Contactor coils: Conventional or Electronic?

Panel builders must make many choices in selecting the right components for power-control panels. When it comes to choosing contactors, one of the key differentiators is to choose conventional or electronic coils. Read this short article for guidance on which choice makes sense for your next panel.

Contactors are fundamental control-panel components, used to control high-current-load devices, typically large industrial motors. For devices rated below 15 amps or a few kilowatts, relays typically perform this function. In both contactors and relays, a control voltage applied to an electromagnet creates a magnetic field that attracts the moving core of the contactor, closing the circuit. When the control voltage is removed, the coil de-energizes and gravity or a spring returns the electromagnet core to its original position.

There are two basic coil designs that provide the closing action: conventional/standard coils and electronic coils. Panel builders need to know that there are some significant differences between the two designs.

Dealing with power problems
Voltage fluctuations can create problems for almost all electric and electronic devices, including contactors. Contactor function and reliability depend heavily on the quality of the power. Industrial, food & beverage, and process-industry facilities are all subject to power-quality issues. Common power fluctuation causes include brief, high-power outtakes and long cabling. These issues can reveal critical contactor coil operational differences.

There are two common, low-power conditions: sags and dips. Complete (0 V), momentary (20ms) voltage drops are referred to as sags, while dips are small but longer-lasting voltage drops. Conventional contactor coils open during sags, although auxiliary options are available to enable the contactor to ride through the sag. During a dip, conventional coils may or may not open over a fairly wide range of reduced voltage. Electronic coils, on the other hand, are programmed to open at a known voltage. For example, a 100 – 250V coil would drop out at roughly 60V. While operating at below the expected voltage but above the drop-out voltage, the coil is in a safe holding condition.

For applications where the ability to ride through dips and sags is important, electronic coils have an advantage. In applications that call for a safety contactor, it’s critical that the contactor drop out quickly under a certain voltage. This ride-through ability becomes a liability for electronic coils.
Contacts protected
At lower control voltages, the contactor contacts can bounce off one another, oscillating quickly back and forth between the open and closed positions. This is chatter which can be detected by a buzzing or humming from the contactor. Chatter can result in phase-losses and greatly increases contact wear, shortening device life.

In the event of an over-voltage, the contacts can weld together, destroying the contactor. More seriously, this creates a permanently closed connection and loss of device control. In some cases, the problem will become immediately apparent, but in others it may take some time until it’s detected. At a minimum, this can result is ruined batches and wasted product. It may also cause downstream damage to other equipment and could create safety issues for equipment operators.

Electronic coils totally eliminate contactor chatter and nearly eliminate welding, extending contactor life and improving panel reliability.

Power saved
In all coils, more initial current is required to actuate the device. Once actuated (typically closed), it requires less current to hold the moving and fixed contacts together and maintain the circuit. Electronic coils inherently capitalize on this fact and draw less energy after the closing action occurs. Standard coils can be equipped with an optional economizer circuit that reduces the power required to keep the contactor closed. You will find economizer circuits on most direct-current contactor coils and on large alternating-current contactor coils. However the power reduction is accomplished, it will not only save a substantial amount of power – up to 80% – but also allow the energized coil to stay cooler, extending its life.

Size reduced
Some manufacturers tout the small footprint of their power-control devices. In some production facilities, this provides little benefit because they have plenty of space. In others, though, space is a huge concern. Panel builders dealing with space constraints go to great lengths to minimize panel size, combining components with linkage bars and busbars to reduce the panel footprint. Electronic coils are typically more compact than conventional coils having the same capacity, helping panel builders shrink the size of their panels.

Other features
ABB’s AF Contactors include electronic coils as standard equipment, providing the benefits described above. They also provide additional features, like the ability to operate on both AC and DC and the ability to cover broad power ranges. An inventory of just four coils covers the full span of 24 V-500 V AC/DC, simplifying panel-builders’ parts needs. Built-in surge protection eliminates the need to stock them as a separate component. In all, ABB AF contactors can reduce parts requirements by 90%.

Most manufacturers offer contactors equipped with electronic coils. For some manufacturers, it is an optional feature, while others use electronic coils as their standard offering. In most cases, the improved reliability and other benefits provided by electronic coils make them the best choices. When selecting contactors, panel builders should include consideration of the coil type in their purchasing decision.