




The Basics of SWITCHES AND DISCONNECTS



Safety switches and disconnects are an essential part of electrical equipment installations. Federal and industry safety regulations and standards require their use at electrical service entry points as well as near rotating machinery. Choosing the right switch or disconnect for a given application requires understanding a few basics.



DISCONNECTING EQUIPMENT FROM POWER SOURCES IS AN ESSENTIAL FIRST STEP IN THE SAFE MOVEMENT, MAINTENANCE, OR REPAIR OF ELECTRICAL EQUIPMENT.



The same is true when working near power outlets and wiring at buildings and installations. Disconnection from power is also important in reducing damage during failure events such as short circuits and overloads and to minimize injury in accidents involving motors and rotating machinery. Safety switches and disconnects provide a quick, simple, and reliable means of removing power.

The Difference Between Safety Switches and Disconnects

While both serve to interrupt electrical power flow, there is a fundamental difference between a safety switch and a disconnect. Safety switches, as the name suggests, are mechanical switches that require human action (throwing the switch) to connect or disconnect a system and its power source. Safety disconnects, on the other hand, have an ability to sense one or more fault conditions and to automatically interrupt power to help protect personnel and equipment. In addition, safety disconnects can allow manual switching and even remote electrical control.

Choosing the right switch or disconnect starts with a few basic specifications:

VOLTAGE RATING

This is the maximum operating voltage a device can safely handle. The rating should be equal to or greater than the power source's voltage. A 600 V switch, for instance, can be safely used in a 450 V circuit, but a 450 V switch is unsafe for use in a 600 V circuit.

CURRENT RATING

This is the maximum sustained current a device can safely handle. Devices rated as heavy duty typically offer a higher current rating than general purpose devices.

NUMBER OF POLES

This is the number of independent circuits a device controls. A single-pole device, for instance, can handle one circuit, such as a series of parallel-connected household wall outlets. Three-phase line power requires a three-pole device.

NUMBER OF THROWS

This is the number of independent circuits a device can control individually. A device that can select between a main and an auxiliary power source (or disconnect both) requires a dual throw.

FUSED OR UNFUSED

Basic safety switches are unfused; they simply connect or disconnect power. Unfused switches provide no integral protection against electrical faults. Fused switches incorporate a fuse into the power circuit, housed in the same enclosure as the switch and its electrical connections. Fused switches protect against overcurrent faults such as short circuits or excessive loads. Quick-blow fuses react immediately to an overcurrent condition. Slow-blow fuses allow brief overcurrents, such as when a motor starts up.

TYPE OF FAULT

Safety disconnects typically include circuit breakers to handle overcurrent conditions but may also detect and react to other electrical faults that present safety hazards, such as voltage surges or ground fault conditions. A shunt-trip safety disconnect allows an electrical signal to remotely activate the switch.

CHOOSE THE RIGHT SAFETY SWITCH OR DISCONNECT FOR YOUR APPLICATION

Beyond these basic specifications, there are many other considerations in matching a device to an application. The housing, for instance, must be appropriate to the installation environment. An indoor installation might need only a Type 1 enclosure to keep dust and solid foreign objects from entering the switch area. An outdoor location might need a Type 3R enclosure for additional protection against rain, sleet, and snow. Protecting against windblown dust, windblown rain, and splashing or hose-directed water might involve a Type 4 enclosure. The presence of dripping liquids, corrosive agents, and other environmental hazards might require specialty housings. In addition to protecting against environmental factors, the housing can help protect operators. Inside an enclosure, switching mechanisms typically expose

some power-carrying conductive elements. Personnel who open the enclosure can therefore be at risk for accidental contact with live circuits, regardless of switch position. A housing that helps minimize this risk might include a mechanical interlock that prevents opening the housing when the switch is in the power-on position. Double-door housings offer a fuse compartment with a door separate from the switch mechanism to allow fuse access without live power present. Similarly, line-isolation safety disconnects keep the line-side circuits in a compartment separate from the circuit breakers and system controls. Other specialty housings are also available. Beyond these basics, consideration must be given to the industry specifications and safety regulations to which an installation must conform. [ANSI C37.46](#), for instance,

is the IEEE specification for high-voltage (>1000 V) fused disconnect switches. Other specifications apply to different switch types, applications, and installation environments.



CONCLUSION

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