

Emergency-Stop Safety Components, Safety for Man and Machinery



Emergency-Stop is now state-of-the-art, providing safety for Man and the machine. Moeller offers a wide range of Safety Components for the protection of Man, machines and production goods in emergency situations. It is the purpose of an Emergency-Stop device to deflect or minimize the risk as quickly as possible and optimally in the event of an emergency arising. In accordance with the Machine Directive 98/37/EG, an Emergency-Stop device must be fitted on all machines/systems, with the exception of machines on which an Emergency-Stop device would not reduce the risk, i.e. machines carried and operated by hand. A distinction is made between two STOP categories: STOP category 0, i.e. immediate stopping, and STOP category 1, i.e. controlled stopping. The appropriate STOP category must be chosen according to the assessment of the least risk in each case.



Aims

The Emergency-Stop equipment on systems and machinery is implemented using one or more Emergency-Stop command devices in accordance with the Machine Directive. The main purpose of the equipment is quickly and safely to remove the hazard arising from malfunctioning of the machine, caused by disturbance in the production sequence or by human behaviour. Shutting down the entire machine is a practical way of removing such a hazard. Adjacent machines or sections of plant are also shut down via the Emergency-Stop equipment on the main machine or system, in case their continued operation represents a risk. In the event of an emergency, safety takes absolute priority over production.

Function

The Emergency-Stop signal is passed to the control system via a clearly marked Emergency-Stop command device, i.e. a red actuating element on, as far as possible, a yellow background. The Emergency-Stop function is triggered by a single action of a single person. Dangerous situations and movements are switched Off as quickly as possible. The Emergency-Stop is effective in any mode of operation. The Emergency-Stop actuator latches when activated and remains in the latched position until it is deliberately released. The restart of the machine or system must be effected by a Start command and not by the release of the Emergency-Stop actuator.

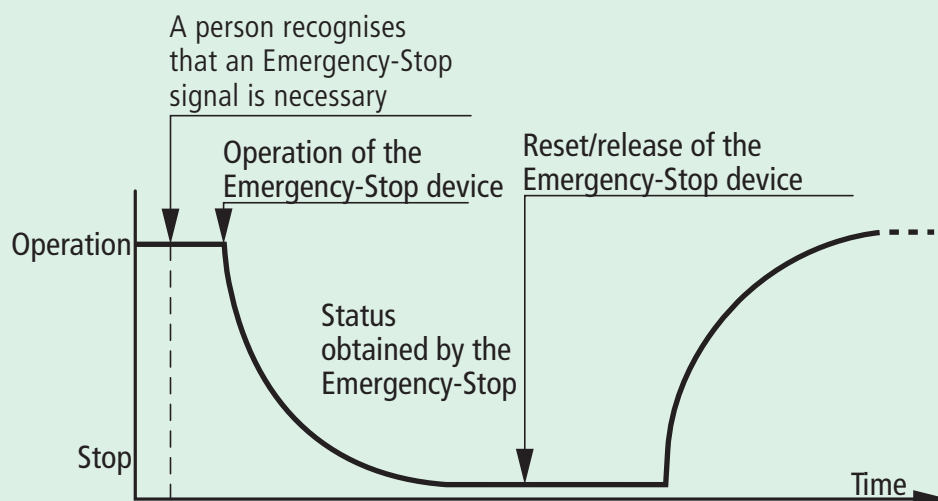
Application

Emergency-Stop elements are shaped and fitted on the machine or system in such a way that they can be quickly and intuitively actuated in the event of danger. The Emergency-Stop equipment is engineered and designed in such a way that it correctly switches Off the machine or system. All Emergency-Stop actuating elements are freely accessible and their actuation must not be impeded by measures against unintentional operation. The Emergency-Stop function is reserved for hazardous situations and must not be used to shut down the machine or system in any other eventuality.



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Functional sequence in an Emergency-Stop situation in accordance with EN 418





Emergency-Stop buttons from the RMQ-Titan or RMQ 16 ranges

Both these ranges offer a number of different Emergency-Stop buttons with a high degree of protection for practical application. These Emergency-Stop buttons are tamper-proof. Illuminated buttons in particular increase the safety since visual recognition of the Emergency-Stop is even quicker and shortens the reaction time.



Foot and palm switches FAK

Foot and palm switches FAK have a particularly large actuator surface, as well as being tamper-proof. Actuation can be effected using the hand, the arm, the foot, etc. The simple and versatile mode of operation makes for quick reaction in case of emergency. The FAK is exceptionally impact resistant, with a very high degree of ingress protection, IP 69K, i.e. it is the ideal device for application in harsh environments.



Position switches LS-Titan and Emergency-Stop buttons RMQ-Titan

The position switches LS-Titan and the Emergency-Stop button from the RMQ-Titan range provide the ideal link to the Emergency-Stop actuating element. These devices are quick and straightforward to fit, as well as being highly reliable in operation, -properties that are critical for use on machines and systems. They have degree of protection IP 66, which allows them to be used in a wide range of applications.



AS-Interface emergency-stop button



The Emergency-Stop buttons which are a feature of every system can be connected to the AS-i network via a safe AS-i slave. Depending on the device design – surface mounting enclosure or flush mounting – the electronics are located in the device or are clipped on as an AS-i safety adapter to conventional components of the RMQ-Titan range



Rotary switches T and switch-disconnectors P with Emergency-Stop function

The use of rotary T switches or switch-disconnectors P as mains isolating devices with Emergency-Stop function is suitable for many applications. These components in the range from 6.5 kW to 132 kW are extremely robust and compact in construction. The handle directly operates the contacts and can be locked in the Off position using three individual padlocks.



Main switches with overload and short-circuit protection, as well as Emergency-Stop function, using the motor-protective circuit-breaker PKZ

Manufacturing and processing machines, nowadays are often constructed from several autonomous units whose individual power requirement is fairly low and does not need a high switching capacity. The Emergency-Stop function can thus be set up simply and safely using a motor-protective circuit-breaker. The PKZ can be either actuated directly by hand using the Emergency-Stop mushroom button, or via the breaker mechanism in conjunction with an undervoltage release. In the latter case, the supply voltage to the undervoltage release that acts on the breaker mechanism is interrupted by operation of the Emergency-Stop button, and the mechanism trips the switch. The PKZ can be re-closed only after the button has been released.



Circuit-breakers NZM and switch-disconnectors N – the Emergency-Stop switches for high currents

Circuit-breakers NZM and switch-disconnectors N are used wherever large loads must be switched and protected. In many applications, these switches form part of the Emergency-Stop equipment. In the event of an emergency, the switches can be operated directly by means of the handle and disconnect the load, the system or the machine directly in all poles. An alternative method of disconnection in the event of danger is de-energization of the circuit-breakers and switch-disconnectors via their breaker mechanisms. Here, the supply voltage to the undervoltage release that acts on the breaker mechanism is interrupted by operation of an Emergency-Stop button, and the mechanism trips the switch. Once the button has been released, the circuit-breaker or switch-disconnector can be re-closed.



Safety relay ESR 4 for monitoring of the safety circuits

The electronic safety relays ESR4... are an important component of the safety equipment. In fault-free operation, the safety-relevant circuits are monitored by the electronics after the switch on command and the enable paths are enabled via the relay. The enable paths are interrupted immediately or after a time-delay – depending on the application – when the switch-off command is received, as well as during a fault with an earth fault, short-circuit or wire breakage. The devices feature a redundant design and provide safety for man and machine.

You can choose between the following safety relays:

- Emergency-Stop
- Protective door
- Light barrier
- Two-hand control
- Delay time
- Contact expansion



Safety for persons and processes door safety switch LS...ZB and LS...ZBZ

By reliable securing and interlocking of protective doors, the LS-ZBZ increases the safety standards for the protection of personnel and processes.

The LS-ZBZ operates according to one of two principles: on the basis of magnet-powered or spring-powered interlocking. The spring-powered interlock is optimally suited for enhanced personnel protection. The door or protective guard remains safely locked even in the event of power failure. In an emergency, the protective guard can be opened using an auxiliary release mechanism. Magnet-powered interlock is used in personnel and process protection. The protective cover is interlocked when operational voltage is applied, and can therefore be opened directly in the event of power failure.



Switch off the danger:

Safety position switches LS... ZB

Safety position switches LS...-ZB and LS-ZB are used on centrifuges, motor and gearbox covers, presses, etc. If the protective guard is opened, they disconnect the power and in so doing, remove the danger. LS 0-ZB and LS 4-ZB comply with EN 1088 "Interlocks with and without mechanical securing action"

The selection of the necessary protective device is thus simplified. All safety position switches also fulfil the demands for use in safety circuits by their use of positively driven switching elements and positively opening contacts. Equipped with double-break contacts, they are also suitable for use in the configuration of redundant safety circuits. The switches featuring double break contacts are suitable for use with electronic devices in accordance with IEC/EN 61 131-2, enabling the safe exchange of information with any controller.



Reliable monitoring with mirror contacts

Operational switching of motors, heating etc. is the typical task of the contactor DIL M. In hazardous situations the contactor DIL M is used to switch off the motor which drives the hazardous motion. The state of the contactor contacts are monitored here via mirror contacts. If any main contact of a contactor is closed, no mirror contact (auxiliary N/C contact) conform to IEC EN 60947-4-1 Annex F may be closed. After the hazard has been eliminated it is possible to switch the system back on without danger based on the feedback from the mirror contacts.



Positively driven auxiliary contacts for safety-relevant controls

Small control tasks – which require the duplication of contacts and the connection of large contactors to electronic outputs – are typical tasks for contactor relays. As soon as safety-relevant circuits are affected the NO and NC auxiliary contacts may not be closed simultaneously.

Contactor relays DIL A features positively drives contacts conform to IEC EN 60947-5-1 Annex L. They can be used to safely implement control functions in safety-relevant system sections.



The contactor monitoring relay CMD

Two contactors must be connected in series for conventional safety-related shutdown to safety category 3 and 4 for compliance to the EN 954-1. This is a particularly expensive solution, especially with large contactors. This is where the CMD comes into play. The CMD has the function of monitoring the main contacts on a contactor for welding. To implement this, the CMD compares the control voltage of the contactor with the state of the main contacts, which are reliably signalled with a mirror contact (IEC EN 60947-4-1 Annex. F). If the contactor coil is de-energized and the contactor drops-out, after a short delay the CMD will trip the upstream circuit-breaker / motor-protective circuit-breaker / switch-disconnector using an undervoltage release. The CMD has a safety-related design, as it must guarantee reliable shutdown of a "welded contactor" in safety applications in combination with the circuit-breaker / motor-protective circuit-breaker / switch-disconnector. In these applications, it replaces the series connection of two contactors. All components satisfy safety category 3 to EN954-1.