

## The new generation of safety sensors

### “Safe RFID”: utilisation of the RFID technology in safety switchgear

The new generation of safety sensors uses the RFID technology to guarantee a high degree of protection against tampering and to offer the machine builder a cost-efficient as well as functional solution for the non-contact guard door monitoring. The user can choose between different coding variants.

Multiple studies conducted by independent institutions reveal that the tampering of safety devices is a frequent cause of accidents on and with machines. According to the studies, machines with tampered safety devices would be running in approximately one third of the companies



**Image 1 (siaz16fi):** Coded variants of well-established series of safety switches are now available. Here, the AZ 16 with coded actuator is shown.

A useful measure to make tampering more difficult is the use of safety switchgear with coded actuators (image 1). “Coded” here means: similar to the key lock principle, the safety switch can only be activated by a suitable type of actuator. In this way, the tampering by me-

ans of every-day objects such as screwdrivers is pre-vented.

#### Recommended in case of high tampering stimuli: individual coding

For applications, which are especially sensitive to tampering, e.g. in case of a re-petitive and time-consuming guard door actuation, safety switchgear with individual coding can be used as additional protective measure. These devices can only be operated by one specific actuator, so that the use of a “replacement key” is excluded.

If the machine builder wants to monitor the position of safety guard doors according to the non-contact principle, he can choose, in addition to coded and non-coded safety sensors, devices with individual coding, in which the target only communicates with the corresponding sensor (image 2). Just like for the electro-mechanical safety switches, a graduated coding is available here.

#### Alternative to magnetic safety sensors

Considering the increased use of the non-contact guard door monitoring, some four years ago a new operating principle, which offers significant advantages to the machine construction and the machine safety in practice, was developed as an alternative to the established magnetic safety switches. With the Coded Safety Sensor technology (abbreviated CSS), the sensor and the target communicate with each other according to the impulse-echo principle. In this way, additional information is generated, which leads to a higher availability of the plant (considering that guard door misalignments are detected and prematurely signalled



**Image 2 (BNS 36):** Coded safety sensors on the basis of magnetic switches are state-of-the-art for a long time already

to the operator). The new operating principle of these electronic safety sensors simultaneously allows for a higher switching distance.

For the signal evaluation, these devices also offer significant advantages: the builder can set up self-monitoring series-wiring in control category 4/PL e to EN 13849-1 of, depending on the series used, up to 31 devices. This means that a separate safety-monitoring module is no longer required for each and every safety switchgear: that saves costs and space in the control cabinet.

#### CSS safety sensors with paired coding

The CSS technology moreover makes additional information available, which can be used for diagnostic purposes for instance. This increases the availability and makes, considered from the point of view of the operator, tampering less attractive. For the gathering, transmission and evaluation of the diagnostic-relevant signals, a new Gateway generation is now available with interfaces for different field bus systems.

Meanwhile a variant has been developed for

this new operating principle as well, which offers a higher level of protection against tampering. The safety sensors of the CSP 34 series (image 3) feature a paired coding of the CSS sensor and the target.

#### „RFID inside“: from CSS to RSS

This paired coding prevents that a sensor reacts onto the actuator of another CSS sensor. Technically speaking, this is more challenging to realise than for conventional magnetic safety sensors, considering that with the CSS technology, the sensor and the target communicate with each other in a bidirectional manner. The designers however came up with a convincing solution to this problem.



**Image 3 (sicsp34):** CSS safety sensors are offered with paired coding

According to the motto „Good is good, but better carries it“, a brand-new series of safety sensors now has been developed, featuring a flexibility similar to that of the CSS series devices, though more cost-effective and with different coding variants to enable the protection against tampering. In these sensors, the otherwise tried-and-tested RFID technology is used, however now optimized for the safety technology.

#### Different coding possibilities

In the basic version of the RSS 36 electronic safety sensor (image 4), the sensor accepts any suitable target of this series. A second version only accepts the target that has been taught during the teach-in process. And finally, a third version is available, for which the teach-in process of the individual coding can be repeated an arbitrary number of times. This provides the user with additional flexibility when retrofitting his machinery.

In this way, the user can choose the best suitable coded variant for his application and determine the desired degree of protection against tampering. All of this is enabled by the integration of the RFID technology in the safety sensor technology.

In addition to the selectable level of tampering protection, the new series also features universal mounting possibilities. The high switching distance offers additional degrees of freedom for fitting the sensor and the actuator. Optionally, an integrated magnetic latching is available, which enables using the sensor as end stop on small safety guards.

#### Perfect for foodstuff production

The sensor and the target of the RSS 36 series are extremely compact and universally mountable. The enclosure materials have been tested to the ECOLAB Directives and are resistant to aggressive cleaning agents. The variants with protection class IP 69K can also be used in unfavourable ambient conditions, for instance in those areas of foodstuff production, where steam jet or high-pressure cleaning is a common thing. Especially in these areas, the sealed and hence corrosion-resistant magnetic latching offers significant advantages compared to commonly available separate solutions.

#### Tampering and coding: also a standards theme

Not only the manufacturers of safety switchgear, but also the standardisation bodies reacted onto the results of the surveys mentioned above and increased their focus onto tampering protection in their work. In this way, the successor standard of the EN 1088 (“Interlocking devices in combination with separating safety guards – Principles for design and selection”, i.e. EN ISO 14119, explicitly deals with this theme.

The standard, which is currently discussed in the standardisation bodies, contains a graduated concept, which the builder should use as guideline to prevent any reasonably predictable tampering. The standard includes, amongst other things, basic measures such as a secure fixation and protection against the accidental loosening of switches, cams and actuators as well as the coding of separate actuators. Furthermore, a checklist is published together with



**Image 4 (sirss36):** Brand-new: the electronic safety sensor with integrated RFID technology, enabling three different levels of coding.

the standard, which should uncover the stimuli for tampering considered from the point of view of the user.

The draft standard therefore proves that, considered from the point of view of the standardisation bodies, coded safety switchgear are a useful measure to prevent tampering and to increase the machine safety once again. The builder has many options at his disposal, as it is demonstrated by the safety switchgear series described in this article.

#### Authors:

Thomas Dahmen, Head of Product Management, Uwe Richter, Product Manager, K.A. Schmersal GmbH, 42279 Wuppertal