



## Pushbutton Engineering Information

Pushbutton switches are selected not only by their ratings, but also by their contact type. While nearly all rotary switches and DIP switches have wiping contacts, pushbutton switches may have either wiping or butt contacts (see internal views below).

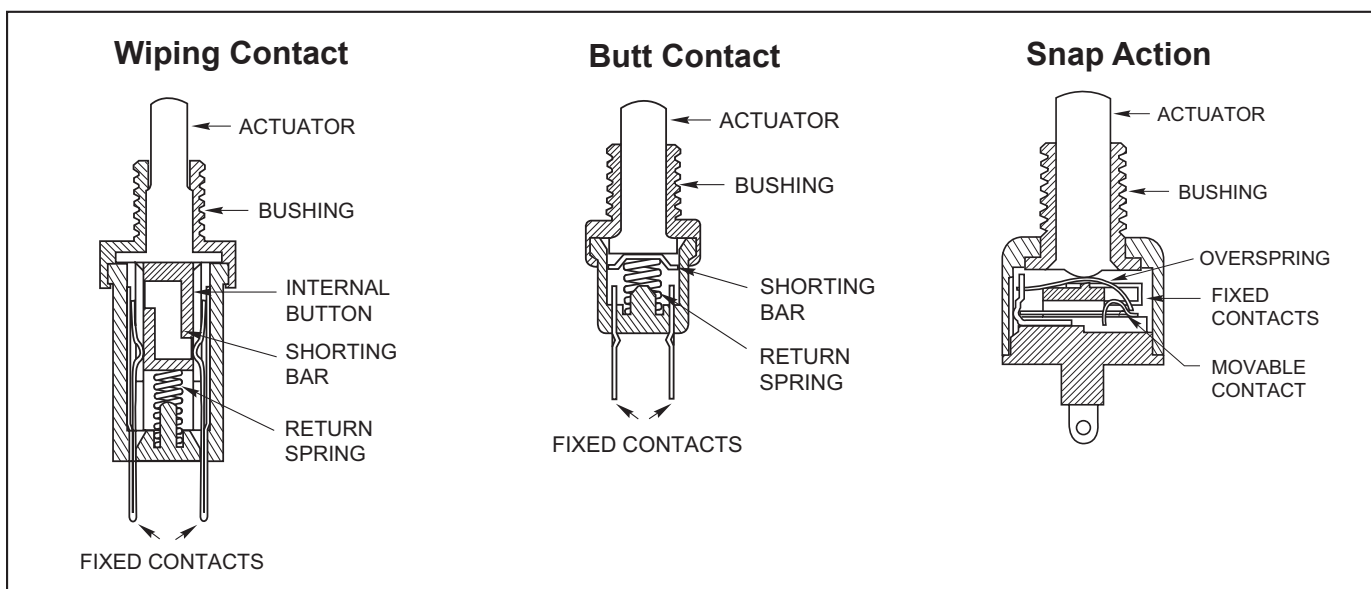
Wiping Contacts are self-cleaning and usually provide a low resistance in circuits where contact resistance is critical. However, the wiping action creates mechanical wear and conductive wear products.

Butt Contacts have less wear than wiping contacts and therefore, have a longer life. They are also smaller. Butt contacts are not self-cleaning, so their contact resistance can vary from operation to operation.

Snap Action switches are basically butt contact switches with a spring mechanism which provides the make and break. The mechanism controls both the operating point and the rate of operation, but adds to the wear of

the switch. The rapid rate of make and break means that these switches are appropriate for high current loads. They usually have a slight wiping action and contact surfaces made of precious metals to minimize their disadvantages.

### Internal Views of Pushbutton Switches



### Switch Terminology

**Actuator:** The part of the switch to which an external force is applied to operate the switch.

**Alternate Action (Push-Push) Switch:** A switch in which the operable position is maintained after the first actuation, and then disengaged with the second operation.

**Break-Before-Make Switch (BBM):** A double throw switch in which the moving contact breaks the connection with the first circuit before making contact with the second; also called non-shorting switch.

**Double Throw Switch:** A switch which has a normally open as well as a normally closed circuit per pole.

**Joystick Action Switch:** (From Joystick, the control for an airplane). A lever switch which operates with momentary action in 4 directions, and is disengaged in the upright position.

**Make-Before-Break Switch (MBB):** A double throw switch in which the contacts makes connection with the second circuit before breaking contact with the first; also called shorting switch.

**Maintained Contact Switch:** A switch in which the actuator remains in a position until it is actuated to another position where it also remains until actuated. Example: Push-Pull Switch.

**Momentary Contact Switch:** A switch in which the shorting bar returns from its operated position to its normal or free position when the actuating force is removed.

**Operating Position or Point:** The position of the actuator when the desired electrical action (make or break of contact) occurs.

**N.C., Normally Closed:** Switch in which the circuit is closed without actuation (with actuator in the "normal" position).

**N.O., Normally Open:** Switch in which the circuit is open without actuation (with actuator in the "normal" position).

**Overtravel:** The distance or angle between the operating position and the extreme position to which the actuator may be moved.

**Pole:** An electrically isolated circuit within a switch; a common terminal and all the selected terminals to which it connects.

**Pretravel:** The distance or angle through which the actuator moves from its free position to its electrical operating position.

**Single Throw Switch:** A switch which has only one normally open or one normally closed circuit per pole.

**Throw:** See Single Throw and Double Throw.



| Circuitry* | Rating<br>(Amps at<br>115 Vac Res.) | Operations<br>At Rating | Maximum<br>Width***<br>inch (mm) | Features | Series |
|------------|-------------------------------------|-------------------------|----------------------------------|----------|--------|
|------------|-------------------------------------|-------------------------|----------------------------------|----------|--------|

**Butt Contact**

|             |              |              |           |               |                                                                          |    |
|-------------|--------------|--------------|-----------|---------------|--------------------------------------------------------------------------|----|
| <b>SPST</b> | N.O. or N.C. | 5            | 6,000     | 3/8 (9,53)    | UL Listed                                                                | 30 |
|             | N.O. or N.C. | 1            | 1,000,000 | 3/8 (9,53)    | Momentary, Terminal Seal, (Wire Leads Optnl.)                            | 30 |
|             | N.O.         | 1            | 500,000   | 3/8 (9,53)    | Overtravel, Terminal Seal, (Wire Leads Optnl.)                           | 30 |
|             | N.O.         | 1            | 200,000   | 11/16 (17,46) | Positive Feel, Overtravel, Terminal Seal, (Wire Leads Optional)          | 30 |
|             | On or Off    | 1            | 100,000   | 11/16 (17,46) | Push/Pull Action (Maintained)                                            | 30 |
|             | N.O. or N.C. | 1            | 250,000   | 1/2 (12,7)    | Watertight, Terminal Seal, (Wire Leads Optnl.)                           | 30 |
|             | N.O.         | 1            | 1,000,000 | 11/16 (17,46) | Square & Round Bezels                                                    | 30 |
|             | N.O. or N.C. | 1            | 1,000,000 | 1+ (25,4)     | Square Bezel Panel Mount                                                 | 30 |
|             | N.O.         | 1            | 200,000   | 11/16 (17,46) | Pos. Feel, Overtravel, Square & Round Bezels                             | 30 |
|             | N.O.         | 1            | 200,000   | 11/16 (17,46) | Pos. Feel, Overtravel, Sq. Bezel Panel Mount                             | 30 |
|             | N.O.         | .020**       | 80,000    | 5/16+ (8,13)  | Miniature, Surface Mount                                                 | 38 |
|             | N.O.         | .020**       | 80,000    | 5/16+ (8,13)  | Miniature, Horizontal PC Mount                                           | 38 |
|             | N.O.         | .020**       | 80,000    | 5/16+ (8,13)  | Miniature, Vertical to PC Mount                                          | 38 |
|             | N.O. or N.C. | .250         | 100,000   | 1/4 (6,35)    | Sealed Plunger, Stackable with LEDs                                      | 32 |
|             | N.O.         | .500         | 1,000,000 | 1/4 (6,35)    | Miniature                                                                | 39 |
|             | N.O.         | .500         | 500,000   | 1/2 (12,7)    | Overtravel, Miniature Limit Switch, (Wire Leads Optional)                | 39 |
|             | N.O.         | .500         | 100,000   | 1/2 (12,7)    | Overtravel, Miniature, (Wire Leads Optional)                             | 39 |
|             | N.O.         | .500         | 250,000   | 5/16 (7,94)   | Watertight Seal, Miniature, (Wire Leads Optional)                        | 39 |
|             | N.C.         | .250         | 250,000   | 1/4 (6,35)    | Miniature (Wire Leads Optional)                                          | 39 |
|             | N.C.         | .250         | 100,000   | 5/16 (7,94)   | Watertight Seal, Miniature, (Wire Leads Optnl.)                          | 39 |
|             | N.C.         | .250         | 100,000   | 1/2 (12,7)    | Actuator Seal, Miniature Limit Switch (Wire Leads Optional)              | 39 |
|             | N.O.         | .150**       | 1,000,000 | 1/4 (6,35)    | PC Mount, Miniature, Sealed                                              | 39 |
|             | N.O.         | .150**       | 1,000,000 | 1/4 (6,35)    | PC Mount, Miniature, Right Angle, Cap Seal                               | 39 |
|             | N.O.         | .150**       | 100,000   | 1/4 (6,35)    | PC Mount, Miniature, Overtravel                                          | 39 |
|             | N.O.         | .020, .150** | 1,000,000 | 3/8 (9,53)    | Economical Contact Plating                                               | 30 |
|             | N.O.         | .020, .150** | 1,000,000 | 3/8 (9,53)    | Econ. Plating, Square Bezel Panel Mount                                  | 30 |
|             | N.O.         | .020, .150** | 1,000,000 | 1/4 (6,35)    | Economical Contact Plating                                               | 39 |
|             | N.O.         | .020, .150** | 100,000   | 1/2 (12,7)    | Actuator Seal, Overtravel, Miniature Limit Switch, (Wire Leads Optional) | 39 |
| <b>SPDT</b> | BBM          | .250         | 100,000   | 1/4 (6,35)    | SPST AND SPDT, Stackable w/LEDs                                          | 32 |
|             | BBM          | .250         | 500,000   | 1/2 (12,7)    | PC Mount, 2 Circuits, Right Angle, Total Seal                            | 39 |
|             | BBM          | .020**       | 80,000    | 5/16 (8,13)   | Miniature, Surface Mount                                                 | 38 |

**Wiping Contact**

|             |              |      |         |               |                                            |         |
|-------------|--------------|------|---------|---------------|--------------------------------------------|---------|
| <b>SPST</b> | N.O. or N.C. | 3    | 6,000   | 13/16 (20,6)  | Decorator Line                             | 4000/10 |
|             | N.O. or N.C. | 1    | 100,000 | 13/16 (20,6)  | Momentary Action & Positive Feel Types     | 4000/10 |
|             | N.O.         | .250 | 100,000 | 1/2 (12,7)    | Momentary Action & Terminal Seal Types     | 23      |
|             | N.O.         | .4VA | 40,000  | .177 (4,5)    | Process Sealed, Subminiature               | 49      |
| <b>SPDT</b> | BBM or MBB   | .250 | 250,000 | 7/16 (11,11)  | Momentary Action                           | 46      |
|             | BBM or MBB   | .250 | 250,000 | 1+ (25,4+)    | Square Bezel Panel Mount                   | 46      |
|             | BBM or MBB   | .250 | 100,000 | 1/2 (12,7)    | Watertight Seal                            | 46      |
|             | BBM          | .250 | 250,000 | 11/16 (17,46) | Square & Round Bezels                      | 46      |
|             | BBM          | .250 | 250,000 | 11/16 (17,46) | Alternate Action, Square & Round Bezels    | 46      |
|             | BBM          | .250 | 250,000 | 1+ (25,4+)    | Alternate Action, Square Bezel Panel Mount | 46      |
|             | N.O.         | .4VA | 40,000  | .177 (4,5)    | Process Sealed, Subminiature               | 49      |
| <b>DPDT</b> | BBM or MBB   | .250 | 100,000 | 5/8 (15,88)   | Momentary Action                           | 46      |
|             | BBM          | .250 | 250,000 | 13/16 (20,6)  | Environmental Seal/Wire Leads              | 46      |
|             | BBM or MBB   | .250 | 100,000 | 11/16 (17,46) | Watertight Seal                            | 46      |
|             | BBM          | .250 | 250,000 | 11/16 (17,46) | Square & Round Bezel & Positive Feel Types | 46      |
|             | BBM          | .250 | 250,000 | 11/16 (17,46) | Alternate Action, Square & Round Bezels    | 46      |
|             | BBM or MBB   | .250 | 250,000 | 1+ (25,4+)    | Alternate Action, Square Bezel Panel Mount | 46      |

**Snap Action Contact**

|             |              |       |        |             |                   |         |
|-------------|--------------|-------|--------|-------------|-------------------|---------|
| <b>SPST</b> | N.O. or N.C. | 1, 3  | 25,000 | 7/8 (22,23) | SPST, 1 and 3 Amp | 4000/10 |
| <b>SPDT</b> | BBM          | 5, 10 | 25,000 | 7/8 (22,23) | Audible Click     | 2000/7  |

\* BBM is Break-Before-Make (Non-Shorting). MBB is Make-Before-Break (Shorting).

\*\* Rated for 28 Vdc and/or 5 Vdc (.150 A) and 20 Vdc (.020 A).

\*\*\* Maximum width behind panel or above PC board rounded to next highest 1/16" (1,59 mm).