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Non-contact is better

Machine safety in dust Ex zones

Safety switches used in explosive environments have to meet two different complex sets of requirements: those for explosion protection, and those for machine safety. Engineers have the choice between different designs and different active principles. At the Powtech, the steute business division Controltec will be demonstrating the various available technologies – one of which plays a particularly prominent role.



A (good) alternative especially for dusty and damp environments: RC Si M 30 IP69 Extreme safety sensor

Monitoring the positions of guard doors on machines in dust Ex zones is a complex use case for safety switches because they must comply with two different sets of strict requirements at the same time – those for machine safety, and those for explosion protection.

In industrial practice, this combination of requirements is not so seldom. It is found, for example, in processing, filling and packaging machines for powdered foodstuffs (flour, sugar, coffee, baking mixtures...); while in numerous processes within the chemicals industry, powdered and flammable materials (additives, pigments, powder paints...) are handled or can escape during processing.



At the Powtech, steute will be demonstrating different options for the position monitoring of guard doors in dust Ex zones – in a cloud of dust

Generally speaking, in mechanical engineering there are many different applications in which dust Ex safety switches are an option or even a necessity. And these switching devices are available in a range of designs. So which design is best suited to which application?

Electromechanical safety switches

The solution most frequently selected in practice is an electromechanical position switch with safety function, or a safety switch with separate actuator. The standardised switches (EN 50047 and 50041) in series Ex 97 and Ex 99 from the steute Ex Safety range correspond to the first option. The switch actuator, such as a roller lever, detects the position of a guard door and sends a corresponding signal to the safety relay. These series can be used in gas Ex zones 1 and 2, as well as dust Ex zones 21 and 22.

The same is true of the classic safety switches, for example in series Ex AZ 16. They generate a safety signal if the coded actuator (mounted on the guard door) is pulled out of the switch. Features which guarantee dust explosion protection include a dustproof

terminal compartment for the connecting cable.

A good alternative: non-contact position monitoring with sensors

As an alternative to electromechanical switching devices, mechanical engineers can also opt for non-contact safety sensors. In dust Ex zones, this has the added benefit of facilitating position monitoring for guard doors with smooth surfaces. The active parts of both the sensor and the actuator are completely closed, with no opening as for a

mechanical actuator. These safety switching devices are therefore highly recommended in dusty or otherwise contaminated environments.

Various different designs and sensor technologies

For these applications, various safety sensors are suitable, for example the Ex RC Si M30 series in a cylindrical design – also available in a particularly robust variant with a stainless steel enclosure and protection class IP69.

For installation in the profile systems typically favoured by mechanical engineers, suitable options include the Ex RC Si 56 series, which permits switching distances of up to 6 mm, as well as the very compact Ex HS Si 4 series. All of the abovementioned sensor series are also able to monitor positions "undercover": provided that the covers and enclosure components are made out of non-magnetic materials (plastic, stainless steel), the sensor will still be able to detect the actuator through the material. This has benefits not only regarding cleaning, but also regarding manipulation prevention: users cannot see where the safety sensor is located.

Reed contact or Hall sensor?

The difference between the Ex HS Si 4 and the other safety sensors within the steute range is that its detecting principle is not mechanical, with a Reed contact. Instead it uses an electronic Hall sensor, which has a much higher level of shock and vibration resistance. This type of safety sensor is therefore a better option for heavily vibrating machines and plants.

The benefits of locking

Any overview of dust Ex-protected safety switching devices would be incomplete without mention of solenoid interlocks. They keep guard doors and maintenance flaps closed until all dangerous machine and plant movements have come to a complete standstill. This task can be assumed, for example, by the solenoid interlocks in the Ex-STM-515-series. Typical application examples envisaged by the manufacturer

during the development process include guard doors and maintenance flaps on mixers and mills, as well as packaging plants for powdered or dusty goods. These locking devices are used increasingly frequently even when they are not strictly necessary for occupational safety. In such cases, they serve process safety and prevent a guard door monitored by a safety switch or sensor from being opened by an operator, inadvertently stopping the machine.

Overview at the Powtech

This overview has shown: designers of machines and plants used in dust Ex zones have multiple options when it comes to safety switching devices. In order to give a concrete idea of how these options work, the steute business division Controltec has commissioned the building of functioning fair exhibits for the Powtech. The solutions described here for guard doors will be on display – and, very graphically, in dusty and damp conditions.

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