

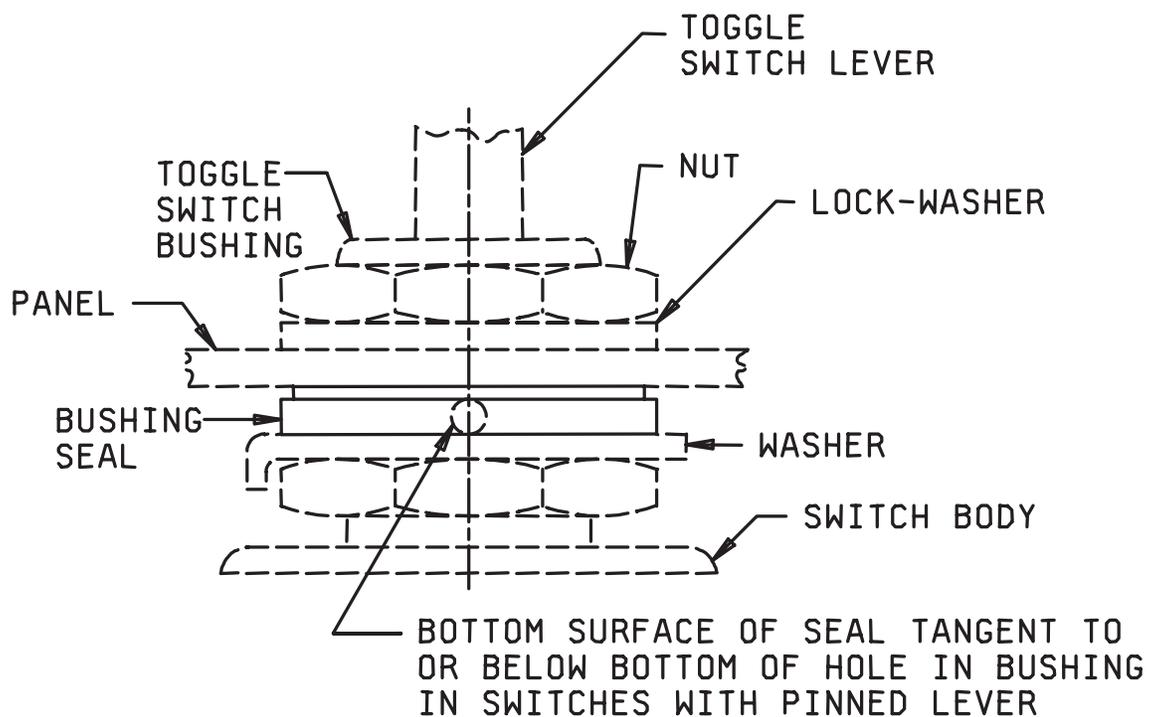
TOGGLE HARDWARE
STANDARD ASSEMBLY CONFIGURATION

WHEN USING PANEL SEALS

MIL-DTL-5423/16E
17 February 2009

SUPERSEDING
MIL-DTL-5423/16D
AMENDMENT 1
12 May 2003

MIL-DTL-5423/16E



Note: Not applicable with all configurations.

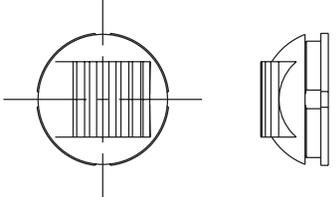
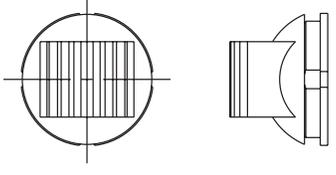
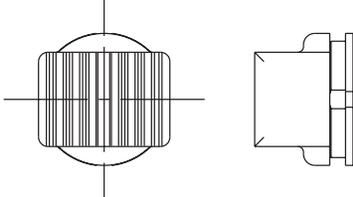
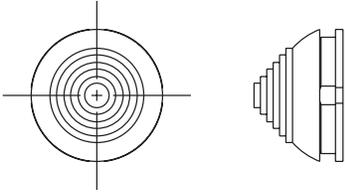
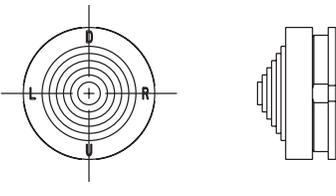
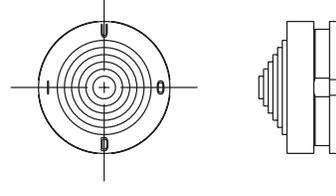
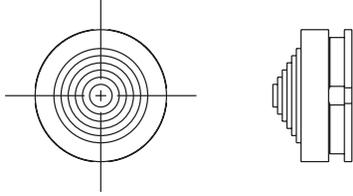
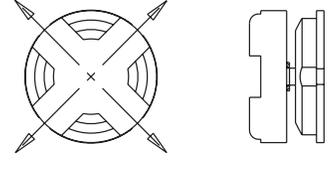
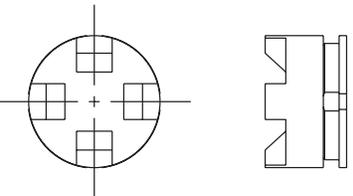
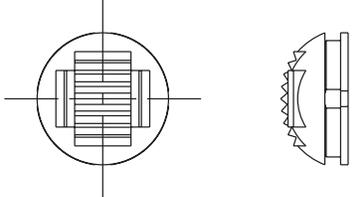
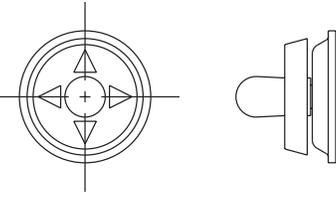
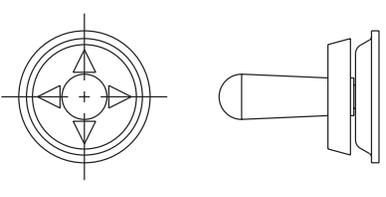
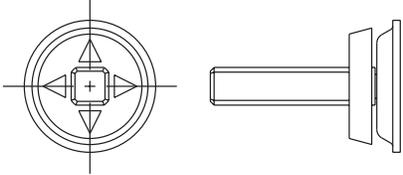
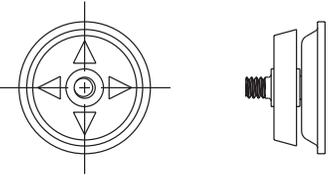
Customer is responsible for keying the switch to the panel.

STANDARD LEGENDS PER SAE SPECIFICATIONS

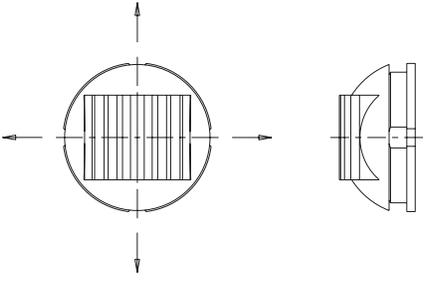
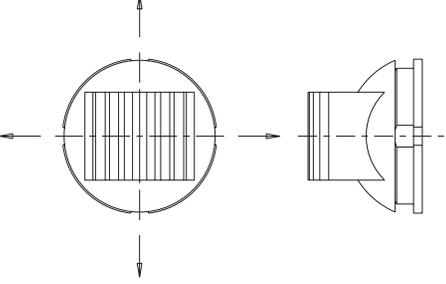
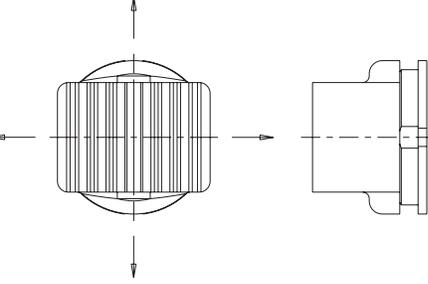
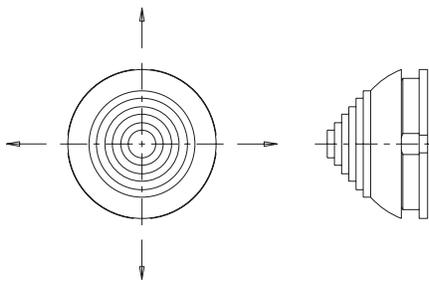
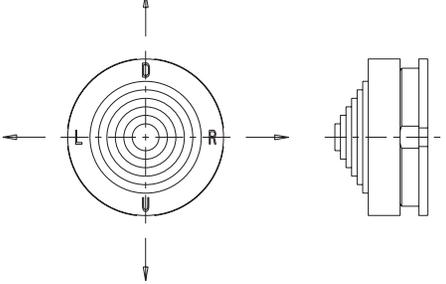
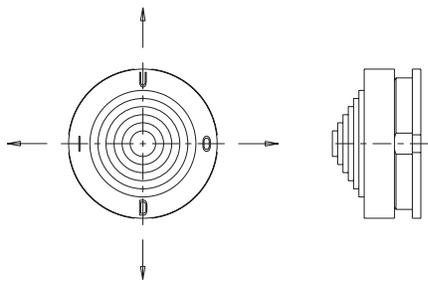
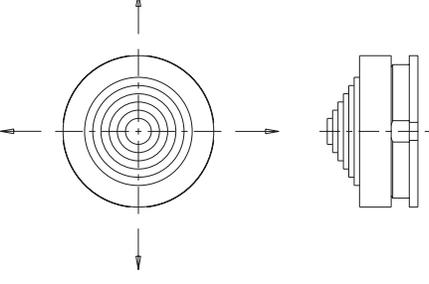
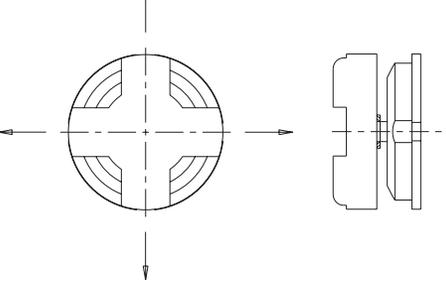
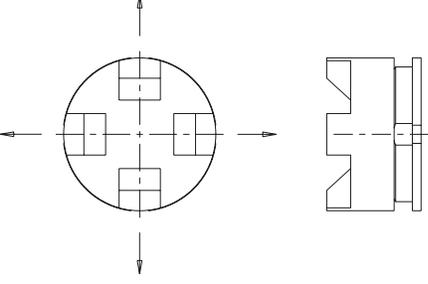
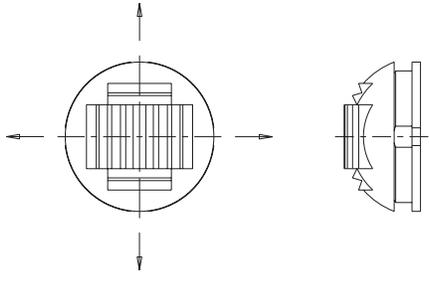
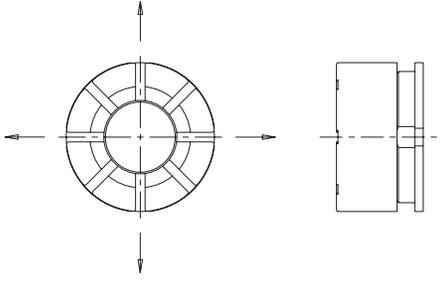
STANDARD LEGENDS PER SAE SPECIFICATIONS								
A1		ANCHOR	K2		UNLOCK	P5		BILGE BLOWER
B1		BATTERY	L1		LIGHT	R1		LIFT
B2		ELECTRIC POWER	L2		MASTER LIGHTING SWITCH	R2		LOWER
C1		AC/COOLING SYSTEMS	L3		HEADLIGHTS	R3		UP
C2		DEHUMIDIFIER	L4		HEADLIGHTS-LOW / DIPPED BEAM	R4		DOWN
C3		HEATER/INTERIOR HEATING	L5		HEADLIGHTS-HIGH / UPPER BEAM	R5		RIGHT
D1		WINDSHIELD DEFROSTER	L6		PARKING LIGHT	R6		LEFT
D2		REAR WINDOW DEFROSTER	L7		WORK LAMP	R7	FWD	FORWARD
D3		MIRROR DEFROSTER	L8		WORK LAMP	R8	REV	REVERSE
E1		ENGINE/START	L9		INTERIOR DOME LIGHT	S1		RADIO
E2		ENGINE/STOP	M1		BEACON	S2		MUTE
E3		ON/START	M2		HAZARD/POSITION LIGHTS	T1		FAST
E4	○	OFF/STOP	M3		CLEARANCE LIGHTS	T2		SLOW
E5	ON	ON	M4		SIDE MARKER LIGHT	T3		TRIM TAB / TRIMMING OPERATION
E6	OFF	OFF	M5		RUNNING LIGHTS (UNDER POWER)	T4		TRANSMISSION
E7		ENGINE ELECTRIC PREHEAT	M6		ANCHOR LIGHT	V1		VENTILATING / AC FAN
E8		ENGINE-GAS INJECTION	M7		RUNNING/ANCHOR LIGHTS	W1		WINDSHIELD WIPER
F1		FRONT FOG LIGHTS	M8		SEARCH LIGHT	W2		WINDSHIELD-WASHER
F2		REAR FOG LIGHTS	M9		LEFT TURN SIGNAL	W3		WINDSHIELD-WASHER/WIPER
G1		FUEL	MA		RIGHT TURN SIGNAL	W4		REAR WINDOW WIPER
H1		HORN	P1		BILGE PUMP #1	W5		REAR WINDOW-WASHER
H2		HORN REAR	P2		BILGE PUMP #2	W6		REAR WINDOW-WASHER/WIPER
K1		LOCK	P3		BILGE PUMP #3	ZZ		NO LEGEND
			P4		BILGE PUMP			

For legends not shown, please consult an OTTO representative.

MINI TRIM BUTTON STYLES

<p>A - 2-WAY JOG</p> 	<p>B - TALL JOG</p> 	<p>C - ROCKER</p> 
<p>D - CONE</p> 	<p>E - LRUD HAT</p> 	<p>F - IOUD HAT</p> 
<p>G - HAT</p> 	<p>H - STADIUM</p> 	<p>J - CASTLE</p> 
<p>K - 4-WAY JOG</p> 	<p>L - SHORT BAT</p> 	<p>M - LONG BAT</p> 
<p>N - POST</p> 	<p>P - 4-40 THREADED POST</p> 	

T4-T BUTTON STYLES

<p>A - 2-WAY JOG</p> 	<p>B - TALL JOG</p> 	<p>C - ROCKER</p> 
<p>D - CONE</p> 	<p>E - LRUD HAT</p> 	<p>F - IOUD HAT</p> 
<p>G - HAT</p> 	<p>H - STADIUM</p> 	<p>J - CASTLE</p> 
<p>K - JOG</p> 	<p>L - INVERSE HAT</p> 	

APPENDIX

Actuator: Device applied to the button of a switch that causes the switch to operate.

Alternate Action: A pushbutton switch which alternatively changes from ON to OFF or OFF to ON when actuated, but stays in the desired electrical state after the button is released.

Bat Handle: Toggle lever shaped like a baseball bat. (See Figure 1)

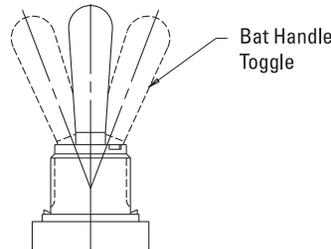


Figure 1

Bezel Mount: Switch mounting method from the front of the panel that has an attractive portion of the switch exposed on the front panel.

Blade: The moveable component of the switch used to complete the electrical circuit. (See Figure 2)

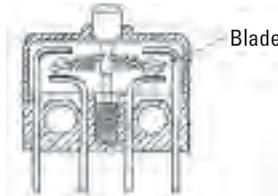


Figure 2

Boot: A rubber part used to protect a switch from water or dust. Usually found between the button of a switch and the case inside of the switch. An external boot can be placed over a button or toggle lever to protect the switch from water or dust.

Bounce: Rebounding of moving contact from the fixed contact during contact transfer (during switch operation).

Break: Interruption of a circuit.

Break Before Make: The moving contacts of a double throw switch interrupts one circuit before completing another circuit.

Bus Bars: Rigid conductors serving as a connection for two or more circuits.

Butterfly: The snap-action mechanism in a switch composed of the spring guide, two switch blades and extension spring; a double break mechanism.

Capacity: Usually refers to the current handling capability of a switch.

CE: The CE mark is a symbol that indicates a product complies with the "essential requirements" of the European laws. It indicates conformity to the legal requirements of the European Union (EU) Directive with respect to safety, health, environmental, and consumer protection.

Chatter: Rapid opening and closing of contacts, usually exhibited during extreme vibration and/or shock.

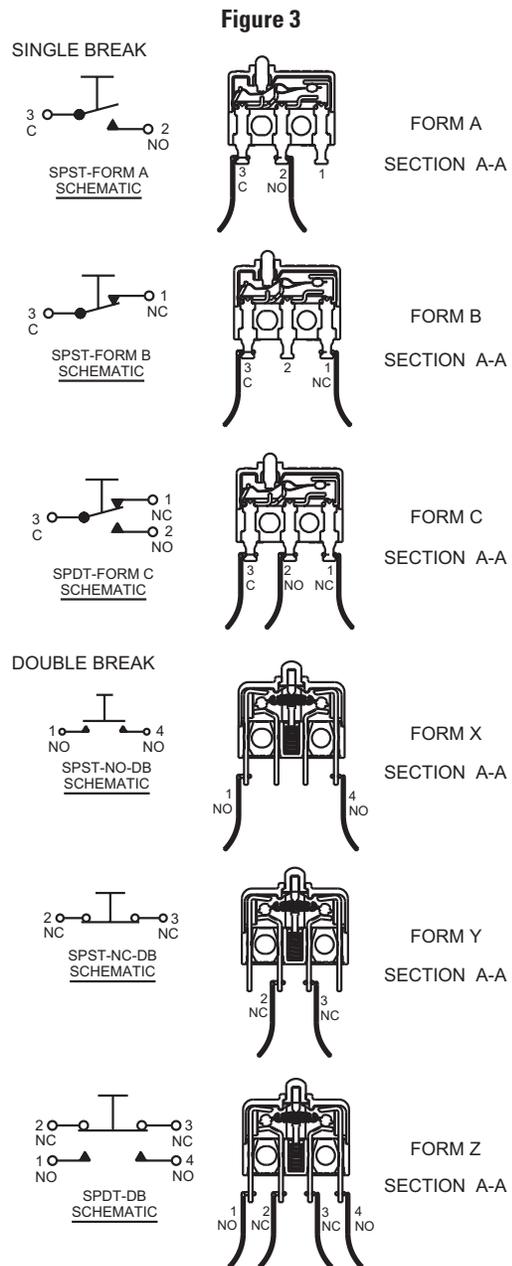
Clearance (Spacing): Distance through air between electrically live parts of opposite polarity or ground.

Collective: A grip used to control the up/down movement of an aircraft.

Common: The terminal of a switch that is part of both the normally open and the normally closed circuits.

Common Trip: A feature on a multi-pole switch in which the operation of any pole will cause all other poles to actuate.

Contact Forms: The way the switch contacts are arranged in a switch. There are single and double break arrangements in normally open and normally closed arrangements. (See Figure 3)



Contact Force: The force that the movable contact in a switch exerts on the fixed terminal.

Contact Gap: The distance that separates two contacts when the circuit is open.

Contact Resistance (CR): Resistance, measured in milliohms, of an electrical circuit caused by the contacts.

CSA (Canadian Standards Agency): A testing and safety certification agency.

Cyclic: A grip used to control the left/right or forward/backward movement of an aircraft.

Dead Break: Open circuit condition, usually caused when actuating a switch slowly. Dead break results from low contact pressure, contact lift off or friction in the switch mechanism.

Detent: Feature that provides a tactile feel when the switch actuation point has been reached.

Dielectric Strength: Minimum voltage an insulating part of the device will withstand before it starts to conduct electricity.

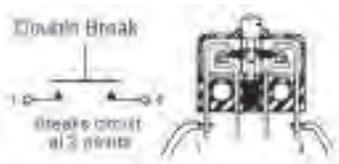
Differential: Distance the button travels between actuation and reset point.

Direct Current (DC): Type of electrical current having constant polarity, generally associated with electricity from a battery.

Double D: Flat edges on two sides of a cylinder used for orientation and anti rotation.

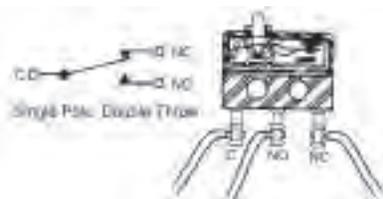
Double Break: A mechanism that breaks the circuit at two points simultaneously. The B3 is a double break switch. (See Figure 4)

Figure 4



Double Throw: Contact arrangement that allows current to flow from the common terminal to a normally closed terminal and then to a normally open terminal. (See figure 5)

Figure 5



DPDT (Double Pole Double Throw) Switch Configuration: Double pole means two independent circuits are actuated by the button. Double throw means the common terminal of each circuit (pole) can transfer current to a normally closed terminal and then alternately to a normally open terminal.

DPST (Double Pole Single Throw) Switch Configuration: Double pole means two independent circuits are actuated by the button. Single throw means each circuit only has two terminals and only operates as an on/off switch.

Dusttight: Sealed switch that will withstand sand and dust environments per MIL-PRF-8805 Design 2.

DWV (Dielectric Withstanding Voltage): The maximum voltage that can be applied to an insulator or switch before it will break down and begin to conduct electricity.

Electrical Life: Expected number of cycles a switch will withstand when operated at a specified or full rated load.

Electrical Load: The amount of electricity that is applied to the switch or the circuit.

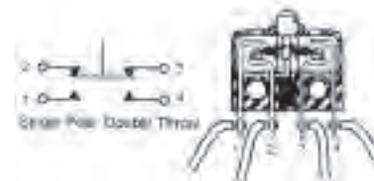
Environmentally Sealed Switch: A switch that is sealed to protect the internal contacts from the external environment.

Flash Plating: Plating thickness of 10 micro inches (0.00001) or less, typically done with gold plate.

Free Position: The position of the button or toggle of a switch in its normal position. The free position is usually measured from the center of the mounting holes to the top of the button on a basic switch or from the top of the button to a reference point on a pushbutton switch.

Form Z: A two circuit double break switch such as a Single Pole Double Throw Double Break switch. (See Figure 6)

Figure 6



Gated: Restricted movement in XY axis only.

Hall Effect Sensor: An electronic device that changes voltage output or its state when exposed to a magnetic field.

Header: The part of a switch that groups terminals or wires together to allow entry or exit.

Hermetic: An environmental seal specification grade that requires no air, gas or liquid will leak into, or out of, the switch.

High Inrush: A brief pulse of very high electrical current, much greater than the design load, that occurs when the electrical load is initially applied to the circuit.

IC (Integrated Circuit): An electrical circuit composed of many components etched on a semiconductor chip.

Immersion Proof: A switch or product able to withstand submersion in water to a depth of 3 feet or more without leaking.

Inductive Load: A load where the current rises slowly to a steady state.

IP (Ingress Protection): Numbers used to rate the environmental seal of an enclosure.

IP64: IP rating indicating that the product is dusttight and protected against splashing water.

IP65: IP rating indicating that the product is dusttight and protected against water projected by a 6.3 mm nozzle against enclosure for 3 minutes at 100 liters per minute of 100 kN/m² at distance of 3 meter.

IP68S: IP rating indicating that the product is dusttight and sealed against continuous immersion under 1 meter of water for a minimum of 31 minutes, not operated.

Lamp Load: A type of electrical load imposed by the use of incandescent light bulbs.

LED (Light Emitting Diode): A solid state device that is capable of emitting light.

Lever Actuator: A lever that is attached to a basic switch to allow actuation of the switch from a place other than its button.

Lever Lock: A part of the toggle on a switch that keeps the toggle lever from being moved accidentally. Its spring detent requires an outward pull on the toggle lever to operate the switch.

Limit Switch: A type of switch used to determine the position of a moving component that activates it.

Lockout Collar: Part of the switch bushing that prevents the toggle lever from being moved accidentally. There are many styles to allow for the desired operating features of the switch.

Logic Level: An electrical load that simulates a computer input circuit, typically 5 volts at 10 milliamps or less.

Low Level: A very small load; 30 millivolts at 10 milliamps.

Make Before Break: The moving contacts of a double throw switch complete one circuit before interrupting another circuit.

Moistureproof: A seal rating of a switch. Moistureproof seals withstand high humidity and limited exposure to water or liquid spray.

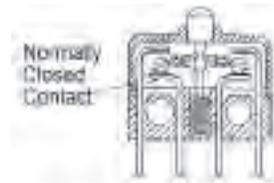
Momentary Action: Switch that requires the operator to hold the button or lever in the operating position. The button or toggle will return to the free position (rest position) when it is let go.

Motor Load: A switch load that simulates an electric motor, it usually specifies an in-rush current seven times the running current.

Movement Differential: The distance the button moves from the operate point to the release point (hysteresis).

Normally Closed (NC): A normally closed circuit allows electricity to flow through when the switch is in its free position; it prevents the electrical flow when actuated. (See Figure 7)

Figure 7



Normally Open (NO): A normally open circuit prevents the flow of electricity to flow through the circuit in its free position; it allows the electrical flow when it is actuated. (See Figure 8)

Figure 8



Null Hysteresis: The measure of output after release from deflected position; usually only used in transducers.

Null Output: Voltage output of a device at rest, usually measured in transducers.

OEM: Original Equipment Manufacturer.

Operating Point: The position of the button or toggle of a switch when the switch operates. The operating point is usually measured from the top of the button to the center of the mounting holes in basic switches or from the free position of the button in pushbutton switches.

Overtravel: Distance the button travels from the operate point until the button stops.

Pretravel: Distance the switch button or toggle travels from the free position until it reaches the operating point.

QPL (Qualified Parts List): A government report that lists which companies are approved to make a particular product for military use.

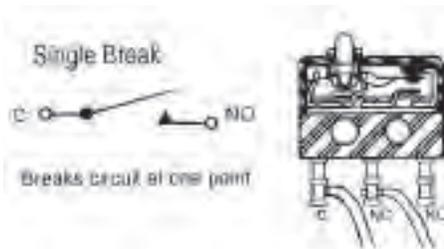
Resistive Load: An electrical load in which the current instantly rises to its steady state when applied and instantly drops to zero when discontinued.

Shroud: A wall or housing that surrounds a switch, button or toggle to protect the switch from accidental operation.

Single Throw: A switch configuration using a common and only one other contact.

Single Break: A switch mechanism with one fixed terminal and one moving terminal that interrupts the flow of electricity at only one place. (See Figure 9)

Figure 9

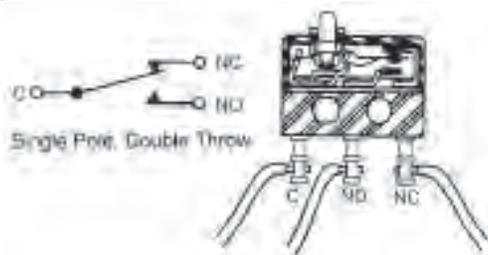


Snap Action: The abrupt opening or closing of contacts from one position to another. Snap-action switches operate relatively independent of the speed of the button or actuator.

SPDT (Single Pole Double Throw) Switch Configuration:

A single circuit or switch with one common terminal that is capable of switching electricity between two other terminals or circuits. (See Figure 10)

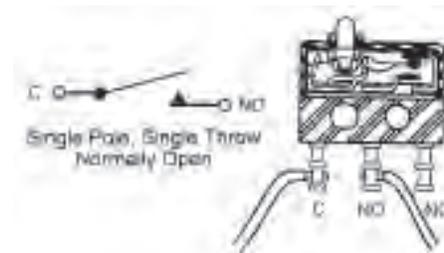
Figure 10



Splashproof: A seal rating for a switch that will withstand high humidity and limited exposure to water or liquid spray.

SPST (Single Pole Single Throw) Switch Configuration: A single circuit or switch with one common terminal that is only capable of switching between one other terminal for on/off operation of the circuit. (See Figure 11)

Figure 11



Subminiature: A switch that is smaller than 1 inch long.

Sub-subminiature: A switch that is smaller than 1/2 inch long

Tactile Feedback: The feel of increased or decreased force transmitted through the button or toggle of a switch when actuated. The snap feel of a switch.

Transducer: A device that converts a mechanical input into an electrical output.

Travel: The distance that a switch button moves between events like operate point, reset point or other point of interest when operating the switch.

Trim Switch: A switch used to provide 2 or 4-way actuation - often up/down or up down/right left control.

Trip Point: The position of the button or toggle of a switch when the switch operates.

Two Circuit: Refer to Form Z. Includes single pole, double throw and double break configurations.

UL (Underwriters Laboratories): A testing and safety certification agency for consumer products.

Waterproof: A seal rating that indicates that water cannot get in when the item is submerged in more than 3 feet of water.

Watertight: A seal rating that indicates that water cannot get in when the item is submerged in 3 feet of water.

Wiping Action: The travel of the moveable contact over the fixed contact as the switch operates. This action helps clean the contacts of contamination.

It is the buyer's responsibility to determine the suitability of the particular device for its application. Use of this catalog is for reference purposes only. Dimensional drawings are available upon request - contact your Customer Service Representative.