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Section on *Machine and System Safety*

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Use of safety proximity switches for monitoring of safety gates

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Initial situation

In the past, the position monitoring of protective devices on machines and systems was implemented using mechanically acting position switches that were specially designed for personnel protection functions. According to IEC 60204-1:2016, Section 10.1.4, the following applies: Position sensors (e.g. position switches, proximity switches) must be arranged in such a way that they are not damaged when being passed over. Position sensors in circuits with safety-related control functions (e.g. to maintain the safe state of the machine or to prevent dangerous situations on the machine) must have positive opening (see IEC 60947-5-1) or must offer a comparable reliability.

As an alternative to the mechanical position switches, "safety proximity switches" are used, which reduce the disadvantages in terms of wear, contamination and increased mechanical effort during installation. In order to achieve the same level of safety, alternative measures must be taken to achieve comparable reliability, such as

- Use of proven techniques and components;
- partial or complete redundancy;
- diversity;
- functional tests, etc.





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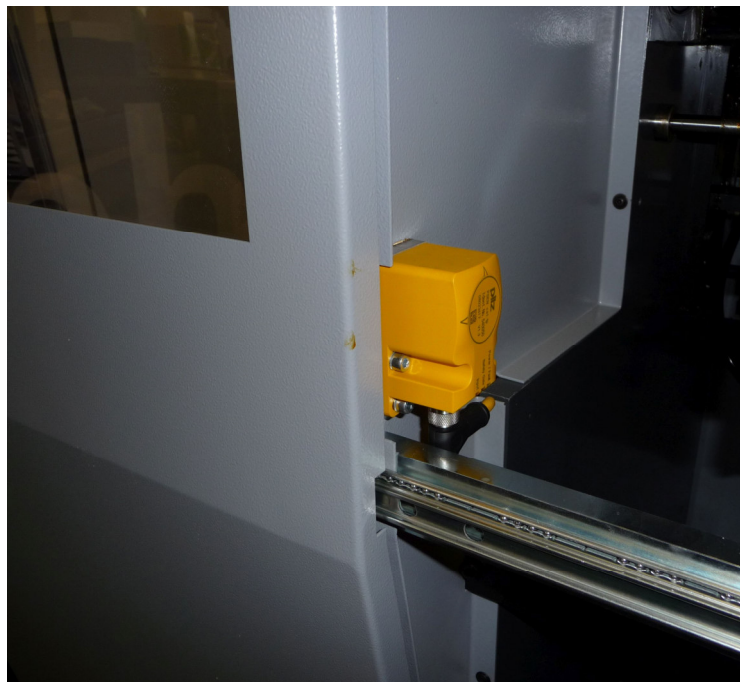
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It follows from this: A positive opening position switch can be replaced by two "standard" proximity switches, if a suitable evaluation and plausibility check of the proximity switches is carried out when the protective device is actuated. In order to avoid the redundant use of proximity switches, safety proximity switches have been developed which alone offer the required "comparable reliability". Proof of this is usually provided by a voluntary type examination by an independent testing and certification body. However, it can by no means be deduced from this that in control engineering applications a single "safety proximity switch" can cover the required level of protection of the respective application without additional measures.



Are the advertising-worthy statements that a safety guard with a Performance Level (PL) of d or e can generally be monitored with only one single "safety proximity switch", or do I need two?

The following requirements must at least be taken into account in order to monitor a safety guard in PL d or e with a single safety proximity switch.

-) Safety switches and actuators must be mounted in such a way that bypassing is easily prevented, e.g. by
 - concealed installation,
 - fastening of counterparts and switches with disposable screws (further possibilities, e.g. gluing, riveting, welding)

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-) The proper functioning of the protective device must be monitored for each requirement.

- In the case of power-operated doors, the switching position must change after each activation of the door. (Evaluation by the machine control system)
- As soon as a fault occurs, the initiation of a further hazardous movement must be prevented
- Electrical faults in the cabling must be detected.

-) The proximity switches must be connected to the evaluation unit in accordance with the manufacturer's instructions.

The operating instructions for safety proximity switches must contain clear safety-related information that describes the above-mentioned requirements for mounting and fault evaluation.

Conclusion: Mechanically acting position switches can be replaced by "safety proximity switches if the additionally required measures are effective in every machine or system constellation.

ISSA International Section for Machine and System Safety

We are a section of the Special Commission on Prevention of the International Social Security Association - ISSA.

The ISSA was founded in 1927 and is based in Geneva. Today it operates in 156 countries worldwide with 367 member institutions from all areas of social security.

The **Special Commission on Prevention** is the ISSA's body for dealing with work-related risks. It has 14 international sections as members.

The **Section on Machine and System Safety** was established in 1975 to deal with issues in this field at the international level. Further information available at: www.safe-machines-at-work.org

Mannheim, March 2021

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