

Switches Reference Guide

Switches disconnect or connect the conducting path in an electrical circuit. The most familiar form of switch is a manually operated electromechanical device with one or more sets of electrical contacts. Each set of contacts can be in one of two states: either “closed” meaning the contacts are touching and electricity can flow between them, or “open”, meaning the contacts are separated and no electricity can flow. The mechanism actuating the transition between these two states (open or closed) is usually either an “alternate action” (flip the switch for continuous “On” or “Off”) or

“momentary” (push for “On” and release for “Off”) type.

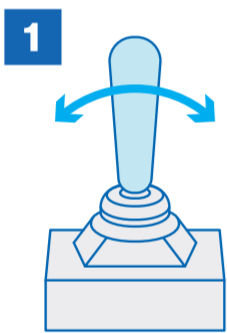
An ideal switch would have no voltage drop when closed, and would have no limits on voltage or current rating. It would have zero rise time and fall time during state changes, and would change state without “bouncing” between on and off positions. Real-world switches fall short of this ideal; as the result of roughness and oxide films, they exhibit contact resistance, limits on the current and voltage they can handle, finite switching time, and other effects.

The main contact configurations

Poles indicate how many circuits a single switch can control. Throws indicate how many contacts the switch can choose between.

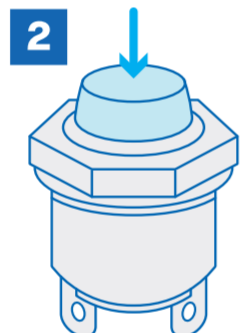
Designation	Full name	Description	Symbol
SPST	Single pole, single throw	On-Off switch: The two terminals are either connected or disconnected. <i>Example: light switch</i>	
SPST-NO	Single pole, single throw, normally open	On-Off switch. The two terminals are normally disconnected (open) and close when the switch is activated. <i>Example: pushbutton switch.</i>	
SPST-NC	Single pole, single throw, normally closed	On-Off switch. The two terminals are normally connected (closed) and open when the switch is activated. <i>Example: pushbutton switch.</i>	
SPDT	Single pole, double throw	On-On Changeover switch: COM is connected either to L1 or to L2.	

Common types of mechanical switches



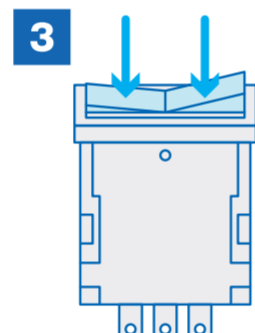
1 Toggle Switches

Available in a large range of poles and throws, with many different variations. Their easy actuation, quick visual feedback, and ability to easily integrate safeguards make them ideal for industrial or scientific applications. Form factor may make them less than ideal for vertically limited spaces.



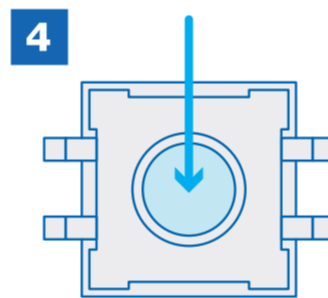
2 Push Button Switches

Can be momentary or latching. Often incorporate LEDs to illuminate or show on or off state. Can handle a wide variety of power or signal levels. Most often available in PCB or panel mount. Can be ruggedised, with specific anti vandal features and high IP ratings that make them ideal for harsh environments like elevators.



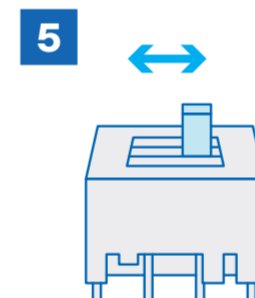
3 Rocker Switches

Pivot in the middle, toggling between two states. Typically used as power switches for mains level circuits, and often rated for higher voltages



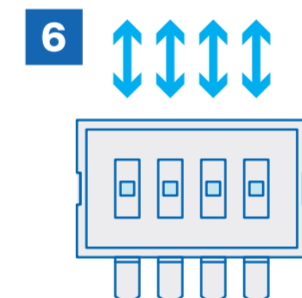
4 Tactile Switches

Small, momentary contact buttons that have a click that can be felt and heard. Designed for low voltage, low current signals, but physically robust with lifecycles measured in the hundreds of thousands, millions, or even tens of millions of actuations. Available in IP rated version, they are always mounted on a PCB: through hole, surface mount, or edge mount. Usually single pole but may have multiple throws.



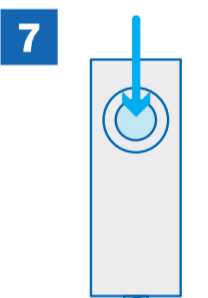
5 Slide Switches

Actuator slides in one direction or the other. Often used as power switches in the SPST configuration and rated for higher voltages and currents as well as frequent use. Usually SPST but can be multiple poles or throws.



6 DIP Switches

An array of switches in a single through-hole or surface mount package. Through-hole are commonly designed to fit into a breadboard but also small enough to fit in finished products. Usually consist of a series of low voltage, low current SPST switches, where all switches can be used separately or in tandem to create a single number. Ideal for situations where users need to make semi-permanent selections. Available in a variety of shapes, mainly piano, slide, and rotary.



7 Emergency-off

A safety mechanism used to shut off machinery in an emergency situation. Unlike a normal shut-down switch or shut-down procedure, which shuts down all systems in order and turns off the machine without damage, a kill switch is designed to stop operation as quickly as possible, even if it damages the equipment, and to be operated simply and quickly. Designed to be noticeable, even to an untrained operator or a bystander.