MachineDesign

Top Tips
Selecting a High-Reliability Safety Relay

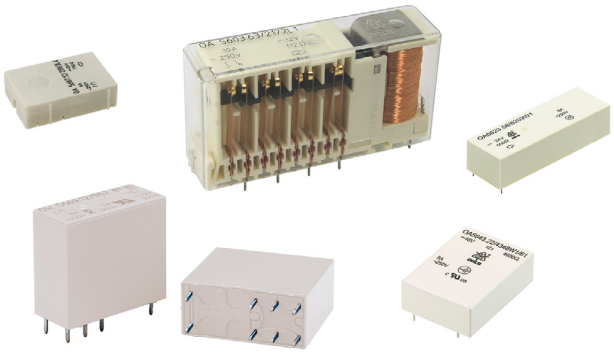
Safety relays are used to protect machines and operators during catastrophic failures to avoid costly maintenance, equipment replacement, or employee harm. When applied properly, these components help detect failures in output and input devices, as well as internal failures, and allow power to be removed from a load to prevent a subsequent restart of the load until the failure is corrected.

These tips will help you understand what safety relays are, how they work, and where they're used for you to identify the best choice during your product selection process.

1

Understand why safety relays are used across many industries.

Often the safety relay is used to keep the fault area restricted from operators entering an area—so they don't get hurt—until an evaluation of the problem can be completed. The relay also stops the piece of equipment from operating so that it doesn't cause further damage to itself. To facilitate these two operations, the safety relay must remain engaged during a machine or industrial equipment failure. Note that when using standard relays, opposing contacts can remain in the same state, causing a safety risk to the operator and/or the machine.



Sponsored by
Altech Corp.®

2

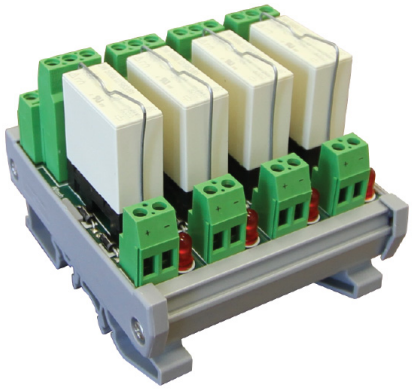
Know how your safety relay operates to best perform its purpose.

Safety relays are designed in such a way that relay contacts in a particular contact set are mechanically linked together so that no single contact in the relay can change state without changing the state of all other contacts. Described as force-guided relay contact, this arrangement makes it impossible for NO (normally open) and NC (normally closed) contacts to be closed at the same time. This method of forced guidance is a requirement for safety relays or the part will not function correctly.

3

Select the number of poles you need for your project.

Every application is different as is every operation completed by that application. A wide variety of safety relays are available to fit most applications. Force-guided safety relays are available in two-pole, three-pole, four-pole, six-pole, and eight-pole versions. The more complex the equipment, the more contacts you may need. Be sure that components come with international approvals so that machines shipped out of the country can maintain operational approval.



4

Consider the safety relay format you need for your equipment.

There are multiple ways to incorporate a safety relay system into your machine. Consider, for example, if your equipment requires a DIN rail system or a printed circuit board. Safety relays are also available in standard vertical configurations and as low-profile, flat-pack designs. DIN rail mount modules may also include a choice of isolated or bussed channels, screw cage clamp connections, an LED coil voltage indicator, reverse polarity LED protection, and a broad enough number of channels to suit your application.

5

Select contact materials based on current loads.

Contact material selection can be an important part of your evaluation process. Materials vary based on the required switching current and the type of load. While most contacts are gold flash plated for long shelf life, you can purchase relays that use mixed contact materials. The chart below provides some variations to consider.

Material	Characteristics	Applications	Range
C $AgSnO_2$ + 0.2µmAu	• Very low welding tendency • Highest burn-up resistivity • Very good arc suppression	Special for switching, inductive loads	10mA – 10A
N AgNi10 + 0.2µmAu	• Low welding tendency • High burn-up resistivity • Good arc suppression	Circuits with medium to high switching current, DC current circuits	10mA – 10A
S AgNi10 + 5µmAu	• Higher welding tendency • Low burn-up resistivity • Low contact resistance	Where very low to medium switching current and voltage is mandatory	2mA – 300mA

6

Become aware of what accessories are available for present and future projects.

Supplier accessories for safety relays are often specific to the relay's model number. In particular, be sure that sockets are available for DIN rail projects as well as printed circuit board projects. This capability allows relays to be removed without de-soldering them for the PC board.

7

Pay attention to the details.

Relay specifications can vary from relay to relay or manufacturer to manufacturer. This is why it's so important to pay attention to specifications such as breakdown voltage, creeping distance, and max switching power as these can affect how well the relay works in your application. Mechanical and electrical life can also vary greatly, which can mean you may need to replace your relays more frequently than expected—if you choose a relay with a low life expectancy based on your switching cycles.

8

Work with a solutions provider with the capabilities to adapt to your needs.

Technical assistance is often the best thing a supplier can offer its customer. When you're designing a unique piece of equipment, be sure you have the help you need in determining if you need a custom designed system. For example, Altech has seen common customizations over the years including coil voltage and resistance, mixed contact materials, various contact pressures, unusual contact arrangements, and a variety of operate/release times.

9

Rest assured that safety relays are tested during manufacturing.

Safety relays must receive functional testing on every relay manufactured rather than merely completing batch testing like most other products. This ensures that the safety relay or module you've bought is 100% safe to use as it was designed to do. During use, the force guidance of the relay ensures that opposing contacts are always in opposite states. This enables simple diagnostics and fault detection when monitoring the forcibly guided feedback contacts.

10

Be aware of the breadth of applications where safety relays are a requirement.

Increases in certifications for equipment in all types of industries require the use of safety relays. This drive toward machine and operator safety is found in applications such as safety door controls, two-hand operating devices, pressure mat controls, light curtains, speed controls, and a wide number of monitoring devices. Such equipment is found in elevator controls, rail transportation systems, machine tools, cutting machines, packaging machines, stamping machines, robots and cobots, printing and textile machinery, cranes, medical equipment, and many others. Keeping our workers and equipment safe has become a priority.