Electronic circuit breaker for the secondary circuit

ifm efector

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The demands on the DC voltage supply are getting higher and higher. In particular with regard to energy efficiency and reliability. Therefore there is a tendency towards central, high-performance power supplies. If high current intensities are to be distributed in the plant, the question arises how to protect the cables in a meaningful way. With the new electronic circuit breakers ifm offers simple and reliable protection.

Issue of circuit breakers

Modern switched-mode power supplies are usually overload protected and short-circuit proof so that no protection of the secondary side is required for functional reasons. Without protection of the cable the cable cross section has to be adapted to the maximum current. This is 4 mm² for a 40 A power supply. However, only very few users will want to use a sensor with a 4 mm² cable, if only for cost reasons. To reduce the cable cross section the regulations require suitable protective elements.

Often circuit breakers are used for this purpose. The planner of a plant is often not aware of the risks connected with the use of circuit breakers in a 24 V DC network. The reason: circuit breakers are designed for 115 to 230 VAC. The electromagnetic short-circuit quick-acting release is based on the technology of an armature coil. Due to the considerably lower voltage the ohmic resistance has a considerably higher effect in 24 V DC networks. In particular with high currents and thin cross sections the voltage drop is especially high. The cable resistance limits the short-circuit current so that the short-circuit quick-acting release cannot act at all. Only the considerably slower excessive current switch-off is active. During this delay time the switched-mode power supply reduces the secondary voltage due to the overload. That means that sensitive plant parts such as the controller cannot operate reliably any longer which results in incidents or even loss of production.

Electronic current monitoring

Electronic circuit breakers operate a lot cleverer here: They measure the actual current and monitor it microprocessor-controlled. If the current is too high, they switch off - fast and reliably. The new electronic circuit breakers from ifm offer not only this reliable switch-off function but also a number of other features:

Thanks to its modular design the new electronic protection system can be individually adapted to the plant configuration. The protection system consists of a supply module into which the 24 VDC supply voltage is conducted. A maximum total current of 40 A can be conducted via the supply module. Two-channel protection modules can be connected to this supply module. Only the built-in clip mechanism has to be opened and repositioned. Links or other accessories are not required. The protection modules mounted side-by-side are at the same time a distribution rail for the individual circuits. Up to eight protection modules can be connected to one supply module. Protection modules are available for 2 x 2 A, 2 x 4 A and 2 x 6 A.

Double protection

The protection modules cannot be adjusted. ifm has consciously decided in favour of fixed currents to prevent misuse and unauthorised tampering.

Furthermore the requirement for electric separation of the cable protection element in DIN VDE 0100-530 can be met. All electronic circuit breakers from ifm have a micro fuse as fail-safe element that triggers if there is an error in the electronic circuit breaker. This protection element is designed for nominal current.

Other electronic circuit breakers on the market do not have this electrical separation or they are configured to the maximum value of the current intensity to be adjusted. This means that for an electronic circuit breaker with a setting range from 1 to 10 A the cable cross section has to be designed to the maximum current intensity (in this case 10 A).

The modular mounting system of the ifm circuit breakers allows more than easy replacement of the modules and protection of the circuits as required.

Additional benefit thanks to IO-Link communication

With the new electronic circuit breaker ifm provides a protection element that can be addressed and evaluated via IO-Link for the first time. This technology results in many additional functions that could so far only be found with very expensive products.

By means of the IO-Link interface a number of parameters can be set and read. With the LINERECORDER device software ifm offers a respective parameter setting and diagnostic tool:

The current voltage values and currents in each current path can be measured. This provides transparency. Indirect power consumption is also possible.

When an adjustable threshold level has been reached, the circuit breaker signals a status "Threshold". The LED built into the module starts flashing yellow. With this message the circuit breaker signals that the capacity of the current path has almost been reached.
In the event of overload, the status "Overload" is displayed. After a short delay time the circuit breaker switches off the circuit. The delay time is needed to bridge short-term overload as may occur for example when capacitors are switched on. In the event of short circuit, the protection element switches off at once providing a corresponding status message.

The plant operator is not only informed that a circuit breaker has triggered but he is also advised which circuit was shut off and the reason for it. This helps the service staff to directly find the overload or short circuit. The triggered protection element can be locally reset by the controller via the IO-Link interface.

This switching-on and switching-off of the circuit breaker also provides new options:
Large machines and installations will usually not be switched on as a whole but each module one after the other to avoid unnecessary inrush current peaks in the supply network. This means that an output has to be provided in the controller for each module and a load contactor with positively-driven contacts has to be wired. Thanks to the new IO-Link capable circuit breaker from ifm this function can also be assumed by the circuit breaker. Thanks to the basic functions, the circuit breaker has a switching element for the current paths. Each current path can be switched individually via IO-Link, without any additional cost. The money you save can be invested into the additional diagnostic capabilities of the IO-Link technology.

The new electronic circuit breakers do not only provide reliable protection but also a modular wiring system and additional important diagnostic functions