

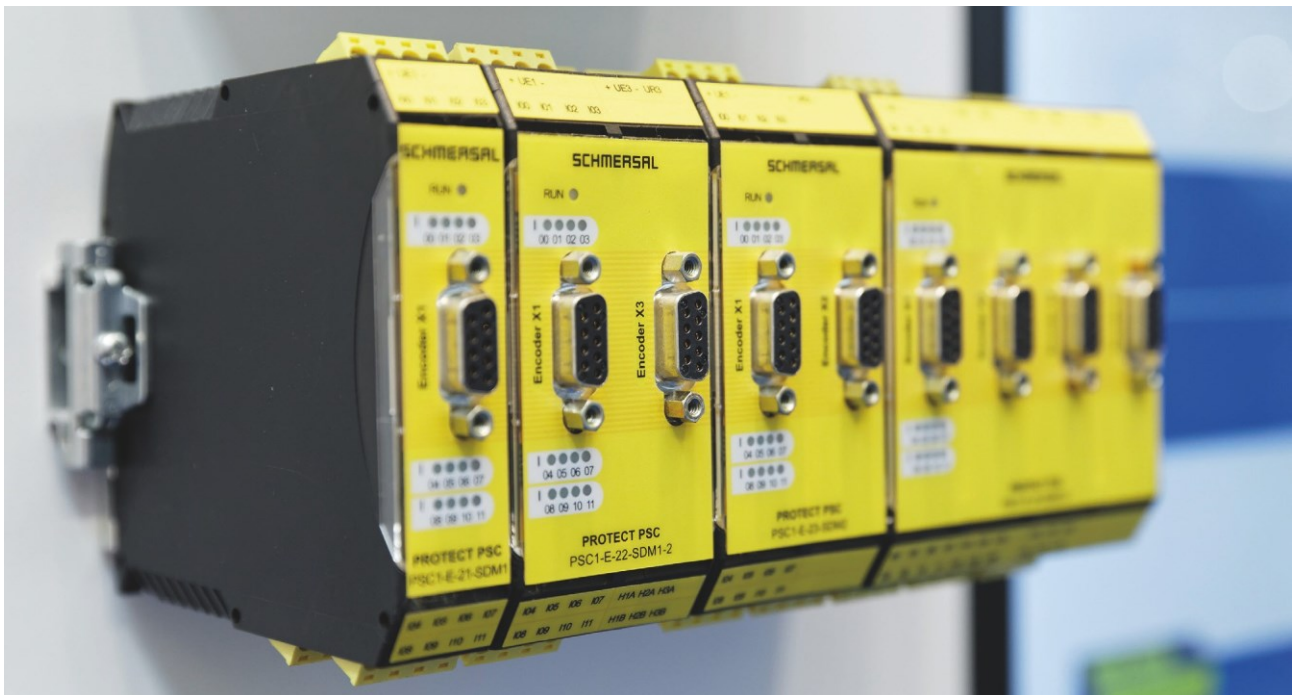


New requirements for machine safety in Industry 4.0

Industry 4.0 would be inconceivable without functional machine safety. But the digital transformation poses new challenges for experts in safety technology. They need to keep up with the rapid pace of technical developments, even in terms of standardisation.

At the same time, safety technology needs to become an integral part of every system, not only to protect the employees from injuries, but also as a tool to increase production efficiency.

Siegfried Rüttger



The modular safety controllers from the PSC product range from Schmersal provide the option of individually configuring flexible protection systems based on software.



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One of the key objectives of Industry 4.0 is improved efficiency, which can be achieved through predictive maintenance, for example. This should also enable improved production planning,

longer running times and increased machine availability. This requires the components used in the machines to be able to generate data and information. Based on the machine and production data



read on an ongoing basis, predictions can be derived on the status of the system. As a rule, these are used to plan service intervals, avoid or minimise production downtime and maximise production turnover. A prerequisite for this is that safety switches can also pass on diagnostic information. This is already happening, one example is RFID-based safety sensors which allow high levels of tolerance to door offset. If the offset limits are reached, the sensors issue an electronic warning signal before the machine shuts down, thus providing information which can be used for preventive maintenance.



The Schmersal Safety Installation Systems (from left to right): the PDM passive distributor module, the PFB passive fieldbox and the SRB-E active input extensions.

Networking is another important element of Industry 4.0: machines and intelligent workpieces will be able to cooperate. Machines and transport systems should be able to make autonomous “decisions” as to whether a subsequent production stage should be delayed or if another welding robot should take over in the event that one fails, for example. Converting production systems or machines to manufacture

different product variants should also be possible on an automated basis without interrupting production processes. New safety engineering solutions need to be developed for these changing production methods.

Dynamic safety solutions

While production previously involved integral system, the safety technology of the future needs to respond to dynamic production units by providing solutions which are just as dynamic. Machine safety functions will therefore increasingly be implemented using programmable safety controllers.

The modular safety controllers in the PSC product range from Schmersal provide the option of configuring flexible custom safety systems on a software basis. There is also safe communication between different PSC controllers



via Ethernet SDDC (Safety Device to Device Communication). This simplifies the design of complex, multi-part plants with interconnected safety sub-systems. In these systems, individual production cells can communicate with one another for safety purposes.

Another advantage of the PSC range is the option of forwarding additional non-secure diagnostic signals via a standard bus system to another automation controller or the IT environment. This means, for example, signals can be evaluated which are relevant to the avoidance of downtimes and increasing plant availability.

Economical solutions for small and medium-sized machines

Of course, the economic viability of safety solutions also needs to be taken into consideration, and not all machines are complex systems. For small and medium-sized systems where the user does not wish to use a bus system at the sensor/actuator level, the Schmersal Safety Installation Systems with an SD interface are a simple installation solution for series connection. This means that non-safety-related diagnostics signals can be transmitted to a standard PLC via the conventional fieldbus system such as Profibus. The new multi-functional relay modules in the Protect SRB-E range from Schmersal offer cost-effective solutions which can be used



With respect to machine safety and Industry 4.0, increased knowledge transfer is required, and this is where tec.nicum, the Schmersal service division, comes in.

in a wide range of applications. Each module has multiple functions, so the customer can simply select the application or function they require. At the same time, Schmersal has a comprehensive range of safety components with built-in AS-i interface. All the major ranges from Schmersal are available with AS-i safety hubs. The benefit of the AS-i safety solutions is that they enable extensive diagnostics options despite minimum cabling.

Standardisation: Safe data via OPC-UA

In the future, machines will be able to send safety-related data to a cloud on a predictive basis. The problem lies in the fact that different protocols have been used in the past for communication between two devices in industrial automation, and these protocols are not compatible with one another. In order for controllers to be able to exchange data with one another and with the cloud, companies are working on integrating OPC UA as the standardised protocol for data exchange in the next generation of their products.

The Schmersal Group also considers

OPC UA will be the future standard for M2M communication protocols, as it not only transports machine data but also allows a semantic description of the data. Although the exchange of non-safety-related data has largely been successfully standardised in line with the OPC-UA model, there is still a need for standardisation for the transfer of safety-related data via the OPC UA protocol. Schmersal is in favour of a joint approach by all manufacturers in the machine safety sector.

The benefit of primarily software based safety solutions are clear: in the future, all safety-related data can be transferred to a cloud and collected there, for example, technical data from sensors, reaction times, safety-critical failure rates, etc. This allows a higher-level computer to analyse the current risk based on this data and determine the measures to be taken to reduce this risk. This will allow future safety solutions to be simply adapted to flexible, dynamic production units and machines.

Adapting the standards to Industry 4.0

But all this is still in the future. There are some hurdles to be overcome first. For example, increases in software-based safety solutions will lead to another group of personnel, the programmers, having to get to grips with the subject of safety. Many design engineers have already been trained in the current hardware solutions in the safety technology sector. This has led to a reduction in error frequency. Machine manufacturers and users implementing safety-driven software solutions also need to familiarise their IT experts in the safety requirements. Clear standards and regulations are helpful in this respect. The amended DIN EN ISO 138491-1:2016 does not include detailed quantifiable aspects such as error prevention in development and in software. However, further development and adaptation of the standards is necessary in order to take the new requirements of Industry 4.0 into consideration. In all cases, strong knowledge transfer is necessary around the topics of machine safety and Industry 4.0. The Schmersal Group has considered this development with the foundation of its services division: “tec.nicum” offers machine constructors and operators not only training and manufacturer-neutral advice, but also programming of the safety software.

Knowledge transfer and use cases

In order to support machine manufacturers and users on the introduction of digital future technologies with automation and safety-driven solution strategies and provide expert advice, Schmersal has set itself the objective of permanently expanding its own expertise. It is especially important for experts in machine safety to be at the cutting edge of technology. In order to achieve the best possible safety solution from an economic perspective, machine safety specialists should be involved as early as the design phase of machine and plant construction. As a member of the ZVEI, the VDMA and the initiatives “Mechanical Engineering Future Alliance” and LNI4.0 Labs Network Industry 4.0, the Schmersal Group can benefit from information exchange in these interdisciplinary expert and working groups made up of representatives from mechanical engineering, applied research and the supplier industries. The companies in these networks also work together on specific use cases.

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