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SPECIAL: TECHNICAL SAFETY

Explosion protection meets machine safety

Safety switchgear for special requirements

Keywords

- switchgear, switching devices, solenoid interlocks·
- Ex protection
- functional safety

Safety switching devices used in Ex zones have to meet two different sets of complex requirements: explosion protection and machine safety. Designers also have to choose between different types of construction and different active principles. This is true for both heavy-duty applications and machines used for the processing and packaging of e.g. (dust-)explosive foodstuffs.

There are comprehensive normative standards in place for both machine safety and explosion protection, listed in Europe under the machine directive and the ATEX directive. In addition, there are international regulations (e.g. IECEx) and – for both areas – national standards and stipulations (UL/CSA, Inmetro, Ex CCC…).

Each of the two categories is already extremely demanding in its own right, as designers of machines and plants for explosive

The Ex STM 515 Ex solenoid interlock

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zones are well aware. But they also know that some switching devices have to fulfil both directives equally. Examples include switching devices which monitor the position of guard doors on machines inside Ex zones, or which assume other safety-related tasks, such as the emergency-stop function on conveyor belts.

Diverse applications

This might be a niche area within the large industrial switchgear market, and yet for general mechanical engineering there are many different applications for Ex safety switches, some of which are mandatory. If the guard doors and maintenance flaps on processing, filling and packaging machines for powdered bulk goods or foodstuffs require monitoring, for example, then dust explosion requirements nearly always need to be met. Organic dusts are always flammable and can ignite when they come into contact with air. And in many processes found within the chemical industry, powdered and flammable substances (e.g. additives, pigments, coating powders…) and also flammable gases are either handled directly or can be released during the manufacturing process.

Safety in Ex zones is provided by e.g. the Ex AZ 16, a safety switch with separate actuator and separate terminal compartment.

Addition to product range: Ex safety solenoid interlock

The steute "Ex and Extreme" products have been used in this (niche) market for decades, offering manufacturers of machines and plants for explosive zones a wide range of safety switchgear. This range is not only well curated, but also expanding – including the recent addition of the Ex STM 515 series of Ex safety solenoid interlocks with ATEX and IECEx approvals. Their task is to keep guard doors and maintenance flaps locked until dangerous movements inside machines and plants have come to a complete standstill – in Ex zones and also in adverse environmental conditions.

This new series has been designed from the outset with its task in mind, from the cable connection to the actuator. A robust die-cast aluminium enclosure ensures durability, even with severe mechanical wear and tear. The multiple coating of the enclosure (passivation, priming, powder coating) guarantees high-level anti-corrosion and, thanks to an effective sealing, protection classes IP66/67 are also achieved. The electrical connections are well protected inside a separate terminal compartment.

Flexible installation in Ex zones 1, 2 and 21, 22

The combination of a compact design and an actuator head which can be positioned in 4 x 90° increments facilitates flexible installation in any position. The modular design permits selection of diverse additional functions. For example, users can choose between the closed-circuit and open-circuit principles, and optionally select both a manual release (from the access side) and an escape release (from the hazard side).

The new solenoid interlocks in the Ex STM 515 series can be used in accordance with their ATEX/IECEx approvals in Ex zones 1 and 2 (gas Ex), as well as 21 and 22 (dust Ex). Typical application fields considered during the development phase include the guard doors and maintenance flaps on mixers and screening

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machines, as well as packaging plants for powdered or dusty goods.

Position monitoring instead of interlocking

If there are no dangerous movements to be expected inside the hazardous zone, and an interlock is not required for process safety, the method of choice will be a safety switch to monitor the position of the guard door. Here the company from Löhne offers solutions including its Ex AZ 16 series. This electromechanical safety switch with a separate actuator, three contacts and a separate terminal compartment can be used in gas Ex zones 1 and 2, as well as dust Ex zones 21 and 22.

As an alternative, there are two series of Ex position switches available which are also suitable for functional safety applications. The standard switches (EN 50047 and 50041) in series Ex 97 and Ex 99 can be used in gas Ex zones 1 and 2, as well as dust Ex zones 21 and 22. They are also suitable for temperatures down to -60 °C, making particularly high demands on the enclosure construction and sealing. With the Ex 98 series, there is also a position switch available with safety function and metal enclosure (aluminium enclosure with stainless steel cover).

Non-contact instead of electromechanical

As an alternative to electromechanical switchgear, mechanical engineers can also use non-contact safety sensors in Ex zones – for example the Ex HS Si 4 series, which in combination with an actuator monitors the position of guard doors and is particularly shock-proof and easy to integrate in the surrounding construction of a guard door. Another option is the safety sensors in the Ex RC Si M30 series, which have a cylindrical design and a separate actuator. They are also available in a particularly robust variant with a stainless steel enclosure and protection class IP69K.

Heavy-duty applications in conveyor technology

Heavy-duty variants of Ex safety switchgear are used in conveyor and extraction technology. Here the entire equipment must also be mechanically robust and usable in areas with high dust levels, as well as wide-ranging temperatures. These requirements are met by e.g. the emergency pull-wire switches in the Ex ZS 92 S series, equipping conveyor belts with an emergency stop function over long distances of up to 2 x 100 m.

The overview shows: even with highly complex niche applications, such as the combination of gas or dust explosion protection with functional safery, engineers and plant operators have a range of options when selecting switchgear. And even when further requirements must also be met, such as resistance to corrosion or vibrations, or protection from dust or moisture penetration, safety solutions which are also Ex-protected are available.

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