 1 6 4

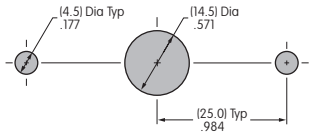
Note: Terminal numbers are on the switch

Notes: Standard Hardware: AT503M Face Hex Nut, AT506M Locking Ring, AT508 Lockwasher, AT527M Backup Hex Nut. See Accessories & Hardware section.



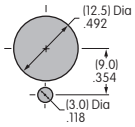
Cap of phenolic resin is black

Panel Mount with Mounting Screws

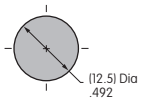


Maximum Panel Thickness: .158" (4.0mm)

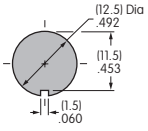
Panel Mount with Bushing Hardware



Maximum Panel Thickness: .079" (2.0mm)



Maximum Panel Thickness: .118" (3.0mm)



Maximum Panel Thickness: .118" (3.0mm)

S732

Notes

General Specifications

Electrical Capacity (Resistive Load)

Power Level (silver): 6A @ 125V AC or 3A @ 250V AC or 6A @ 12V DC for silver
Logic Level (gold): 0.4VA maximum @ 28V AC/DC maximum for gold
(Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)
Note: See Supplement Index for explanation of operating range.

Other Ratings

Contact Resistance: 10 milliohms maximum for silver; 20 milliohms maximum for gold
Insulation Resistance: 1,000 megohms minimum @ 500V DC
Dielectric Strength: 1,000V AC minimum between contacts for 1 minute minimum;
1,500V AC minimum between contacts & case for 1 minute minimum
Mechanical Life: 50,000 operations minimum
Electrical Life: 25,000 operations minimum for silver; 50,000 operations minimum for gold
Static Capability: Withstands 20 kilovolts ESD minimum
Nominal Operating Force: 1.9N for .689" (17.5mm) toggle; 2.5N for .433" (11.0mm) toggle
Angle of Throw: 25°

Materials & Finishes

Toggle: Polycarbonate
Housing: Glass fiber reinforced polyamide
Sealing Ring: Nitrile butadiene rubber
Base: Diallyl phthalate (UL94V-0)
Movable Contactor: Phosphor bronze with silver or gold plating
Movable Contacts: Silver alloy or copper with gold plating
Stationary Contact: Silver plus copper with silver plating or copper with gold plating
Lamp Contacts: Beryllium copper with silver plating
Power Terminals: Copper with silver or gold plating
Lamp Terminals: Brass with silver plating

Environmental Data

Operating Temperature Range: –10°C through +55°C (+14°F through +131°F)
Humidity: 90 ~ 95% humidity for 240 hours @ 40°C (104°F)
Vibration: 10 ~ 55Hz with peak-to-peak amplitude of 1.5mm traversing the frequency range & returning in 1 minute; 3 right angled directions for 1.75 hours
Shock: 50G (490m/s^2) acceleration (tested in 6 right angled directions, with 5 shocks in each direction)

Installation

Mounting Torque: .98Nm (8.67 lb•in) maximum
Soldering Time & Temperature: Manual Soldering: See Profile B in Supplement section.

Standards & Certifications

Flammability Standards: UL94V-0 base

Distinctive Characteristics

Choice of long or short toggles in translucent colors combine with bright LEDs available in red, amber, and green, plus super bright LEDs available in white, green, and blue.

Black face nut enhances front panel appearance.

Antistatic material used for toggle withstands 20 kilovolts electrostatic discharge.

Panel seal, achieved with use of optional exterior o-ring, conforms to IP65 of IEC60529 Standards.

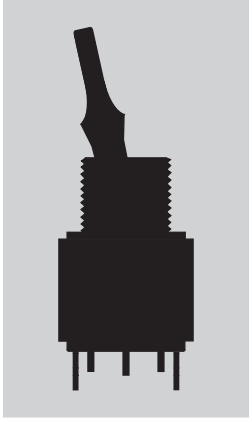
Interior o-ring protects contacts from oil, dust, water, and other contaminants.

UL94V-0 flammability rated for base.

High insulating barriers protect against crossover.

Terminals are molded in and epoxy sealed to lock out flux, dust, and other contaminants.

Actual Size



TYPICAL SWITCH ORDERING EXAMPLE

TL	2	2	D	N	A	W01	6G

Pole

2	DPDT

Circuit

2	ON	NONE	ON

Toggle Lengths

D	.689" (17.5mm) (combines with silver contacts only)
S	.433" (11.0mm) (combines with gold contacts only)

Toggle Colors

For Bright	
C	Red
D	Amber
F	Green
For Super Bright	
N	No Color

Housing

A	Black

Terminals, Contacts & Ratings

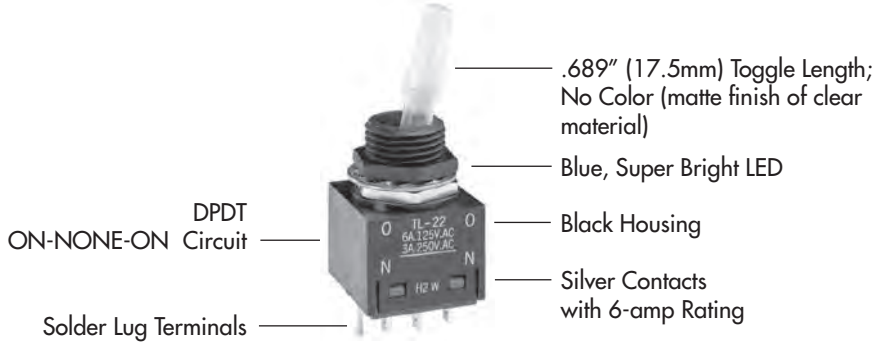
W01	Solder Lug Terminals Silver 6A @ 125V AC for .689" (17.5mm) Toggle only
G01	Solder Lug Terminals Gold 0.4VA @ 28V AC/DC for .433" (11.0mm) Toggle only

LED Colors

Bright	
5C	Red
5D	Amber
5F	Green
Super Bright	
6B	White
6F	Green
6G	Blue

DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

TL22DNAW016G



POLE & CIRCUIT

		Toggle Position			Connected Terminals			Throw & Power/Lamp Schematics
Pole	Model	Down	Center	Up	Down	Center	Up	
DP	TL22	ON	NONE	ON	1-1b 2-2b	OPEN	1-1a 2-2a	DPDT

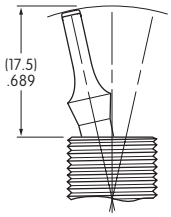
Notes: Terminal numbers are not actually on switch. Lamp circuit is isolated and requires an external power source.

TOGGLE LENGTHS & COLORS

D **.689" (17.5mm)**

Combines with Silver Contacts only

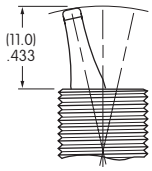
Material: Polycarbonate



S **.433" (11.0mm)**

Combines with Gold Contacts only

Material: Polycarbonate



Colors Available for Bright LED

C Red **D** Amber **F** Green

Color Available for Super Bright LED

N No Color (Appearance is matte finish of clear material)

HOUSING

A **Black**

The housing consists of the one-piece bushing/case of glass fiber reinforced polyamide in black color only.

The diallyl phthalate material used for the base is UL flammability rated 94V-0; housing material is not.

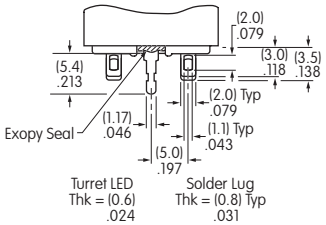
CONTACT MATERIALS, RATINGS, & TERMINALS

W **Silver Contacts** **Power Level**
6A @ 125V AC & 3A @ 250V AC
& 6A @ 12V DC

G **Gold Contacts** **Logic Level**
0.4VA maximum @ 28V AC/DC

See Supplement Index for complete explanation of operating range.

01 **Solder Lug Terminals**



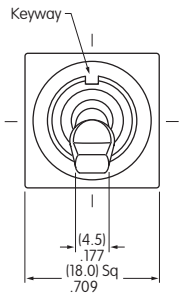
LED CODES & SPECIFICATIONS

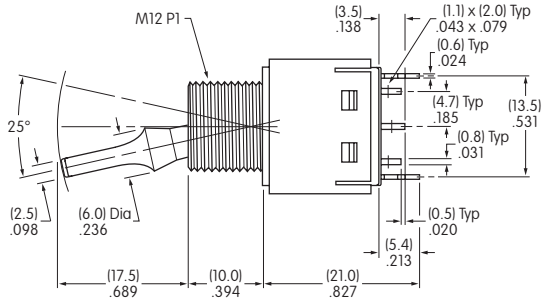
Electrical specifications are determined at a basic temperature of 25°C. Lamp circuit is independent of switch operation.
If the source voltage is greater than rated voltage, a ballast resistor is required.
The ballast resistor calculation and more lamp detail are shown in Supplement section.

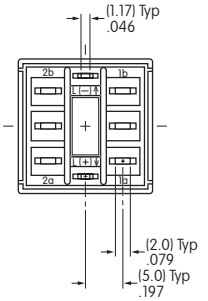
Super Bright LEDs are Electrostatic Sensitive — ATTENTION ELECTROSTATIC SENSITIVE DEVICES		Colored Toggles			Clear Toggles		
		5 Bright			6 Super Bright		
LED Factory Assembled **Not Available Separately**	Color	C Red	D Amber	F Green	B White	F Green	G Blue
Maximum Forward Current	I_{FM}	30mA	30mA	50mA	30mA	30mA	30mA
Typical Forward Current	I_F	20mA	20mA	20mA	20mA	20mA	20mA
Forward Voltage	V_F	2.0V	2.1V	2.27V	3.3V	3.3V	3.3V
Maximum Reverse Voltage	V_{RM}	4V	4V	4V	7V	7V	7V
Current Reduction Rate Above 25°C	ΔI_F	0.32mA/°C	0.32mA/°C	0.50mA/°C	0.40mA/°C	0.40mA/°C	0.40mA/°C
Ambient Temperature Range		−10°C ~ +55°C			−10°C ~ +55°C		

TYPICAL SWITCH DIMENSIONS

17.5mm Toggle

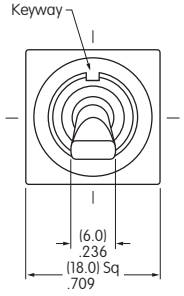


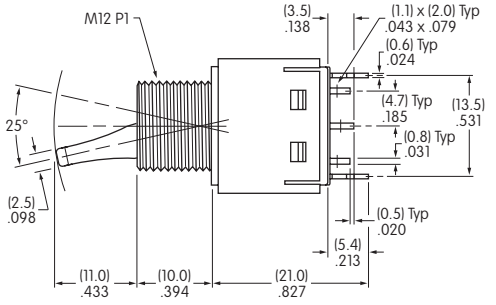


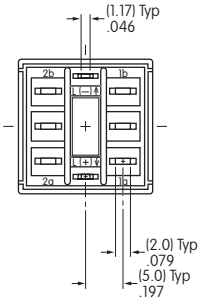


TL22DNAW016G

11.0mm Toggle





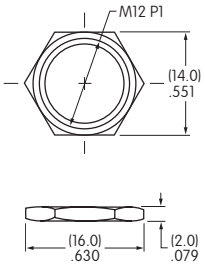


TL22SCAG015C

STANDARD HARDWARE

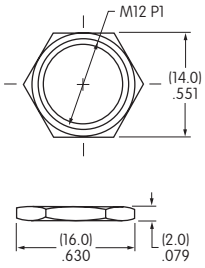
AT527MA Black Hex Nut

Use as Face Nut
Chrome/Steel



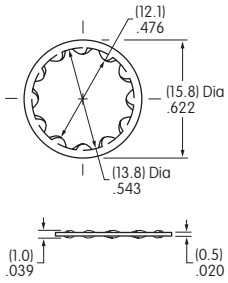
AT527M Hex Nut

Use as Backup Nut
Nickel/Steel



AT508 Lockwasher

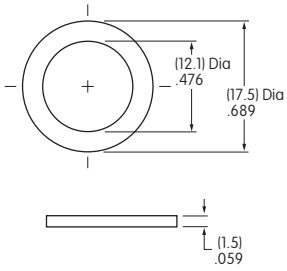
Not to use with Panel Seal
Steel with Chromate/Zinc



OPTIONAL HARDWARE

AT401P O-ring

Use for Panel Seal
Nitrile butadiene rubber

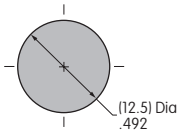


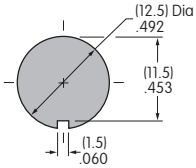
Hardware details in Accessories & Hardware section.

Panel Cutouts

Maximum Panel Thickness
with Standard Hardware:

.157" (4.0mm)





Maximum Panel Thickness
with Standard Hardware
& AT401P O-ring:

.236" (6.0mm)

General Specifications

Electrical Capacity (Resistive Load)

Power Level: 10A @ 125V AC or 6A @ 250V AC or 10A @ 30V DC

Other Ratings

Contact Resistance: 10 milliohms maximum for solder lug & screw terminal models;
30 milliohms maximum for wire lead terminal models
Insulation Resistance: 200 megohms minimum @ 500V DC
Dielectric Strength: 1,500V AC minimum for 1 minute minimum
Mechanical Life: 50,000 operations minimum for On-None-Off, On-None-On, & On-Off-On models
30,000 operations minimum for all other models
Electrical Life: 15,000 operations minimum
Angle of Throw: 24°

Materials & Finishes

Toggle: Brass with chrome plating
Bushing & Outer Case: Glass fiber reinforced polyamide (UL94V-0)
Inner Case: Melamine
Inner Sealing Ring: Nitrile butadiene rubber for On-None-Off, On-None-On, & On-Off-On models;
silicone rubber for all other models
Outer Sealing Ring: Nitrile butadiene rubber
Movable Contactor: Copper with silver plating
Movable Contacts: Silver alloy plus copper with silver plating
Stationary Contacts: Silver alloy plus copper with silver plating
Terminals: Brass with tin plating
Wire Lead Covers: Heat resistant polyvinyl chloride (Leads are AWG 16)

Environmental Data

Operating Temp Range: –30°C through +70°C (–22°F through +158°F)
Humidity: 90 ~ 95% humidity for 96 hours @ 40°C (104°F)
Vibration: 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
Shock: 50G (490m/s^2) acceleration (tested in 6 right angled directions, with 5 shocks in each direction)
Front Panel Seal: IP67 of IEC60529, dust tight & water protected during temporary immersion for all models;
optional toggle boot AT401 for additional protection (details at end of WT section)
Behind Panel Seal: IP60 of IEC60529, dust tight but not water protected
for solder lug & screw terminal models
IP67 of IEC60529, dust tight & water protected during temporary immersion
for wire lead models

Installation

Soldering Time & Temp: Manual Soldering: See Profile A in Supplement section.
Mounting Torque: 1.47Nm (13 lb•in)

Standards & Certifications

Flammability Standards: UL94V-0 outer case
Wiring Material Standards: UL AWM 1015 Recognized at Flammability VW-1;
Temperature Range –20°C ~ +105°C; Maximum Load 600V; AWG 16.
CSA TEW 105 Certified at Temperature Range –20°C ~ +105°C;
Maximum Load 600V

Distinctive Characteristics

Sealing for wire lead models meets IP67 of IEC60529 Standards at front and back panel.

Sealing for solder lug or screw lug models meets IP67 at front panel and IP60 at back panel.

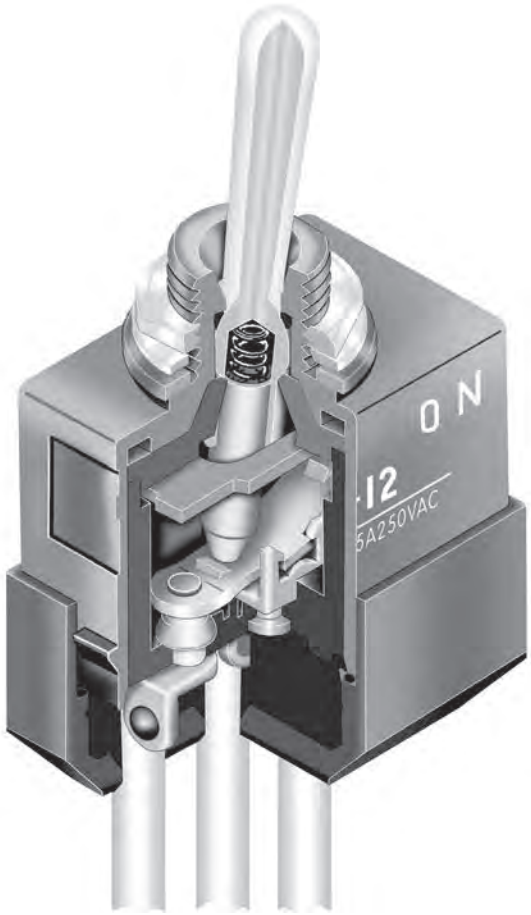
Single unit construction of bushing and case gives added protection from environmental elements.

Epoxy sealed base covered by outer case doubles protection from dust and water (not operable under water or oil).

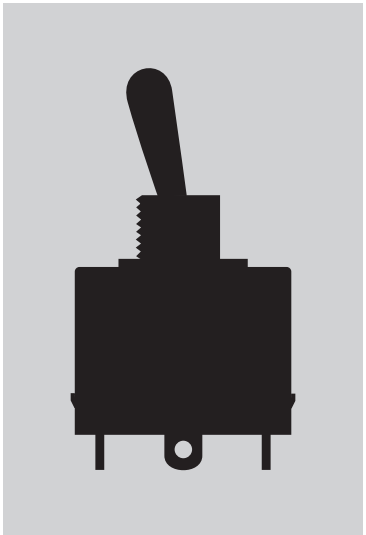
Specially designed contact mechanism that breaks light contact welds for circuits 11, 12, 21 and 22.

Interlocked movable contact mechanism provides highly reliable switching by minimizing contact bounce over center contact.

Heat resistant resin used for outer housing meets UL94V-0 flammability standard and provides high arc and tracking resistance.



Actual Size



TYPICAL SWITCH ORDERING EXAMPLE

WT **2** **2** **S**

Poles	
1	SPST SPDT
2	DPST DPDT

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)
( ) = Momentary			

Terminals	
S	Solder Lug
T	Screw Lug
L	Wire Lead

DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

WT22S

DPDT
ON-NONE-ON Circuit

Solder Lug Terminals

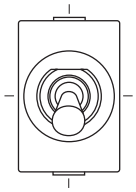
POLES & CIRCUITS

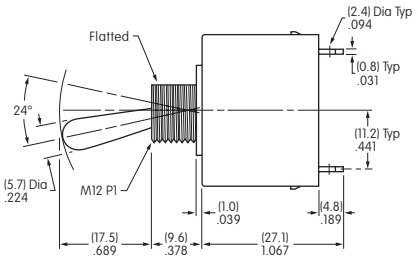
Pole	Model	Toggle Position ( ) = Momentary Down	Center	Up	Connected Terminals Down	Center	Up	Throw & Schematics
SP	**WT11**	ON	NONE	OFF	1a-1b	OPEN	OPEN	SPST
SP	**WT12** **WT13** **WT15** **WT18** **WT19**	ON ON ON (ON) ON	NONE OFF NONE OFF OFF	ON ON (ON) (ON) (ON)	1-1b	OPEN	1-1a	SPDT
DP	**WT21**	ON	NONE	OFF	1a-1b 2a-2b	OPEN	OPEN	DPST
DP	**WT22** **WT23** **WT25** **WT28** **WT29**	ON ON ON (ON) ON	NONE OFF NONE OFF OFF	ON ON (ON) (ON) (ON)	1-1b 2-2b	OPEN	1-1a 2-2a	DPDT

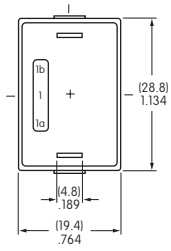
Note: Terminal numbers are not actually on wire lead models.

TYPICAL SWITCH DIMENSIONS

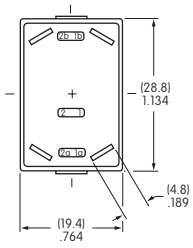
Single Throw • Solder Lug







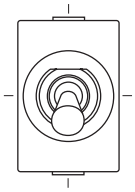
Single Pole

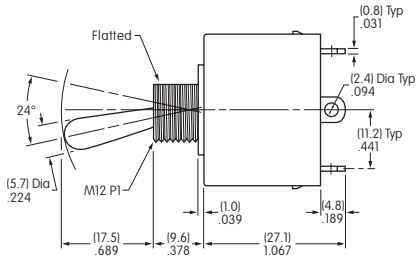


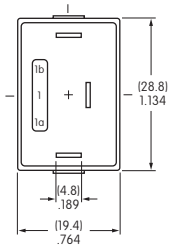
Double Pole

WT11S

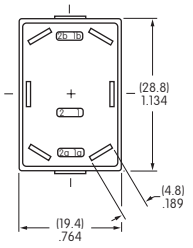
Double Throw • Solder Lug







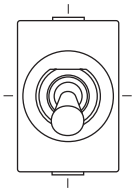
Single Pole

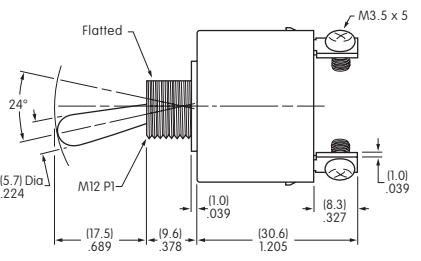


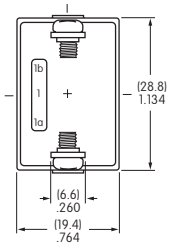
Double Pole

WT22S

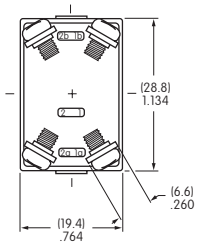
Single Throw • Screw Lug







Single Pole

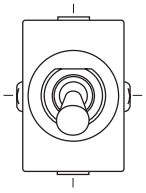


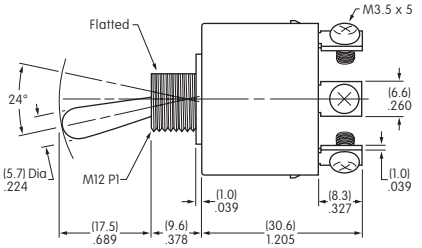
Double Pole

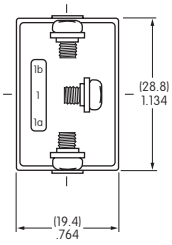
WT21T

TYPICAL SWITCH DIMENSIONS

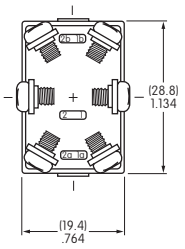
Double Throw • Screw Lug







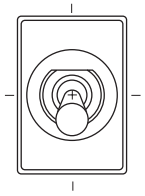
Single Pole

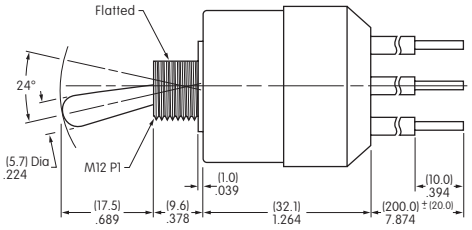


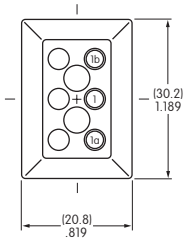
Double Pole

WT22T

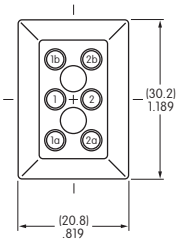
Single & Double Pole • Wire Lead







Single Pole



Double Pole

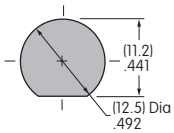
WT22L

STANDARD WIRE COLOR SCHEME

Wire leads are covered with heat resistant vinyl in accordance to UL 1015 and CSA TEW 105 Standards for Appliance Wiring Material (AWM).

	Terminal Numbers & Wire Colors					
	1a	1	1b	2a	2	2b
WT11	Black		White			
WT12-19	White	Black	Red			
WT21	Black		White	Blue		Yellow
WT22-29	White	Black	Red	Yellow	Blue	Green

PANEL CUTOUT & THICKNESS



Maximum Effective Panel Thickness

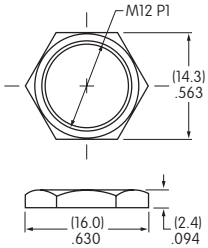
With Standard Hardware: .157" (4.0mm)
With optional Boot Assembly AT401A/H/S: .063" (1.6mm)
With optional Boot Assembly AT4181: .083" (2.1mm)

STANDARD HARDWARE

AT503M Hex Face Nut

Material: Brass with Chrome Plating

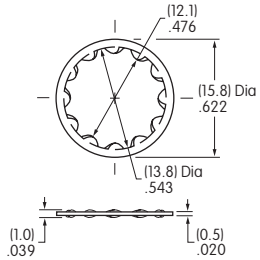
1 supplied with each switch



AT508 Internal Tooth Lockwasher

Material: Steel with Zinc/Chromate

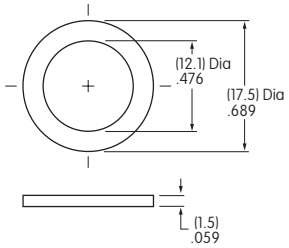
1 supplied with each switch



AT401P O-ring

Material: Nitrile butadiene rubber

1 supplied with each switch



OPTIONAL ACCESSORIES

Boot Assemblies for High Particulate Contamination Applications

AT401A for Oil Resistance

Boot Material:
Black nitrile butadiene rubber

Hex Nut Material & Finish:
Nickel plated brass

O-ring Material: Nitrile butadiene rubber

AT401H for Dust & Ozone Resistance

Boot Material:
Gray ethylene propylene rubber

Hex Nut Material & Finish:
Nickel plated brass

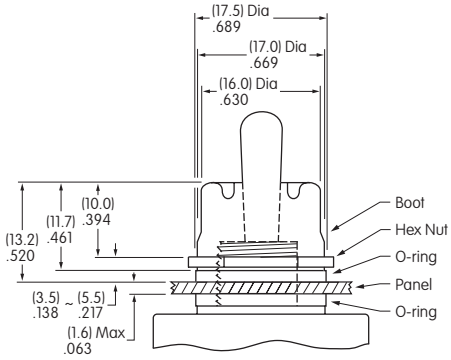
O-ring Material: Nitrile butadiene rubber

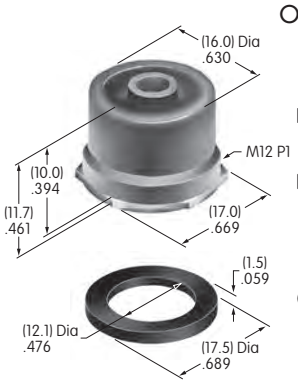
AT401S for Retention of Flexibility, Resilience & Tensile Strength Over Wide Temperature Range

Boot Material: Black silicone rubber

Hex Nut Material & Finish:
Nickel plated brass

O-ring Material: Nitrile butadiene rubber



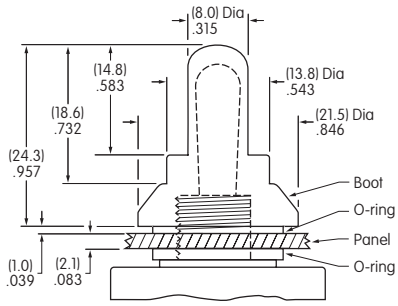


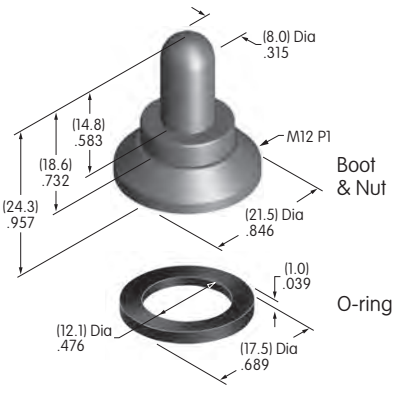
AT4181 Splashproof Boot Assembly

Boot Material:
Black Silicon rubber

Nut Material & Finish:
Nickel plated brass

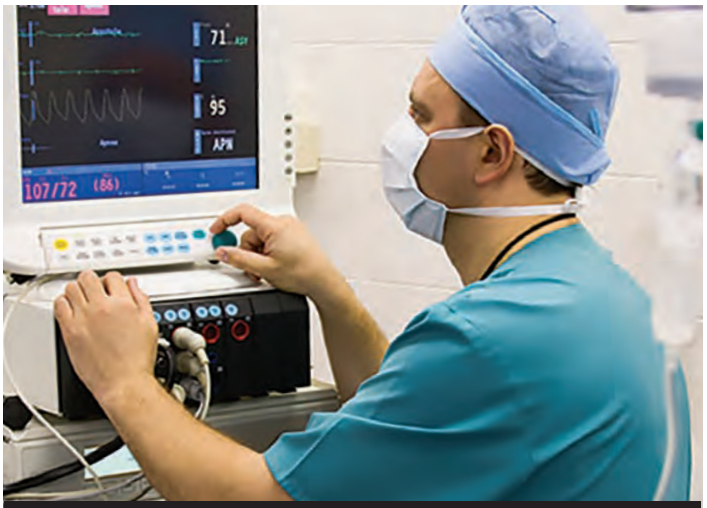
O-ring Material: Nitrile butadiene rubber





Note: When using boot assemblies
AT401A/H/S or AT4181, also use o-ring AT401P from the standard hardware supplied.
Hex face nut AT503M and lockwasher AT508 are not used with these boot assemblies.

Broadcast



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Warranty: All NKK products are warranted against defects in workmanship, material and construction for a period of one (1) year from the date of shipment if the products have been properly installed, used, and maintained. There are no express warranties of merchantability or fitness for a particular purpose. Materials, finishes, and component parts are subject to change without notification.

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