

The safe way to interlocking

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Solenoid interlocks are used to protect operators against dangerous machine movements and unexpected start-up of machinery. Solenoid interlocks also serve to safeguard the process and to prevent damage to machine tools, thus helping to ensure a maximum productivity. Their practical integration in the machine concept and safety circuit however is often subject to – avoidable – errors.

Solenoid interlocks (image 1) ensure that hazardous areas at machinery and plant remain inaccessible until the dangerous machine move-

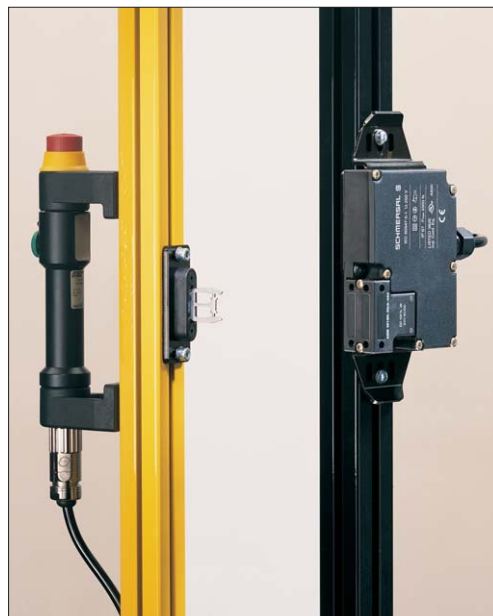


Image 1: Solenoid interlocks protect the operator against dangerous run-down movements.

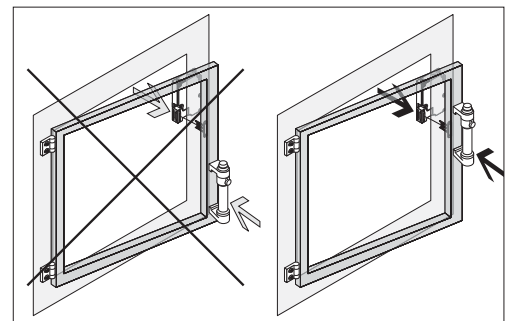


Image 2: Positioning of the solenoid interlock and the door handle on a safety guard.

ments have stopped and avoid any unauthorised intervention in the running processes or any unexpected machine stop by an unforeseen opening of a safety guard. For example, a solenoid interlock can ensure that a robot completes its entire cycle before it stops.

Avoid distortions

Often, the solenoid interlock is mounted in the upper part of the safety guard, whereas the handle is located further below. As availability is concerned, this is not an appropriate solution. For trouble-free guard locking, it is imperative that the actuator smoothly enters the solenoid interlock throughout the guard's intended lifetime. Therefore, the safety guard must have a degree of stability that does not allow torsions or doorsetting. In addition, it is recommended to fit the safety guard handle as close as possible to the solenoid interlock. This ensures that the actuator can always be easily retracted or inserted into the solenoid interlock, even in case of a deformed or distorted safety guard (image 2).

Safety in system. Protection for man and machine.

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The advantage of endstops

This simple constructive measure contributes to a long-time trouble-free operation of the solenoid interlock. The solenoid interlock must not be used as mechanical endstop or as a guide for the safety guard; a separate end stop is required. Even with an end stop, the rebound from a heavy safety guard can lead to serious damage to the solenoid interlock and/or the actuator if, upon closing the door, the solenoid latches the actuator into the locked position. To prevent this, a – preferably adaptable – damper can be fitted to the door. The door catcher, especially developed by Schmersal (image 3), also contributes to a smooth insertion of the actuator in the solenoid interlock.



Image 3: This new door catcher ensures a proper closing of the guard door as well as a smooth insertion of the actuator in the solenoid interlock.

Mounting kits simply fitting

Often, all kinds of inappropriate mounting plates and profiles are used, which cause many problems. Schmersal has developed mounting kits to enable quick and safe fitting of solenoid interlocks and actuators. These mounting sets are suitable for fitting on common steel and aluminium profile systems and simplify the alignment between the actuator and the solenoid interlock.

Conventional or slender models?

Apart from the common models, Schmersal also offers “slender” solenoid interlocks with angled actuating head, a particularly elegant solution for aluminium profile systems (image 4). The angled actuating head allows the solenoid interlock to be mounted inside the hazardous area, so that only the head is visible from outside. In addition to the practical advantages, this device can also improve the optical impression of the machine, especially at smaller doors.

Actuators: flexible or fixed?

For hinged guards with small actuating radii, Schmersal offers flexible adjustable actuators. Straight actuators are more suitable for sliding guards. Fitting the actuator in concealed position avoids the actuator being removed for unauthorised use; this solution also minimises the risk of injury by the actuator.

Actuator with supplementary safety features

At larger machines and assembly lines with many safety guards and full body access hazardous

areas, this risk can also be avoided by using a safety door handle switch in conjunction with the B 30 actuator. The actuator can be inserted in the housing, when the guard door is opened. The B 30 features another function: the operator must have actively locked the safety door handle before the machine can be started. This prevents the machine from starting when the guard door is unintentionally closed – an important function to avoid any unexpected machine start. Furthermore, the B 30 is equipped with the so-called “emergency handle” (see further).

Very important:

the communication with the safety guard

Distortion of the guard door can be avoided, if the operator is always informed of the locked or released condition of the door. In this way, he can be deterred from pulling on the door and jamming the interlocking mechanism. Therefore, indicating and signalling components such as stack lights should be installed as close as possible to the door handle. The TG series door handle switch developed by Schmersal features a door lock control button with integrated LED's to indicate if the safety guard is locked or released. In addition, emergency stop buttons, release buttons and/or reset buttons can be integrated in the door handle switch as well (image 5 door handle switch).

Standstill monitoring

In case of constant run-down times, the solenoid interlock can be combined with a fail-safe delay timer. Fail-safe standstill monitors however are a more practical alternative, since they allow for a faster opening of the safety guard.

Auxiliary function: manual release

Solenoid interlocks with spring-to-lock operating principle, i.e. who are locked by spring force and unlocked by energising the solenoid, are generally used for safety functions. Machinery fitted with this type of solenoid interlock require an auxiliary unlocking mechanism, the so-called “manual release” that enables opening the safety guard during a power failure, usually by means of a triangular key. Upon operation of the manual release, the positive break safety contacts are simultaneously opened, thus preventing unexpected machine start.



Image 4: Solenoid interlocks with a particularly slender design are available for fitting to aluminium profile systems.

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For spring-to-lock solenoid interlocks installed in inaccessible or concealed position, Schmersal optionally offers a battery-operated release (image 6) that provides a separate power supply for the solenoid interlock to open the safety guard in case of power off or failure.

For hazardous areas with full body access: emergency exit

The emergency exit allows an intentional opening of the safety guard from inside the machine without tools, for example when maintenance personnel is trapped inside a machine and quickly must evacuate the hazardous area. To this end, the Schmersal Group has developed the B 30 actuator with emergency exit and integrated "emergency handle".

For all situations: emergency release

On the other hand, when a fast intervention into the hazardous area is required to guarantee the process safety, even if the machine is shut-down, solenoid interlocks with emergency release can be used. With an emergency release, the safety guard can be opened from outside the hazardous area without the operator needing to use any tool. Unlocking is possible without special tools, resetting however requires a repair-like intervention.



Image 5: The TG door handle switch informs the operator on the condition of the solenoid interlock.

Brochure with detailed information

Schmersal has published an informative brochure "Guard locking systems for the protection of man and machine", containing a short overview of the product lines and their main accessories, as well as many practical hints on fitting and integrating solenoid interlocks in the safety circuit. This brochure is available for free from Schmersal.



Image 6: The battery-operated release provides a separate power supply for the solenoid in case of power failure.

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