## AT SERIES | POSITION SWITCHES <br> SNAP ACTION PRECISION POSITION SWITCHES (RATED 4 AMPS @ 28VDC)

## Features

- Qualified per MIL-PRF-8805, Enclosure Symbol 5
- Hermetically sealed with dry nitrogen gas backfill
- Proven snap-action switching, reliable performance and long life
- Excellent shock and vibration resistance
- Switching up to 4 amps
- Optimal for low level circuits
- Temperature range between $-275^{\circ} \mathrm{F}$ and $450^{\circ} \mathrm{F}$

- Small, lightweight axis-symmetric design for robustness and reliability
- Single and multiple pole designs available
- Various mounting configurations for custom applications
- Sealed and unsealed plunger options
- Wide range of side plate designs for narrow width applications
- PMA Approvals for various commercial aircraft
- Customer approvals for space and military applications


## Introduction

KLIXON ${ }^{\circledR}$ hermetic snap-action position switches are ideal for extremely harsh and demanding environments as found in aircraft, military, aerospace, and aircraft engines applications. KLIXON ${ }^{\circledR}$ precision hermetic position switches have been used for over 55 years in a wide range of applications. Our switches are found on virtually all commercial and military aircraft, as well as various space vehicles and satellites worldwide.

Our design library has over 2,000 switch package designs which allow for "off-the-shelf" solutions to meet most application needs. Custom designs are also available if the customer's application requires different form factors, or actuation methods. We offer a wide choice of precision position switches ideally suited for mission-critical applications that require accurate switching in extreme temperatures, high vibration and shock environments, or in the presence of typical aerospace fluids including but not limited to coolants, oils, hydraulic fluid, fuel, and deicing fluids.

## Applications

| AT Series | - Flight Control Actuators <br> - Landing Gear Steering <br> - Landing Gear Down \& Locked | - Engine Start Quadrant <br> - Helicopter Litter Door Latch <br> - Helicopter Rotor Brake | - Helicopter Rotor Brake <br> - APU Valve Indication <br> - Throttle Grip Control | - Satellite Applications <br> - Satellite Arm Extended <br> - Parachute Release |
| :---: | :---: | :---: | :---: | :---: |
| 3AT Series | - Engine Start Valves <br> - Bleed Air Valves | - Env. Control Systems Valve <br> - Avionics Cooling Valves | - Anti-lcing Valves <br> - Fuel Valves | - Thrust Reverser <br> - Flap Assembly |
| 4AT Series | - Liquid Oxygen Valves <br> - Solar Array Position | - Satellite Antenna Position <br> - Mars Observer | - International Space Station Applications <br> - Lunar Rover Release \& Power Up |  |
| 10AT Series (MIL-PRF-8805) | - Gearbox <br> - Blade Fold Indication <br> - Landing Gear Indication <br> - Steering Wheel Switch | - Ejection Seat Armed <br> - Cargo Handling Systems <br> - Helicopter Rotor Condition <br> - Helicopter Door Indication | - Antenna Position <br> - Throttle Quadrant <br> - Thrust Reverser <br> - Flight Control Actuators | - EVA Space Suit <br> - Space Capsule Controls <br> - Inertial Upper Stage <br> - Weapons Systems |

## Nomenclature

Precision hermetic position switches are sometimes referred to as:

- Position switches
- Hermetic switches
- Limit switches
- Aircraft switches
- Aerospace switches
- Military switches
- Miniature switches
- Sensitive switches
- Switches

SPECIFICATIONS
Performance \& Actuation Characteristics Chart

|  |  | AT |  | 3AT | 4AT | 10AT |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Device Type |  | Standard |  | High Temperature | Low Temperature | High Amperage |
| Maximum Actuating Force (STP) |  | 2002 |  | 2002 | 2802 | 30 oz |
| Minimum Release Force (STP) |  | 402 |  | 402 | 102 | 102 |
| Maximum Pretravel |  | 0.009" |  | 0.009" | 0.009" | 0.009" |
| Maximum Movement Differential |  | $0.003^{\prime \prime}$ |  | $0.003^{\prime \prime}$ | $0.003 "$ | $0.003^{\prime \prime}$ |
| Minimum Overtravel |  | 0.002" |  | 0.002" | 0.002" | 0.002" |
| Overtravel Stop |  | No |  | No | No | No |
| Maximum Force on Actuator |  | 5 lb |  | 5 lb | 5 lb | 5 lb |
| Current Ratings in Amps (28VDC) | Resistance | 3 | 1 | 1 | 3 | 4 |
|  | Inductive | 1 | $1 / 2$ | $1 / 2$ | 1 | 1 |
|  | Lamp | 1 | $1 / 2$ | 1/2 | 1 | 2 |
| Minimum Life @ Rated Load |  | 25K | 50 K | 25K | 25K | 25K |
| Minimum Mechanical Life Cycles |  | 100K |  | 100K | 50K | 50K |
| Ambient Temperature Range |  | $\begin{gathered} -65^{\circ} \mathrm{F} \text { to } 275^{\circ} \mathrm{F} \\ \left(-53.8^{\circ} \mathrm{C} \text { to } 135^{\circ} \mathrm{C}\right) \end{gathered}$ |  | $\begin{gathered} -65^{\circ} \mathrm{F} \text { to } 450^{\circ} \mathrm{F} \\ \left(-53.8^{\circ} \mathrm{C} \text { to } 232.2^{\circ} \mathrm{C}\right) \end{gathered}$ | $\begin{gathered} -275^{\circ} \mathrm{F} \text { to } 275^{\circ} \mathrm{F} \\ \left(-170.5^{\circ} \mathrm{C} \text { to } 135^{\circ} \mathrm{C}\right) \end{gathered}$ | $\begin{gathered} -85^{\circ} \mathrm{F} \text { to } 275^{\circ} \mathrm{F} \\ \left(-65^{\circ} \mathrm{C} \text { to } 135^{\circ} \mathrm{C}\right) \end{gathered}$ |
| Dielectric Strength <br> Terminal to Case Terminal to Terminal |  | 1000 VRMS 800 VRMS |  | 500 VRMS 500 VRMS | 1000 VRMS 800 VRMS | 1000 VRMS 800 VRMS |
| Max Leakage |  | $1 \times 10^{-8} \mathrm{Std} . \mathrm{cc} \mathrm{He} / \mathrm{Sec} @ 1$ atmosphere differential |  |  |  |  |
| Shock Resistance |  | 200G, 6 ms sawtooth |  |  |  |  |
| Vibration Resistance |  | $65 \mathrm{G}, 10-2000 \mathrm{~Hz}$, 5DA or 65GTMS |  |  |  |  |
| Insulation Resistance @ 500VDC |  | 100 Megohms |  |  |  |  |
| Voltage Drop @ 1 amp |  |  |  | 0.12 | 0.04 | 0.04 |
| SEAL (MIL-S-8805) |  | Design Enclosure 5 |  |  |  |  |
| Backfill |  | Dry nitrogen with $10 \%$ helium |  |  |  |  |

## NOTE FOR DRAWINGS

1. Because of restricted space we can only show a small percentage of our switch packages and dimensional drawings. Please contact the factory if you do not see the solution you need, or if you require more detailed envelope drawings.
2. Unless otherwise noted, standard leads are AWG \#20 per MIL-W-22759/9.
3. All exposed materials on packaged designs are corrosion resistant steel with the exception of the side plates on Style 7 switches which are anodized aluminum alloy.
4. All hardware provided is corrosion resistant steel.

## Technical Terms

## Electrical Life

The minimum number of cycles allowable for a switch under a specified combination of electrical load, actuation and environmental criteria. Usually specified for the maximum current and temperature rating of the switch.

## Mechanical Life

The minimum number of cycles allowable for a switch with no electrical load, and a specified combination of actuation and environmental criteria.

## Contact Erosion

A general loss of material from one or both surfaces of a pair of mating contacts. This is as a result of switching electrical loads.

## Technical Terms (cont.)

## Pole

The number of completely separate circuits contained in a switch. A single pole switch can control only one circuit at a time. A double pole switch can control two independent circuits at the same time.

## Throw

The number of circuits that each individual pole of a switch can control. The number of throws is completely independent of the number of poles.

## Contact Resistance

The resistance offered to flow of current during its passage between electrical contacts. For practical reasons, lead and terminal resistance may be included in the actual measurement, as well as the contact resistance proper.

## Termination Leads or Connectors

Sensata uses 20 gauge wire per MIL-W-22759 as shown below. Alternative gauges, MIL specs and color coding schemes are available upon request. Sensata will also provide switches with connectors to meet customer application needs.


## Dielectric Withstanding Voltage *

The maximum voltage that a switch can withstand between specified points without leakage current exceeding a specified value.

## Insulation Resistance *

The resistance offered by the insulating members of a component part to a direct voltage tending to produce a leakage current through or on the surface of these members. Insulation resistance should not be considered the equivalent of dielectric withstanding voltage.

## Loads

Three types of loads associated with electrical switches are: resistive, inductive and lamp. Of concern when discussing loads are their effect on the switch contacts.


Life

## Resistive

Purely resistive loads are the easiest to switch. Contact life is maximized when switching purely resistive loads because contact erosion is minimized.

## Inductive

Inductive loads result in the most contact erosion. This is due to the tendency of the current to continue traveling across the contact while opening, causing arcing.

[^0]
## Technical Terms (cont.)

## Lamp

In-rush current is the condition that result in the lamp load rating. The resistance rating of a lamp is normally specified when the lamp is hot. However, when the lamp is cold the resistance is low. This in-rush current can be 10 times the normal current, resulting in welding of the contacts.

## Low Level Circuit

Low level circuits are classified in MIL-8805 as those with resistive loads less than 10 mA at 30 mV . The use of gold plated contacts and the hermetic enclosure of the switch contacts afford an ideal environment for switching low level loads.

## Pretravel

The distance the button moves from the free position to the actuation point.

## Free Position

The position of the button when there is no external force other than gravity applied to it.

## Actuation Point

The position of the button at which the movable contact snaps from the normally closed contact position to the normally open contact position.

## Release Position

The position of the button at which the movable contact snaps from the normally open contact position to the normally closed contact position.

## Maximum Overtravel Position

The position of the button when the positive overtravel stop is reached. Further overtravel would damage the switch.

## Actuation Force

The force which must be applied to the button to cause the movable contact to snap from the normally closed contact position to the normally open contact position.

## Release Force

The level to which the force on the button must be reduced to allow the contacts to snap from the normally open position to the normally closed contact position.

## Overtravel

The distance that the button can travel beyond the actuation point.

## Movement Differential

The distance the button moves from the actuation point to the release point.



BASIC "AT", BRACKET/FLANGE/THREADS, 1 POLE


BASIC "AT", RIGHT HAND ACTUATOR, 1 POLE


BASIC "AT", LEFT HAND ACTUATOR, 1 POLE



BASIC "AT", CENTRAL ACTUATOR, 1 POLE


BASIC "AT", RIGHT HAND ACTUATOR, 1 POLE


THREADED HEX BODY, FLAT \& ROUND PLUNGER, 1 POLE





THREADED HEX BODY, FLAT PLUNGER, 1 POLE


THREADED HEX BODY, ROUND PLUNGER, 1 POLE




THREADED, FLAT PLUNGER, 1 POLE

*3AT / 4AT versions available



THREADED, ROLLER PLUNGER, 1 POLE


* 3AT/4AT versions available

FLANGE MOUNT, SEALED PLUNGER, 1 POLE


FLANGE MOUNT, SEALED ROLLER PLUNGER, 1 POLE



THREADED, SEALED ROLLER PLUNGER, 2 POLE



THREADED, SEALED ROLLER PLUNGER, 2 POLE


THREADED, SEALED FLAT PLUNGER, 3 OR 4 POLE



* Various connectors available


ROLLER PLUNGER SWITCH, 4 POLE


FLAT PLUNGER SWITCH, 4 POLE



| Actuating Force (max) | 160 oz | 160 oz |
| ---: | :---: | :---: |
| Release Force (max) | $160 z$ | $160 z$ |
| Plunger Seal / MIL-S-8805 | Yes | Yes |
| Pretravel (max) | $.030^{\prime \prime}$ |  |
|  | $(.76 \mathrm{~mm})$ |  |
| Movement Diff. (max) | $.020^{\prime \prime}(.51 \mathrm{~mm})$ |  |
| Overtravel (min) | $.200^{\prime \prime}(5.1 \mathrm{~mm})$ |  |
| Positive Overtravel Stop | Yes | Yes |
| Max Force on Actuator | 30 lb | 30 lb |
| Approx Weight (no leads) | 3.402 | $3.40 z$ |
|  |  |  |



SIDE PLATE, RIGHT ARM, 1 POLE



| Lead Length |  |  |
| :---: | :--- | :---: |
| $\mathbf{1}$ | $6^{\prime \prime} \quad(153 \mathrm{~mm})$ |  |
| $\mathbf{2}$ | $12^{\prime \prime}$ |  |
| $\mathbf{3}$ | $18^{\prime \prime}(455 \mathrm{~mm})$ |  |
| $\mathbf{4}$ | $24^{\prime \prime}(610 \mathrm{~mm})$ |  |
| $\mathbf{5}$ | $30^{\prime \prime}(762 \mathrm{~mm})$ |  |
| $\mathbf{6}$ | $36^{\prime \prime}(915 \mathrm{~mm})$ |  |
| $\mathbf{7}$ | $42^{\prime \prime}(1067 \mathrm{~mm})$ |  |
| $\mathbf{8}$ | $48^{\prime \prime}(1220 \mathrm{~mm})$ |  |
| $\mathbf{9}$ | $60^{\prime \prime}(1524 \mathrm{~mm})$ |  |
| $\mathbf{1 0}$ | $72^{\prime \prime}(1829 \mathrm{~mm})$ |  |

PER MIL-W-22759/9
COLOR CODE
GREEN - COM
RED - N.O.
BLACK - N.C.


SIDE PLATE, RIGHT ARM, 2 POLE


LEAF SPRING SWITCH, 1 POLE



## SIDE PLATE, 1 POLE



Ref: MS27216 \& M8805/8

* Various connectors available


FLAT PLUNGER SWITCH, 2 POLE



## FLAT PLUNGER SWITCH, 3 or 4 POLE



* Various connectors available


## HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Disconnect all power before installing or working with this equipment
- Verify all connections and replace all covers before turning on power

Failure to follow these instructions will result in death or serious injury

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[^0]:    * Insulation resistance measurements should not be considered to be equivalent to dielectric withstand voltage tests. A clear, dry insulation may have a high insulation resistance and yet possess a mechanical fault that would cause failure in the dielectric withstand voltage test. Conversely, a dirty, deteriorated insulation with a low insulation resistance might not break down under a high potential of a DWV test.

