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## To good cooperation between people and robots Safety Services - even for virtual safety fences

**Until now, the rule in automated production was that the working areas of people and robots are strictly separated and robots carry out their work behind safety fences. This rule is increasingly being broken, and for a good reason. When people and robots work together, both can contribute their own strengths - people have intelligence, judgement and flexibility, robots have power and untiring performance when lifting and moving loads.**

The move from strict separation of the working areas to cooperative working systems requires intense preparatory work from both the robot manufacturers and from the system engineers and integrators. This is also down to the fact that, just like conventional systems, these systems also need to comply with all the relevant standards and norms.

The service portfolio of the Schmersal Safety Services division includes supporting design engineers and users of automated production systems in the development of cooperation systems between humans and robots. The certified Functional Safety Engineers can call upon comprehensive experience, for example in risk assessment, in CE conformity assessment procedures and in the configuration of standard-compliant safety systems.



**Safety technology allows new forms of human machine cooperation**

### Virtual safety fences

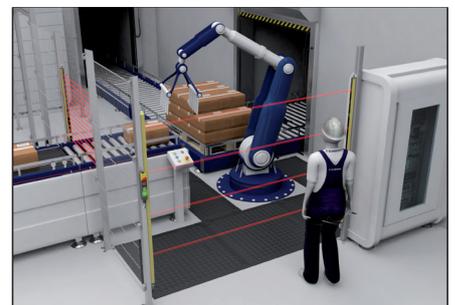
At the same time, the Schmersal Group has comprehensive know-how on cooperative working systems based on around fifteen years of research and development work in this demanding area of machine safety. One of the results of this work is the Safety Controller. It guarantees that the robot can only work within a predefined working space. For this reason, the Safety Controller incorporates what are known as Cartesian cams which form a virtual working space. With the help of the safety controller, the robot then monitors its own position and the speed of the axles. If the forces and speeds are low enough, all the robot axles are kept in a virtual cage and the robot can interact directly with the human. For example, it can hold a part while a person processes or inspects it. From a safety technology perspective, this shifts what were previously hardware functions (safety fence) to software. In terms of human and robot cooperation, this kind of software-based safety system has the advantage that people can reach into defined areas of the safety zone. All the requirements of machine safety, e.g. immediate stoppage in the event of a hazardous situation, are met. At the same time, the Safety Controller monitors the speed towards the limit at all times. This means: The speed can only ever be so fast that the robot can break at any time without leaving the movement zone allowed.

By developing the Safety Controller, Schmersal has laid the foundations for one

of the safety strategies currently used by leading robot manufacturers and which is beginning to really make its mark in the automotive industry (and others). The relevant customer-specific safety controller allows the implementation of functions such as safe axle zone and safe speed.

Initially, the result of this is that electromechanical safety components are not required, and the hazardous area can be made smaller and the safety fence more streamlined. The safety fence only fulfils the function of preventing people entering the hazardous zone and protecting them from, for example, flying objects. The risk of the robot hitting the safety fence no longer needs to be taken into consideration.

At the same time, and this opens up the new opportunities mentioned at the beginning - the safe speed function allows direct cooperation between humans and robots at reduced working speed for the robot. Trend towards integrated solutions The working area of most industrial robots will still be protected by a safety fence in future. But there are also new solutions to this traditional solution.



**01 On trend: Direct human and robot cooperation with a 'virtual' safety fence**

### Statement

Dr Michael Döppert, editor in chief Cooperation between humans and robots is set to take on increasing importance in industrial automation and in the work-flows of future production processes. The technology to allow safe cooperation without a safety fence or even 'hand in hand' work is already in place. There is a place for safety-based systems which shift what were previously hardware functions to software. There is no doubt that human and robot cooperation is best implemented in practice if consultancy is provided by safety experts.

The trend is towards integrated solutions with solenoid interlocks, door handles, door catches and other additional functions such as an auxiliary unlock system which allows the safety door to be opened in the event of a power supply failure. Emergency unlocking is another sensible additional function. It can be used as a panic handle to open the safety door from the inside if personnel are accidentally locked inside the hazard area.

Opto-electronic safety equipment can also be used as an alternative to a safety door. Dual acknowledgement is another safety measure

here which is implemented in the SLC/SLG 440 range of safety light curtains and light grids. To ensure that the robot can be restarted after the safety device is triggered, a command unit within the hazard area and second command unit outside the hazard area need to be actuated within a defined period of time.

### Expert consultancy and training

This means there are various ways of securing robot workstations. The decision on which is best is based on the application, and Schmersal believes that all systems, including safety fences, will retain validity in the market into the future. The optimum embedding of the safety equipment and the safety functions into the production process workflows is key. This is an aspect that the Functional Safety Engineers take into consideration when providing consultancy service. But it is clear that software-based solutions for securing robot workstations have real potential for growth. They are flexible, can be adapted to customer and application-specific requirements and also allow new types of cooperation between humans and robots. For this reason, the Schmersal Group has put together an application engineering team within the Safety Services division manned by software specialists developing customer specific solutions for machine and robot safety.

### Seminar on industrial robot safety

On 26 August, there is a whole-day seminar on „Industrial robots - correct, safe design of humans and systems“ at the Schmersal Group's „tec.nicum“ training centre in Wuppertal. It will include the legal basics for safe use of robots and the safety requirements for robot workstations. The seminar will also cover the new forms of cooperation between humans and robots and an evaluation of them in terms of safety technology.

Further information is available from:  
[www.tecnicum.schmersal.com](http://www.tecnicum.schmersal.com)

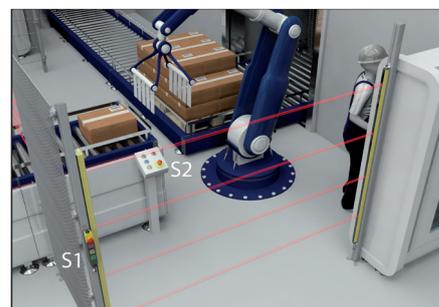


02 A panic handle allows the hazard area to be left if personnel are locked in by accident

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03 Auch optoelektronische Schutzvorrichtungen können zur Absicherung von Roboter-Arbeitsplätzen eingesetzt werden. Die Funktion der doppelten Quittierung schafft dann zusätzliche Sicherheit