MachineDesign

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Bistable Switching Safety Relays with Forcibly Guided Contacts

Battery-powered vehicles and equipment are becoming part of the industrial and commercial world. The needs of these systems can be unique, but that doesn't mean that there is a complete shift in the technologies used.

Even with the growth and expanded uses of solid-state relays over the years, electromechanical relays have continued to evolve. Like most shifts in technology, older technologies that we think might go away only expand their capabilities for application where they are most suited. When it comes to electromechanical relays, this process indicates that they will remain essential in the future.

The growth and development of the electric vehicle market has expanded the needs and requirements for great numbers of charging stations, which forces businesses and cities to have a wide-reaching charging infrastructure. For these infrastructures, it is critical that relays can switch high currents and handle the galvanic isolation of the inherent circuitry on a repeated basis and for long periods. Long life cycles become highly important in such applications where maintenance and repair means sending out a maintenance engineer to remote locations. Similarly, automation controls have decreased in real estate size while simultaneously needing greater power requirements. This has forced the relay technology to become smaller. In addition, to conserve energy, smart meters and test equipment depend on the efficiencies gained by using efficient bistable relays.

As new markets arise, safety relay designers and manufacturers must create innovative products for these applications. For example, Altech's OB 5623 relay from Dold combines technologies to better serve the industry. This safety relay combines the features of bistable switching with that of mechanical forcibly guided contacts (compliant with DIN EN 61810-3) to provide greater energy efficiencies and reliable diagnostics of the switching position.

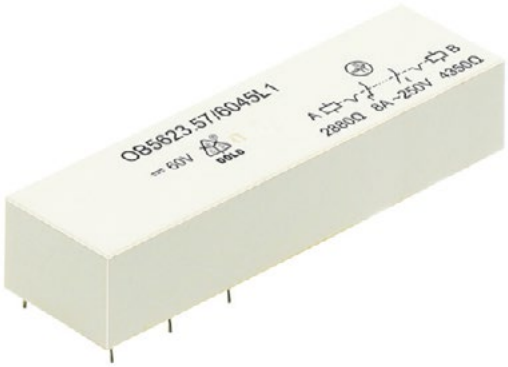

Figure 1: The advanced OB 5623 safety relay in this photo is designed without manual operation and is also available with manual operation for test operations.

The OB 5623 not only has forcibly guided contacts, but it also provides energy efficiency through low energy consumption (see Figure 1). The bistable nature of the relay means that it uses mechanical latching of contact position. This mechanical configuration also provides for safe separation between all current circuits. When both circuits are operating simultaneously, there is a defined position that is set. These safety relays operate within a wide temperature range, provide an optional mechanical indication, and are low profile at only 15.8mm high.

Bistable relays, such as the OB 5623, have the ability to adopt two stable switching positions without continuous power. A short pulse triggers the relays to maintain their most recent switching position until another pulse arrives. This switched mechanical operation allows the relays to exhibit extremely high efficiencies dependent on the application and how often the relay needs to switch positions. All that has to happen is for the relay, such as the OB 5623, to be driven into the operating position with one pulse and to be returned from the operation position (into a neutral position) with a second pulse. Because the safety relay is a mechanical device internally, it is possible to exhibit ultra-strong contact forces, which maintain its position even during high shock and vibration environments. This results in increased contact reliability for the user.

Due to the unique design of the physical connection inside the relay, feedback contacts are inherently open whenever the make contacts are closed. This provides a reliable diagnosis of the switching position at any time during operation. This is keenly important when remote monitoring and/or predictive maintenance must be done and creates an embedded capability for monitoring the relay without the need for an additional sensor system. The OB 5623 provides eight contacts in a compact package compliant with DIN EN 61810-3.

Switchboard relays for energy technology

The technology employed in Dold's latching relays for switchboards used in the energy industry also incorporates the bistable printed circuit board solderable relays (see Figure 2). In the energy industry, the latest switching position must be kept if excitation is suddenly eliminated, such as in a power failure.

Figure 2: The Dold UG 8851 latching relay for the energy industry incorporates bistable switching safety relays, which maintain a switched position even when there is a power failure.

A key feature of the UG 8851 latching relay is its compact size. While other systems incorporating eight contacts need a 45mm width, the UG 8851 requires only half that width, at 22.5mm. These devices offer several key operational benefits over similar products on the market. The units are available for a large voltage range of AC/DC of 24 volts to 240 volts, provide a greater number of contacts with the same footprint, need no holding capacity, and protect against manipulation via a sealable transparent cover mounted over the setting switches. Pluggable terminal blocks are used for easy device exchanges, and terminal blocks are coded for ease of installation and maintenance. The UG 8851 can be operated by voltage pulses or by continuous voltage on the inputs. Once again, the forcibly guided contacts allow for reliable remote monitoring of the contact state.

Comprehensive relay options

It is important to consider partners that offer a line of electromechanical relays for a wide range of applications in a breadth of industries. Altech provides its users with a comprehensive selection of components such as printed circuit board relays, safety relays with forcibly guided contacts, and miniature relays.

Each relay type has its own use. For example, safety relays with forcibly guided contacts are available in vertical and horizontal versions and are most often found in functional safety applications where up to eight contacts are needed. Note that the availability of different contact materials and optional designs offer maximum flexibility to the user. Printed circuit board relays (also called plug-in/print relays) are incorporated to maintain galvanic separation of circuits as well as for signal adaptation and strengthening. Vertical and horizontal, low-profile designs make them easy to engineer into most applications. If your application requires that you switch high currents reliably but in a compact space—while offering galvanic separation of control and load circuits—then the company offers its power miniature relays to the industry.

Conclusion

There is no doubt that physical switching through a highly trusted mechanical design is gaining interest from multiple industries, most notably the electric vehicle and other battery-powered industries. Handling high switching currents while maintaining compact size and fail-safe operation is important, as is the ability to provide energy-saving actuation and low self-heating benefits. Because of the nature of many remote systems, these types of relays offer high efficiency and repeatable capabilities for a long life cycle. As battery-powered equipment penetrate our world, these types of relays will become even more important.