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Virtual protected spaces and networked systems

Trends in machine safety: From hardware to software

In automation technology and in mechanical engineering, functions are increasingly being shifted from hardware to software. This also applies to machinery safety. Aside from software-based safety concepts, however, classical safety devices are still being employed – though these have new mechanical and sensor combinations.

The current trend in robotics sets the course: Small robots can work together (collaborate) with humans without a safety fence separating the working areas. The robots are inherently safe in cases such as these, i.e. they move at a comparatively low speed (safe speed) in defined spaces (safe axis area). In this way, the core competences of robots – fatigue-free repetition of work processes – and workers – intelligence, perception, versatility – can be combined very well.

Virtual safety fences

Similar functions have already been used on "maturer" robots. Some fifteen years ago, the Schmersal Group presented the safety controller, which ensures that the robot can only work within a predefined working space.

Located in this control system is the virtual working area of the robot, which monitors its position and the speed of the axes automatically and with safety in mind. If the forces and speeds are low enough, all the robot axes are kept in a virtual cage. The robot can then interact directly with the human. For example, it can hold a part while a person processes or inspects it. Or it feeds to the person the components that need to be processed. Even opening of the safety fence is possible, e.g. for inserting and removing parts.

Foundation for current safety concepts

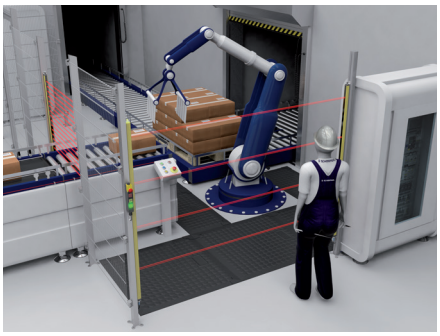
At the same time, the safety controller monitors the speed up to the threshold at all times. This means: The speed can never be so high that, at any time, it would prevent the robot from braking without exiting the permitted movement zone. With this system, the Schmersal Group has done the ground work for some of the safety concepts of human-robot-collaboration (MRK), which are now used by renowned robot manufacturers and which are becoming widespread in the automotive industry.

Setting an example for other applications?

It begs the question, in terms of this development, how safety concepts can become established in other applications and areas of industry as well. The question is even more relevant as there are also other non-mechanical concepts of safeguarding hazard zones and danger areas such as optoelectronic safety devices.
However, all of the signs point to the trusted safety fence maintaining its position in the market of machine safety. Firstly, the separating protection device often does not interfere, which then usually makes it the best solution due to reasons of cost. Secondly, when selecting a safety fence the designer normally has to safeguard other risks, such as run-on movements or parts that could become detached from the machine. In these cases, a safety fence is usually the best choice.

Sensors inside – in solenoid interlocks as well

This means: The safety fence or machine housing with safety door, i.e. the classic separating movable safety device, remains a staple in terms of machine safety. Another reason for this is that safety switchgear employed to monitor the position of safety doors provides interesting newer developments. Borne from electromechanical switchgear



To make the danger zones and hazard areas safe, optoelectronic safety devices are often a wise option – as an alternative to a safety door

are mechatronic system components. For example, monitoring the position of safety doors can be realised equally efficiently with safety sensors. On the latest generation of these contactless switchgear units, the sensor and target communicate with each other via a newly developed safety-orientated principle of detection based on RFID technology. This provides the conditions, among other things, to enable selection between two types of coding depending on the anti-tamper level that is aimed for.

This technology is not only used in safety sensors but also solenoid interlocks. The integrated sensors monitor the position of the safety door here as well as the locking bolt. The combination of mechanics and sensors offers a range of advantages. The RSS sensors detect misalignment of the safety door, for example, and can transmit a relevant signal in good time. This prevents unplanned downtimes of the machine or plant. Furthermore, the safety switchgear can be integrated very easily in safety-orientated communication networks, such as the AS interface "safety at work" bus system. It is likewise possible to

Robot-supported plant systems are widespread in production and packaging. Its working area must be separated from that of the operator – usually by a safety fence

transmit non-safety-relevant information via a dedicated communication standard (SD bus) for diagnostic purposes, for example.

Key topics relating to networking and industrial orientation

These types of networking opportunities that are desired and employed more and more frequently by the machine manufacturer will be in greater demand in future if current talks on Industrie 4.0 are anything to go by. Moreover, the trend towards differentiation is becoming noticeably obvious. There are, as such, solenoid interlocks e.g. for hygiene-sensitive areas that are in high demand above all in the food preparation and packaging industry. The Schmersal program also includes contactless safety switchgear as a result. Thanks to the smooth surfaces of the sensor and actuator, they are easy to clean and can also be mounted discretely.

New products at the SPS IPC Drives 2015

Generally, the constant high demand for safety fences shows that they have in no way reached their shelf life. The working area of most industrial robots will still be protected by this classic safety device in future, too. It is therefore logical for the Schmersal Group to expand its program of mechatronic safety switchgear: At the SPS IPC Drives trade fair, the company will début a new solenoid interlock with electric motor-driven lock for heavy safety doors.

With this new product, too, various technological fields – contactless detection of safety door and bolt position, electric drive, electronic signal evaluation – combine to form a compact unit.

From Schmersal's perspective, this therefore deals with the question that was posed at the beginning: Safety fence or machine housing and safety door will remain the dominant safety devices. However, owing to the combination of mechanics and sensors, this tried and tested measure requires an increasingly high degree of flexibility, functionality and network capability.

Provider of systems and solutions for machine safety

The new technical developments also extend not least the possibility of developing individual and holistic system solutions for mechanical engineering from a safety viewpoint. This development process often includes risk analyses right from the outset as well as safety-related assessments of existing machines and plant systems and does not end with the application-specific programming of safety controls.

Many machine manufacturers would like to delegate this complex task to specialists. With its new business area tec.nicum, the Schmersal Group therefore offers comprehensive consultation services in order to support manufacturers even from the planning phase with the design of individually adapted safety devices, whereupon it supervises the whole process up to a turnkey safety solution following successful integration. As a provider of systems and solutions for machine safety, Schmersal thereby offers everything from one source: Hardware and software, expertise and consulting.

Sensors inside: RSS 260 safety sensor with safety-orientated RFID technology

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