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tec.nicum

The Wind of Change

An old Chinese proverb says that when the wind of change blows, some build walls and others build windmills. It's blowing strong throughout this issue of MRL News – starting with our new look. Not only the MRL News got a new design, but also the tec.nicum in general. On the opposite page, you can find out why we took this step.

It was long overdue to revise the Machinery Directive, which is now becoming the EU Machinery Regulation and introduces some positive features, such as a digital user manual. Read more on page 14.

And that's not all the EU Commission is working on – they have now also presented a draft for an AI regulation. The practical implications of this are discussed in an article on page 18.

An increased e-mobility is one of the changes we need to reduce CO_2 emissions and minimize the effects of climate change. As a result, however, more and more batteries are being produced, the production of which involves a high risk exposure. Read on page 4 how this can be limited.

Two new sector managers support the Schmersal Group in the areas of logistics and food and pharmaceuticals. Meet them on page 20.

Next, we present a practical example of what to do when standards change during the course of a project (page 16).

And finally, as always, a preview of the new seminar program.

Enjoy your reading!

Sincerely

Your Editorial Team

New Look Stands for Openness and Precision

tec.nicum with a new Design

About seven years ago, tec.nicum was founded as a service division of the Schmersal Group. Since that time, tec.nicum has developed extremely successfully with two to three-digit annual growth rates. Now it's time to brush up on our appearance. Therefore you will notice that not only the MRL News appears with a new layout, colors and logo, but also our website tecnicum.com and other media are presented in a new look.

One goal in revising the corporate design was to emphasize the characteristic of the tec.nicum brand. After all, our organization is now active in many different locations, both national and international, and a high level of brand recognition is therefore of great importance to us. We claim that the services we offer to our customers are open and personal, solution-oriented, thorough and precise. These are exactly the qualities that should be reflected in our visual appearance.

We have chosen the "Neue Haas Grotesk" as our new corporate typeface. It is sans serif and straightforward and, being a technical typeface with a distinctive and clear style, it is very easy to read. In addition, turquoise is the new corporate color. The refreshing color turquoise stands for mental openness, inspiration and clarity. What is more, the color is often associated with humor, honesty and prudence.

In addition, we pursued another important goal in the enhancement of the tec.nicum presence: The connection between the individual organizational units will be more clearly expressed. Thus, the tec.nicum still acts independently and the manufacturer-independent consulting of our customers is still part of our hallmark, but in organizational terms, the tec.nicum is part of the Schmersal Group. Therefore, the new tec.nicum logo is usually used with the addition of "Schmersal Group". The consultants of omnicon engineering GmbH, which will continue to operate under its previous name after the acquisition by the Schmersal Group in 2019, is part of tec.nicum as an organizational unit. Therefore, in the new logo omnicon appears as a sub-brand of tec.nicum.

So the appearance of tec.nicum is new – but the quality of our services and our rigorous customer orientation has not changed. ■

Be it cars or bicycles – the areas of application are diverse and the demand for batteries is booming. However, special safety requirements must be observed in battery production due to the high potential risk.

A High Risk Exposure

Safety Requirements in Battery Production

I still remember my apprenticeship as an electrician over 30 years ago. There were exactly two cordless screwdrivers in the entire company. These cost a small fortune and were in high demand among the 80 workers, especially when it came to the typical basement and utility duct installations, which involved screwing hundreds of feet of cable duct to walls or ceilings. Today, cordless drills are mass-produced goods and two or three times a year they are part of the must-have range at all major discounters. While in the “old world” of rechargeable batteries only small outputs were possible due to the use of NiCd or NiMH and thus the range of application was limited, today you hardly see any limitations. Chisel hammers, lawn mowers, circular saws and chain saws, all available with powerful lithium-ion batteries.

In other areas, we see in various applications, such as electric bicycles, hybrid vehicles, all-electric cars and supercars, PV home storage to grid stabilization systems, that scaling from a few watts to the megawatt range is feasible. As a result, the battery segment is currently one of the fastest growing markets in the world. While the production of secondary cells used to be largely concentrated in the Far East, mainly Korea, Japan and China, today not only the assembly of battery systems but also increasingly cell production is being established in Germany and Europe.

However, since the end product “battery” poses special risks for the production environment and, of course, also for the personnel, special safety requirements for the production systems and the production environment for the manufacture of cells, stacks, modules and battery systems must be taken into account already in the planning stage.

Personal Injuries and High Economic Damages

Lithium-ion battery cells, used here for simplicity as a synonym for all major Li cell chemistries, such as LCO, LFP, LMO, NCA, NMC, present different hazards, which in turn have different levels of potential risk. Some hazards are to be applied to rarely assumed abnormal conditions, while others are permanently present, even without special conditions. Furthermore, the hazards differ in the level of damage impact and their radius of effect. In general, personal injuries as well as high economic damages are to be assumed for the production environment. Of course, in addition to the battery-specific hazards, there are also the usual hazards in machine production technology, which must be safeguarded using the well-known machine safety strategies.

Generally existing hazards:

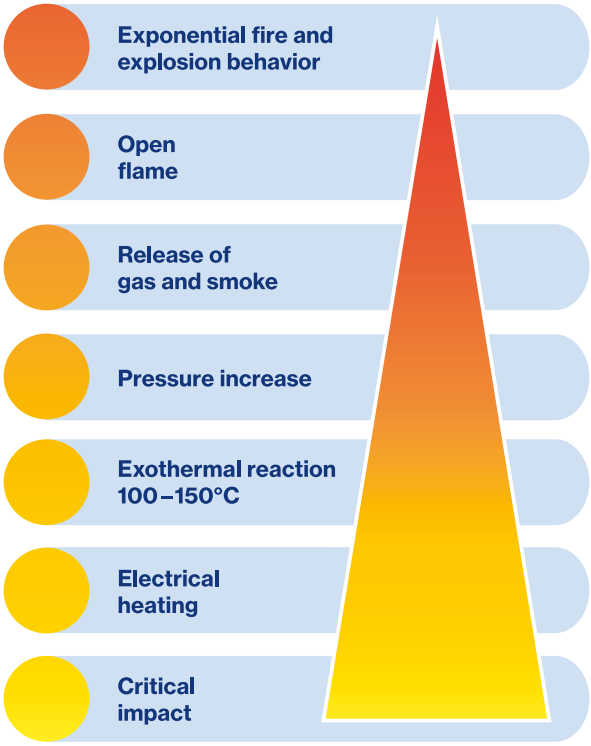
- Electrical hazard due to critical voltages (high-voltage hazards) in case of direct and indirect contact
- Electrical hazard due to short-circuiting
- Danger due to electrolytes released from battery cells
- Fire hazard*
- Explosion hazard*
- Danger from outgassing and fumes*
- Contamination of the production environment by fire products and by extinguishing agents*

* These hazards under the aggravated setting condition of very difficult extinguishability.* →

Chemical substances in the battery cell: reactive, toxic and flammable

The operating principle of the Li-ion cell is converting chemical energy into electrical energy. For the charging process, this procedure is reversed. Usually, the secondary cells are partially charged during transport, storage and assembly.

The chemical substances in the battery cell, some of which are reactive, toxic and flammable, and which also have a very high energy density, present a high potential risk. In certain conditions, the battery cell may enter an uncontrolled state of "thermal runaway". This is a self-reinforcing exothermic chemical reaction, which can quickly reach very high temperatures. It can be assumed that this releases approximately 7 to 11 times the electrically stored energy. This is followed by a fire and/or explosion scenario in which large quantities of toxic gases, smoke, dusts and electrolytes are rapidly spread.



Possible reasons for a "thermal runaway" are:

- Mechanical impact on the cell
- Overload and short-circuit
- Internal defects in the cell (e.g., micro-defects in the separator membrane).

In case of a "thermal runaway" evacuation is mandatory

Local, delimitable effects. As the radius of action increases, e.g. the entire production hall or a fire zone, it is no longer just individual employees who are at risk, but a large number of employees. Evacuation of the entire production area is mandatory in the event of an accident.

Also, the production area cannot be used immediately after the actual accident. Parts of buildings and facilities, even if not directly affected by the fire, must be extensively cleaned and decontaminated.

Risk assessment must include high level of damage

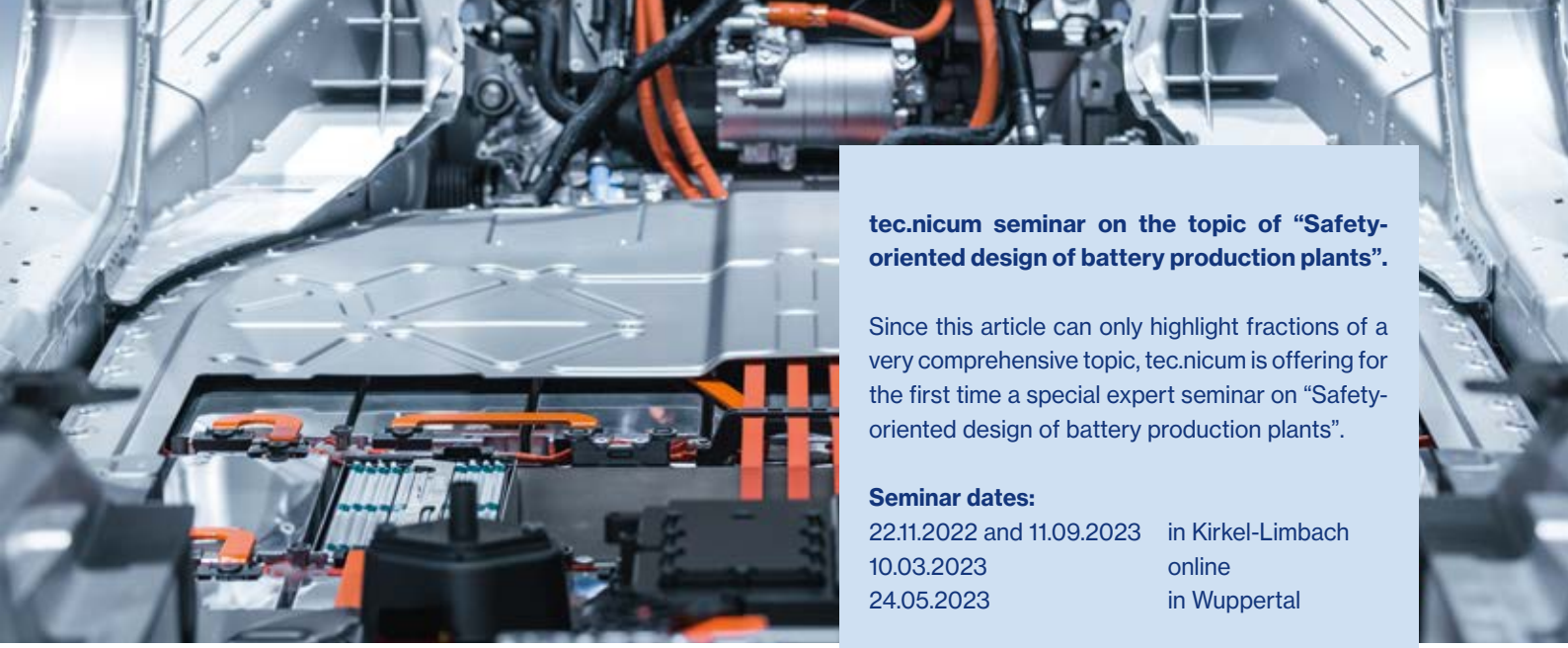
For risk assessment, this means that the common risk graphs used in machine safety are soon undersized for the parameter "severity of damage effects", since the scale here usually ends with individual fatalities and medium economic damage. This means that in the event of an accident, the number of employees at risk and the very high economic losses that can be assumed can no longer be mapped correctly. Hence, in the assessment an extension of the damage extent to the upper end is mandatory!

Likewise, for the individual construction stages of the battery, the energy content and the sensitivity of the assembly of the battery or battery cell must be taken into account. For example, a completed battery module with five stacks of ten cells each would have a significantly higher (critical) amount of energy, but would already be very well protected from mechanical effects e.g. by the metal protective housing. The single pouch cell, on the other hand, would have a much less critical energy content, but is very sensitive and virtually completely unprotected from mechanical influences. A „simple" drop of the pouch cell on the floor or on an awkward structural part of the machine can already cause a "thermal runaway".

Another consideration in risk assessment is the production technologies with which the battery cells or battery assemblies correspond: Picking, stacking, aligning, cleaning, bending/cutting contacts, joining and pressing, bonding, laser welding, spraying out with filler, screwing ...

Certainly, an industrial robot that has to insert battery cells into a protective housing under pressure has a much higher risk than a force/displacement-controlled joining axis. Similarly, the pick-up of a pouch cell via a vacuum gripper is more critical than the keyed pick-up by a spring-loaded clamp.

The principle of an inherently safe design must be taken into account consistently and throughout! →



Generally, the entire production must be designed according to the following accident assumptions:

1. Avoid damage to battery components
   - Apply inherently effective principles
   - Implement protective measures when fault conditions in the Production technology may jeopardize the battery components.
2. Detect damaged battery components as soon as possible.
3. Remove damaged battery components from pro duction, isolate them (e.g. in damage containers) and move them out of the production area.
4. Should 3 be impossible: prevent “thermal runaway” of battery components.
5. Should 4 be impossible: evacuate the facility immediately and limit the effects of the accident as far as possible and wait for the fire fighters to arrive.

It is also essential to have a special production infrastructure and organization in order to be prepared for an accident. This has to be implemented in parallel and in accordance with the plant design. For example, special functional positions such as accident and emergency officer and HV officer must be created, as well as the implementation of emergency and evacuation exercises (with and without fire department) or special training under various emergency conditions in order to release and isolate battery components from production. ■

tec.nicum seminar on the topic of “Safety-oriented design of battery production plants”.

Since this article can only highlight fractions of a very comprehensive topic, tec.nicum is offering for the first time a special expert seminar on “Safety-oriented design of battery production plants”.

Seminar dates:

22.11.2022 and 11.09.2023	in Kirkel-Limbach
10.03.2023	online
24.05.2023	in Wuppertal

More dates on request

Speaker:
Dipl.-Ing. (FH) Ulrich Hochrein

Further information and registration at this link:
www.tecnicum.com/academy

Author: Ulrich Hochrein

Head of Safety Engineering Services, EDAG Production Solutions
Ulrich Hochrein is a sought-after expert for product safety and occupational safety. His consulting focus includes all industries and ranges from the preparation of safety concepts risk assessments and calculations to the preparation of certifications at NB.

https://www.edag.com/de/safet

With more than 750 standards currently harmonized under the Machinery Directive, it is not always easy to identify the standard or standards applicable to a particular machine. Step by step to the proper standard ...

Harmonized Standards in Mechanical and Plant Engineering

Standards within the Scope of the Machinery Directive 2006/42/EC

Mechanical and plant engineering is very diverse and constantly presents the manufacturer with major challenges. These do not always have to be exclusively technically complex issues. Often it is only a matter of an initial fundamental decision at the beginning of a development process, which however can have a considerable influence on the further course of the project.

For instance, the Machinery Directive requires that the manufacturer of a machine must carry out a risk assessment, on the basis of which he must then design and build the machine. However, apart from the basic general requirements, the Machinery Directive itself does not contain any specific requirements or assistance for providing structured evidence with regard to compliance with the essential health and safety requirements listed in Annex I. This is precisely where the European standardization comes in. But which standards are there and which of them apply to my machine? First of all, one step at a time!

With the introduction of the first Machinery Directive in the mid-1990s and in order to implement the contained protection targets, it became necessary to establish a corresponding safety-oriented standardization concept to assist manufacturers in meeting these requirements. The concept, which had already been developed on a European level in the 1980s and has since been implemented internationally, essentially provides for three categories of standards.

- **Type A standards**
  Basic Safety Standards – cover basic concepts, design principles, and general aspects that can be applied to machinery.

- **Type B standards**
  Generic Safety Standards – cover safety aspects or one type of safeguard that can be used across a wide range of machinery.
  However, these are further subdivided into:
  - **Type B1** standards for particular safety aspects (e.g. functional safety, safety clearances, noise)
  - **Type B2** standards for safeguards (e.g. interlocking devices, separating protective devices, emergency stop)

- **Type C Standards**
  Machine Safety Standards – cover safety requirements for a particular machine or group of machines.

Although the basic structure of this standardization is based on a hierarchical principle, when in doubt it follows the “lex specialis” principle. Accordingly, subordinate standards such as a Type C standard take precedence over a Type B1 standard if this Type C standard specifies certain facts from a superordinate standard and thus reflects them more precisely.

One standard that illustrates this fact particularly well is EN ISO 13849-1 – Safety-related parts of control systems. To determine the required performance of a safety function, the so-called “required performance level” PLr can be easily determined using a contained diagram.

However, it must be emphasized at this point that despite all the accuracy and care taken in the “manual” determination of a PLr, in the end it is always a subjective classification by the designer, which is essentially based on his knowledge and experience. If a type C standard is available for the machine or machine type to be considered, which already contains a specific PLr for the safety function to be implemented, this must be referred to by the designer. This is especially true if the PLr contained in the Type C standard is higher than that determined by the designer.

On the other hand, an increase in the PLr by the designer (e.g. from PLr=d to PLr=e) compared to the PLr specified in the standard is generally considered to be uncritical. However, it is always advisable to justify and document such deviations from a standard if you later want to base your CE marking on this standard.

If the manufacturer reaches the point where the question arises as to which standards are applicable to his machine, the relevant Official Journal of the European Union must be consulted. The listed standards always refer to the directive (in this case the Machinery Directive) under which they were published. On March 18, 2019, the Official Journal of the European Union published Implementing Decision 2019/436, which updates the list of harmonized standards giving rise to presumption of conformity under the Machinery Directive 2006/42/EC. →

What is new is that only the changes compared to the last published list have been included here. This new approach by the European Union presents the machine manufacturer with the challenge that they must now always read and compare this implementing decision in combination with the most recent consolidated list of harmonized standards.

Since then, several follow-up notices have already been published. With more than 750 standards currently harmonized under the Machinery Directive, it is therefore not always easy to identify the standard or standards applicable to their machine.

The experts at tec.nicum are happy to support you at this point with their many years of diversified experience gained in countless projects in the field of mechanical and plant engineering. Just contact us if you have any questions. We are confident that we can provide you with the support you need. ■

Tobias Keller
Global Safety Consulting Coordinator
in tec.nicum of the Schmersal Group

Series Connection of Sensors with Regard to Fault Detection

High performance level with low wiring effort

The series connection of sensors on machines and systems reduces the wiring effort and results in significant cost savings. But what are the possibilities for detecting faults – especially when using electromechanical or potential-free sensors?

Especially in the packaging industry, you often see machines with numerous access doors that allow for easy access by the operator. Thus, in the event of a malfunction, a fault can be efficiently eliminated. To protect the operator during this access to the hazardous area, it must be ensured in the simplest case that the machine is safely shut down when a safety door is open. This requirement is generally identical for all access points to the machine, so the same safety function as defined in DIN EN ISO 13849-1(*3) is implemented regardless of the specific door.

With traditional parallel wiring, the sensors for position monitoring would be individually wired to the logic, combined with logical AND, and then act on the same motion component, for example an actuator.

The series connection (often referred to as 'daisy-chaining') shifts this AND operation to the wiring level and thus out of the evaluation logic. Thus, the safe outputs of the sensors are wired to corresponding safe inputs of the respective neighboring sensor. Only if all sensors are in a safe state, the resulting signal – which is evaluated in the safety logic – also bears this state. Any open switch interrupts this chain and hence changes the switching state of the entire chain.

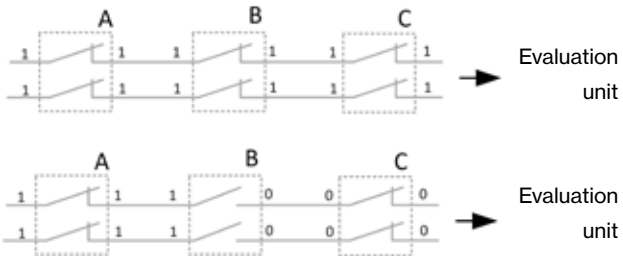
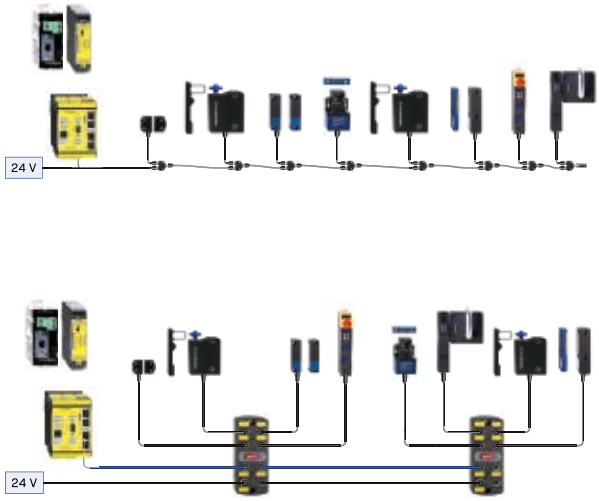


Image: Schematic representation of the logical states in a series connection

What advantages does such a series connection offer to the user? First and foremost, this is associated with cost savings. Compared to parallel wiring, significantly fewer safe inputs are required for the evaluation unit, which can therefore be selected to be more compact and thus generally more cost-effective. In addition, most manufacturers offer appropriate wiring concepts for their series connection. These allow the use of prefabricated connecting cables with coded connectors. This reduces the wiring effort and the required cable length, while potential errors during wiring are minimized, as the possibility of getting 'jammed' is drastically cut out.



Schmersal wiring systems

At first sight, a disadvantage of the series connection is a loss of information. For example, the state of the individual doors in our example – whether open or closed – is not visible when they are connected in series. A remedy would be to wire the diagnostic output of the safety switches in parallel to the evaluation unit or superordinate (process) control. However, this would counteract the advantages of series connection described above. →

A solution here would be communication channels that supply the status of the sensors, often together with other diagnostic information, to the higher-level controller via a gateway. One example is the Serial Diagnostics (SD) from Schmersal. This allows up to 31 devices to be interconnected and diagnostic information (e.g. door status, sensing distances) to be forwarded.

When it comes to safety considerations, two questions often arise:

- Does the series connection reduce the PL of my safety function?
- How many door security sensors can I connect in series without reducing the PL?

The normative framework is provided by DIN EN ISO 14119(*1) (Interlocking devices associated with guards). Besides other aspects to be considered in the design, such as overtravel of the hazardous machine movement or measures to reduce the incentive to bypass the protective measure, chapter 8.6 also deals with the series connection of interlocking devices. In particular, a possible error overlapping when using electromechanical or potential-free sensors is described here, its effect on the diagnostic coverage and thus also on the possible performance level. Electronic sensors are usually not affected. These usually include the error detection inside the device. An error can therefore only be acknowledged directly on the device. Therefore, resetting a fault is independent of the status of the other safety doors.

The standard is based on the assumption that in the course of troubleshooting or fault finding, the operator statistically opens different accesses and can thus falsely acknowledge a fault in the safety evaluation.

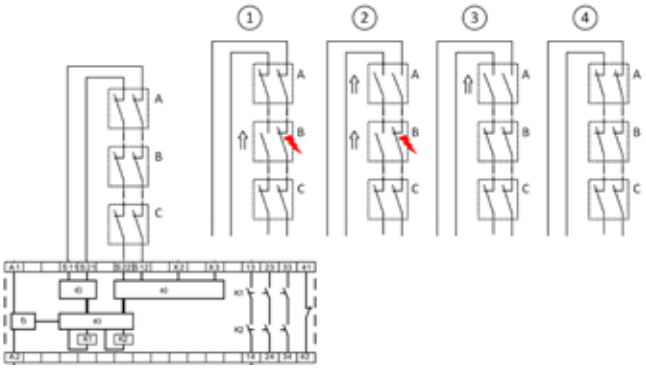


Image: Schematic representation of unintentional acknowledgment

We are looking at a series connection of three electromechanical switches. If switch B is opened and an error occurs, this is detected by the evaluation unit at the latest when switch B is closed (1). But if the operator also opens door A (2) in the course of troubleshooting, the evaluation unit sees a valid state. If door B (3) and then door A are closed one after the other (4), the error is acknowledged because the signal sequence from the logic point of view is correct.

Such a scenario cannot be excluded by the principle of positive opening alone, since such a fault can occur not only due to a defective contact element, but also due to other influences, for example a broken cable or a wiring fault.

In addition, DIN EN ISO 14119 refers to the technical report ISO/TR 24119(*2). Here, among other things, a procedure to avoid this problem is described. As a first step, it should be assessed whether an improvement of the cabling (to enable fault exclusion according to DIN EN ISO 13849-2 (*4) table D.4) or a changeover to other sensors is feasible. If this is technically→

too complex or impossible for budget reasons, ISO/TR 24119 describes a procedure to estimate the effect of the reduction of the diagnostic coverage (DC) and thus the reduction of the achievable performance level.

This method takes into account the absolute number of accesses, but also their distance from each other, as well as the number of accesses to be opened regularly. Regularly means here that the safety function is requested at least once per hour, i.e. when an operator is present in the hazardous area. First, three steps are used to estimate the probability that an error overlap may occur. Based on this probability value, tables then provide a maximum possible DC value depending on the wiring and other diagnostic measures. Of practical importance here is the fact that for many constellations a DC of 0% is given. This means that PLd or PLe cannot be achieved despite the 2-channel structure. Already from category 2 on, a DCavg of at least 'low' is required (see e.g. DIN EN ISO 13849-1 table 10). ■

Conclusion:

The standard committees placed high demands on the series connection of (electromechanical) safety switches. A very simple solution would be to switch to electronic safety switches. Due to the fault detection integrated in the sensors, they can be connected in series almost at will. The cumulative reaction time and pfhD values must of course be taken into account here. If communication interfaces are used, the usable address width often also limits the maximum number. Furthermore, voltage drops across the line must not be disregarded. In practice, however, the above restrictions should prevent use only in very few cases, and due to the typically very small values (order of magnitude 10-9) of electronic safety switches, also the achievable PL is virtually not reduced. Another advantage: electronic safety sensors with RFID technology offer a smart approach to meeting the requirements of DIN EN ISO 14119 on the subject of tampering, but that is a different topic ...

(*1) DIN EN ISO 14119: Safety of machinery – Interlocking devices associated with guards – Principles for design and selection
(*2) ISO/TR 24119: Safety of machinery – Evaluation of fault masking serial connection of interlocking devices associated with guards with potential free contacts
(*3) DIN EN ISO 13849-1: Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design
(*4) DIN EN ISO 13849-2: Safety of machinery – Safety-related parts of control systems – Part 2: Validation

Christian Lumpe
Product Manager Controllers, Schmersal Group

The revision of the Machinery Directive 2006/42/EC was almost overdue after the market has changed significantly in recent years. New technologies have emerged and so have new risks.

Interesting Aspects of the new EU Machinery Directive from a Manufacturer‘s Point of View

Reviewed Machinery Directive 2006/42/EC

The draft of the new EU machinery regulation has been prepared in the meantime and the directive will become a regulation in the future. This fact alone entails a whole pile of changes, because the document was adapted to the guidelines of the NLF (New Legislative Framework). This results in a new structure. For example: Today‘s Annex IV becomes Annex I and the former Annex I has been moved into Annex III.

Not too much has changed in terms of the existing safety-related requirements for machines, at least not for “simple machines”. Rather, requirements have been added that have resulted from developments in recent years.

The situation is partly different for products listed in today‘s Annex IV, as these may be subject to a type examination in the future.

Security requirements for cyber security were also newly included. Unfortunately, there will probably be no alignment with the new AI regulation before publication, so there could be some overlap from the two regulations.

Long awaited and finally possible: the digital operating manual! Yet the euphoria on the part of the manufacturers is immediately thwarted considerably, because at the buyer‘s request, the manuals are to be provided in paper free of charge (for a certain period of time). Hence, it’s an important step in the right direction, but not a milestone.

A hot topic of recent years was also addressed: the “Substantial Change”. Historically, the topic was dealt with nationally by the German Federal Ministry of Labor and Social Affairs (BMAS) in the interpretation paper on “Substantial Modification of Machinery”. Mostly, a detailed examination revealed only very rarely “significant changes” and if they involved “normal modifications”, →

they were implemented in accordance with the state of the art as defined by the German Ordinance on Industrial Safety and Health (Betriebssicherheitsverordnung).

According to the draft Machinery Ordinance, a machine that is retrofitted physically or digitally in a way not intended by the manufacturer, and which may result in the machine no longer meeting the relevant essential health and safety requirements, is to be considered "substantially modified". Initially, the consideration refers only to the part that has been changed. For this modified part, a conformity assessment has to be carried out and the safety has to be restored according to the current state of the art. In addition, it shall be the responsibility of the person making the substantial change to demonstrate that the change does not affect the machine product as a whole.

From the perspective of machine manufacturers, this clarification and approach should be a blessing. For machine owners, this classification can become a challenge. Especially since maintenance personnel (who very often perform the retrofits) do not always feel at home in the world of standards and functional safety of control systems.

Again, your shock as an owner should not be quite so big if you have TRBS-1115 "Safety-relevant measuring, control and regulating equipment" from March 2021 on your radar. However, the experience of the last months has shown that this TRBS is often unknown.

The revision of the harmonized standards is also still uncertain at the moment. Some consolation may be that there is a 36-month interim period until the Machinery Directive 2006/42/EC is withdrawn, and also a 60-month period for type examination certificates. ■

Jürgen Heimann
Lecturer, omnicon engineering GmbH
Siegfried Wolf
Head of tec.nicum academy & tec.nicum consulting

Conclusion:

The new Machinery Regulation will close some loopholes, even if it will not make all market players happy. Machine owners will have to take a new perspective due to the new "substantial change" passage. Here, the wheel should turn a bit faster with regard to the conversions that are sometimes necessary in practice. This in turn means that employees and responsible persons must be qualified accordingly.

Therefore, we at tec.nicum are eagerly awaiting the final version of the new EU Machinery Regulation and hope that it will produce clear regulations.

The tec.nicum is constantly following the developments on the new EU machinery regulation and supports its customers with consultations, trainings and with services on the subject of "machinery and plant safety".

Important! Change in an ongoing project

Practical Application of new Standards based on a Project Example

Even under normal circumstances, it is difficult to maintain an overview in the jungle of standards. However, when standards are changed during an ongoing project, particularly close attention is required. Using the example of a storage & retrieval machine manufacturer, we show how tec.nicum can support machine manufacturers in the compliant implementation of safety functions.

Which documents do I have to create according to the Machinery Directive? I have ordered a machine from China, am I now a distributor? Can I achieve performance level (PL) d with your switch? These and many other questions about machine safety are part of the daily routine of the safety consultants at tec.nicum. The services offered by tec.nicum are as heterogeneous as its customers. Some companies already have a lot of experience with this complex topic and simply need a qualified opinion or a partner for certain project work. For other customers, the topic of machine safety is completely new and they therefore require comprehensive support.

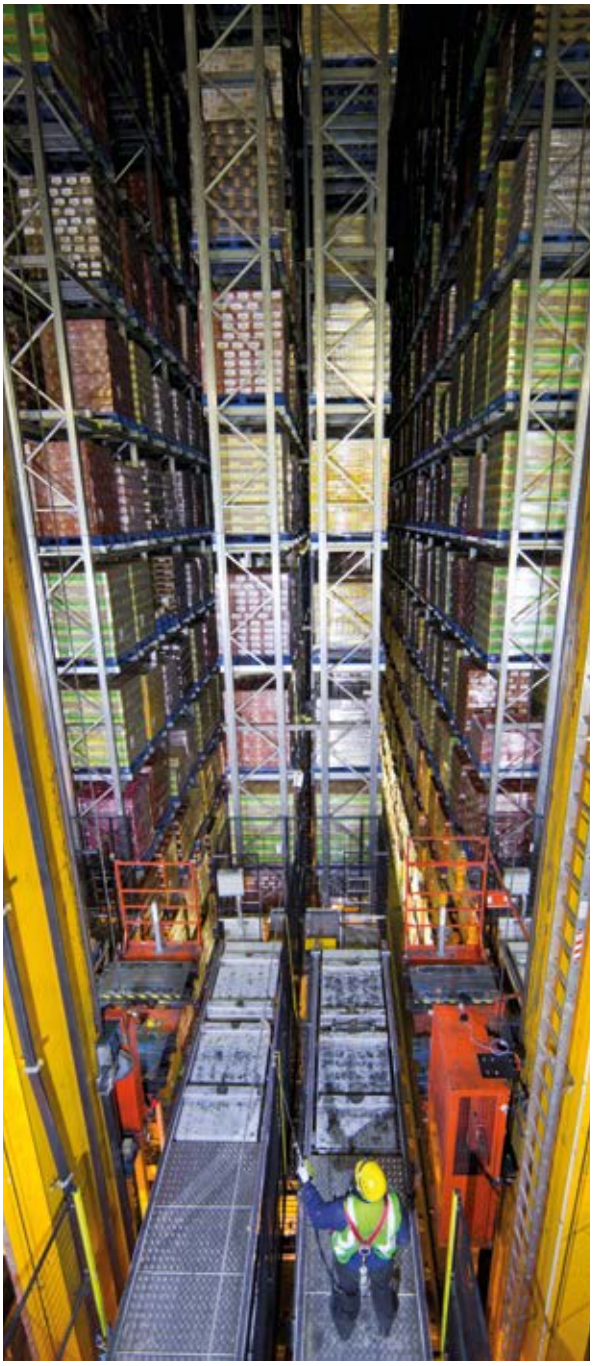
tec.nicum has divided its range of services into demand-driven modules that customers can order according to their individual requirements – from answering individual questions as part of the tec.nicum support ticket to a complete package comprising risk assessment, planning, integration, commissioning and documentation.

Practical example: modified standard for storage & retrieval machines

tec.nicum also supports its customers in the correct implementation of modified standards – as shown by the example of a manufacturer of storage & retrieval (S/R) machines. For S/R machines, there is a machine-specific C standard, EN 528, which is harmonized under the Machinery Directive (MD).

Since the company was producing this machine category for the first time, extensive consultation was desired. Various safety meetings were therefore held to define a strategic process that included all the necessary steps up to the compliant machine.

As part of the project, tec.nicum together with the manufacturer carried out a risk assessment, verified or amended the safety concept in accordance with



the C standard, documented the functional safety with specification of the safety functions (SF), illustrated the SF with schematic diagrams and block diagrams, and carried out the SISTEMA calculation for each SF. In addition, the tec.nicum team worked with the S/R machine manufacturer to prepare the assembly instructions and performed the electrical safety check and documentation, as well as EMC measurements and functional device tests according to the EN 528 checklist. →

In the course of the project, however, it turned out that the standards committee had prepared a draft for a new EN 528 in 2019. For example, the correct application of DIN EN ISO 13849 has been incorporated into EN 528, and structural and technical improvements have been made that were necessary according to the state of the art.

The tec.nicum team analyzed the contents and highlighted the differences to the currently applicable standard. In particular, the technical changes due to new standard requirements were worked out so that the manufacturer could develop appropriate solutions. For example, the old standard required 19 safety functions – but the new standard requires 34 safety functions. Therefore, comparison lists of the standards versions with change analyses were prepared.

In the past, the tec.nicum consultants have found that the valid standard may include some final changes. Therefore, the documents according to MRL, such as the risk assessment and the assembly instructions, have not yet been adapted. Only after the announcement of the new standard version 2021, the documents were changed to comply with the new standard. In fact, there were still significant changes, also in the chapter structure.

Afterwards, the tec.nicum team supported the S/R machine manufacturer in the adaptation of the safety concept and the development of new safety functions. The tec.nicum experts examined whether the required SF could be realized with the existing technical means. For some, this was not the case; for example, to implement a new SF that was not previously required, a new sensor had to be engineered and installed. Overall, however, not all safety functions of the new standard (and not all of the old standard either) had to be implemented, as this manufacturer‘s S/R machine had no repositioning device and no operator‘s platform.

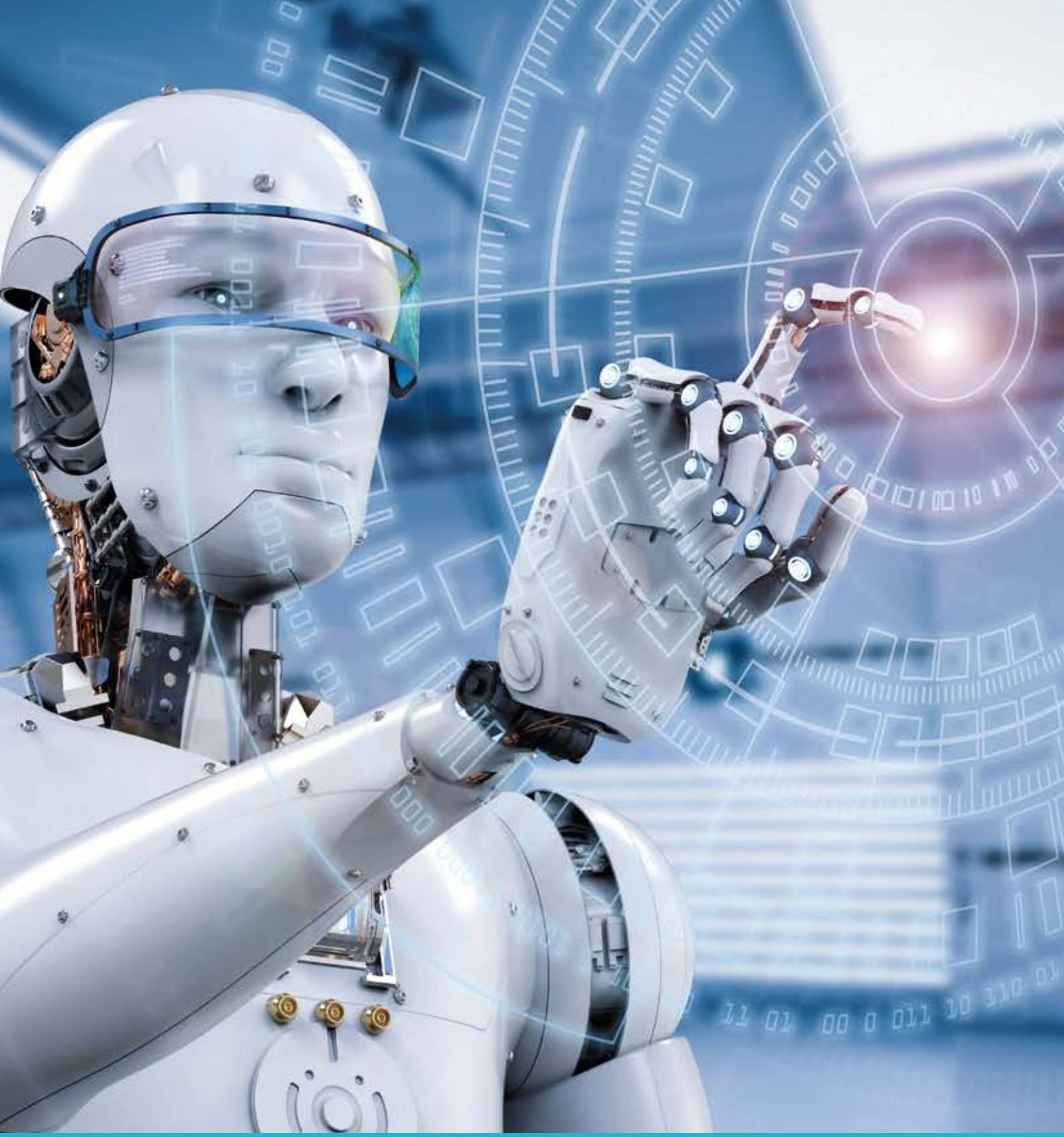
Thus, the specialists at tec.nicum supported the manufacturer in implementing exactly those safety functions that are required under the amended standard without over-equipping the machine with too many safety-related components. ■

Manfred Janasek
Senior Safety Consultant , tec.nicum

In addition to this particular C standard for S/R machines, there are several other commonly used standards that are currently under revision, for example:

- **DIN EN ISO 13849-1:2021-08** – Draft
  Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design
- **DIN EN ISO 10218-1:2021-09** – Draft
  Robotics - Safety requirements - Part 1: Industrial robots
- **DIN EN ISO 10218-2:2021-03** – Draft
  Robotics – Safety requirements for robot systems in an industrial environment – Part 2: Robot systems, robot applications and robot cells integration

Here, too, the experts at tec.nicum can assist mechanical engineers with their specialist knowledge.



Artificial intelligence (AI) deals with the automation of intelligent behavior and machine learning and is considered a technology of the future across all industries –- be it mechanical engineering or the automotive industry. At the same time, AI comes with risks. The EU Commission has meanwhile presented a draft AI regulation. The aim is to regulate the development and use of AI so that it is in line with EU values, fundamental rights and principles.

European Union presents a Draft AI Directive

Artificial intelligence: high requirements for high-risk applications

Artificial intelligence (AI) is designed to help solve real-world application problems. In this context, AI supports humans in both decision-making processes and work processes. On April 21, 2021, the EU Commission proposed a first draft of an AI regulation that classifies AI systems. The aim is to ensure that AI systems on the EU market are safe and that fundamental rights and EU values are respected. Besides a domestic market for secure and trustworthy AI systems, a legally secure framework for AI systems is to be created. This is intended to encourage innovation and investment in the development of AI systems.

The AI Regulation takes a risk-based approach. The higher the potential hazards in an application area, the higher the regulatory requirements for the AI system. A special focus in the AI regulation is therefore on the so-called high-risk applications.

These high-risk applications are listed in Annex III of the AI Regulation:

- Biometric identification and categorization of individuals,
- Management and operation of critical infrastructure (gas, water, electricity, etc.),
- Education and employment,
- Judiciary and law enforcement,
- Administration of democratic processes,
- Border control, migration and asylum
- Accessibility and utilization of basic private and public services (e.g., benefits approval or reduction, credit score/credit evaluation, medical services).

The AI Regulation imposes special requirements on these high-risk applications. For example, these applications should be resilient to risks associated with system boundaries. Applications should be protected against malicious activities that lead to dangerous or otherwise undesirable behavior. Applications must be brought into compliance with data privacy, consumer protection, anti-discrimination laws, and gender equity.

Basically, the AI Regulation names a total of four risk levels:

1) Ban on AI systems with unacceptable risk.
2) Requirements for AI systems with a high risk for health, safety and fundamental rights.
3) Labeling requirements for certain AI applications
4) AI systems without further need for regulation

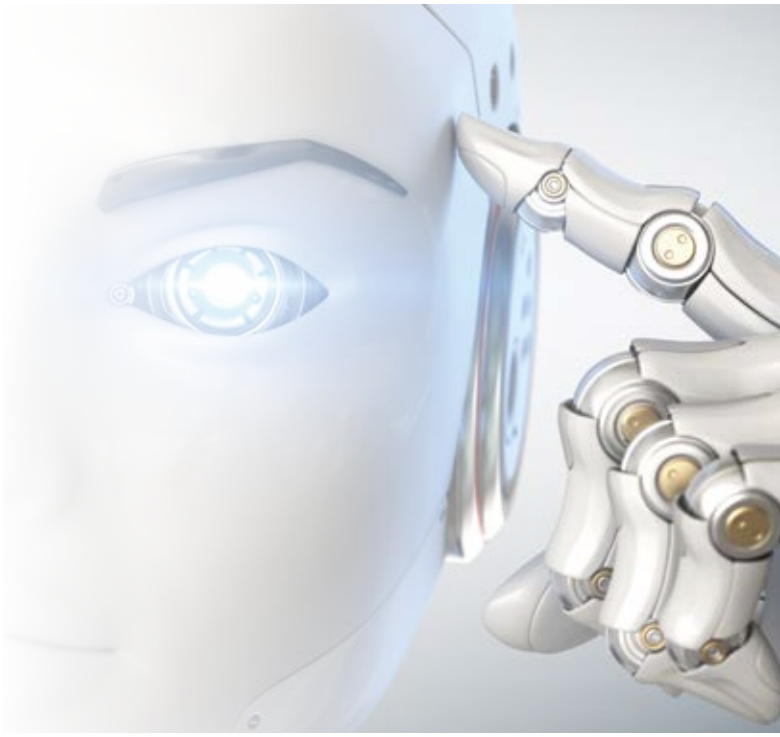
Artificial intelligence in mechanical engineering

In the future, AI will also find its way increasingly into mechanical engineering. There are already research projects looking at possible use cases for artificial intelligence in manufacturing areas. Therefore, mechanical engineering and its suppliers also have to deal with the topic of artificial intelligence and thus also with the AI Regulation. AI also poses new challenges for conformity assessment. Certified third-party bodies, for example, will have to deal in the future with how conformity is assessed for a production facility that optimizes or even changes the production process as a result of machine learning processes. The first step will be to establish a consistent definition of AI.

Contrary to the original plan, the AI Regulation is to be detached from the new Machinery Regulation. Also, AI should only be paraphrased and not directly named in the Machinery Ordinance. The Czech Council Presidency has set itself the ambitious goal of approving a final position on the AI Act by the end of 2022. ■

* AI=Artificial Intelligence.

Jörg Eisold
Head of Standards, Committees and Association Work, Schmersal Group



Two new industry managers are strengthening the Schmersal Group

Fresh forces for the areas of logistics and food/pharmacy

Since the beginning of this year, **Marcel Bogusch** is the responsible branch manager for the logistics sector at the Schmersal Group. Marcel Bogusch was previously employed as a product manager at a renowned manufacturer operating in logistics and automation, with responsibility for the launch of safe robot systems and new control system generations. His strengths include solid technical competence in all matters relating to the Machinery Directive.

Schmersal not only has a comprehensive range of safety switchgear devices, but also complete logistics solutions with carefully coordinated safety components. This allows Schmersal's safety solutions to be optimally adapted to the divergent applications in the logistics field. A positive in terms of the application-specific challenges in logistics: extensive systems that require intelligent networking concepts and high rates of turnover that impose correspondingly high demands on the failsafe performance of systems.

'I am delighted to be a part of the Schmersal team. I would like to put my previous professional experience to good use and to develop this target segment and raise awareness of the benefits of Schmersal's systems and solutions for logistics applications,' says Marcel Bogusch. 'Our objective is also to develop additional innovative, industry-specific safety solutions.'

In addition, Schmersal has appointed **Anton Ivanov** as a new industry manager for the market segments food, beverages, medicine and packaging. In this position, his tasks include supporting and consulting our customers at home and abroad. In addition, he will also be responsible for the development of new products and the maintenance of the existing product ranges tailored to this particular field. The Schmersal Group has developed a dedicated, wide-ranging series of products to satisfy the specific requirements of these sectors, especially their stringent hygiene needs.

Anton Ivanov is a TÜV Rheinland-certified Functional Safety Engineer and began his career in industrial automation as a sales manager for a company in St. Petersburg, Russia. He has more than ten years of professional experience in B2B sales and marketing. Most recently, he worked for the German subsidiary of a globally operating company.

'Schmersal is a very customer-oriented business that enjoys a fantastic reputation in the food and packaging industries as well as in pharmaceuticals. This is thanks to its customised safety systems and application-specific solutions. As such, I'm very much looking forward to the new challenges that this role will bring,' explains Anton Ivanov. 'My primary goal will be to expand existing cooperative arrangements and our strong market position. I see great potential for Schmersal, particularly in networking and system solutions.'

Seminar program 2022/2023

The tec.nicum academy expands its seminar portfolio

Next year, the tec.nicum academy will significantly expand its Nord location, especially since Henrik Döring, a new Safety Consultant, has been working on site regionally since July 1, 2022. In 2023, the tec.nicum academy will offer ten additional events with fixed dates in Lübeck and Bremen, plus a number of topics on request.

In addition, the tec.nicum academy has added brand new topics to its seminar program. In addition to the qualification as "Machinery CE Expert®"(MCEExpert) with TÜV certificate, the seminar program for the first time also includes the topic "Safety-oriented design of battery production plants". Due to the increasing demand in the field of "e-mobility", the need for batteries is also growing. However, the production of batteries is associated with immense hazard potential. In this issue, speaker and guest author Ulrich Hochrein gives a brief overview of the risks and safety requirements in battery production.

You will find the dates of his seminars in the following program overview.

Visit us at **www.tecnicum.com** and find up-to-date detailed information and booking options for all seminars and special events.

We would be happy to prepare an in-house seminar tailored to the individual domain interests of the participants on your desired date.

Contact us:

Martina Dahm
Tel. +49 202 6474 864, mdahm@tecnicum.com

Jasmin Ruda,
Tel. +49 202 6474 804, jruda@tecnicum.com

Seminar topics	Wuppertal	Ulm	Wettenberg	Bremen	Online	In-house
Law						
Machinery Directive 2006/42/EC – CE conformity evaluation procedure	17.11.2023	on request	24.01.2023	10.10.2023	17.03.2023	on request
Legal aspects of machine safety for purchasers, designers, project coordinators **(half-day seminar)**	10.11.2022 27.10.2023	on request	on request	11.10.2023	23.06.2023	on request
Basics of occupational health and safety for managers	14.11.2023	07.07.2023	on request	on request	29.09.2023	on request

Seminar topics	Wuppertal	Ulm	Wettenberg	Lübeck	Online	In-house
Legal aspects of machine safety for managers **(half-day seminar)**	09.11.2022 26.10.2023	on request	on request	12.10.2023	22.06.2023	on request

(Continued on page 22)

Seminar program 2022/2023 (Continuation from page 21)

Seminar topics	Wuppertal	Ulm	Wettenberg	Lübeck	Online	In-house
Standards – Regulations						
Risk assessment for infection prevention	Dates on request: **mdahm@tecnicum.com** or **jruda@tecnicum.com**					
Risk assessment and operating instructions	03.11.2022 15.11.2023	03.07.2023	23.11.2023	20.06.2023	03.11.2022 17.02.2023	on request
Validation according to EN ISO 13849-2 **(half-day seminar)**	16.06.2023	01.12.2022 24.11.2023	on request	21.06.2023	24.02.2023	on request
Basics of the Ordinance on Industrial Safety and Health (BetrSichV)	27.10.2022 16.11.2023	04.07.2023	25.01.2023	on request	15.05.2023	on request
Risk assessment for machinery and equipment	26.01.2023	05.07.2023	on request	on request	30.01.2023	on request
Technical documentation of machines and equipment	on request	06.07.2023	23.01.2023	on request	15.09.2023	on request
New construction, conversion, retrofitting – from manufacturer to owner/operator? **(half-day seminar)**	25.09.2023	on request	on request	22.06.2023	on request	on request

Seminar topics	Wuppertal	Ulm	Hamburg	Lübeck	Online	In-house
Application of EN ISO 13849-1 getting started with SISTEMA	29.11.2022 17.06.2023	22.11.2023	07.11.2023	14.03.2023	25.10.2022 10.02.2023	on request
Practical workshop working with SISTEMA	30.11.2022 15.06.2023	23.11.2023	08.11.2023	15.03.2023	on request	on request

Seminar topics	Wuppertal	Kirkel	Wettenberg	Lübeck	In-house
Qualification as TÜV certified “Machinery CE Certified Expert® – MCEExpert”	20.03.2023 – 24.03.2023	05.12.2022 – 09.12.2022 04.12.2023 – 08.12.2023	08.05.2023 – 12.05.2023	18.09.2023 – 22.09.2023	on request

Seminar program 2022/2023 (Continuation from page 22)

Seminar topics	Wuppertal	Ulm	Wettenberg	Lübeck	Online	In-house
Application						
Basics of safety engineering – separating and non-separating protective devices	07.09.2023	on request	25.05.2023	13.10.2023	on request	on request
Electromagnetic compatibility EMC / EMEC in practice	Dates on request: **mdahm@tecnicum.com** or **jruda@tecnicum.com**					
Safe fluid power – safe implementation of EN ISO 13849-1	Dates on request: **mdahm@tecnicum.com** or **jruda@tecnicum.com**					
Fire protection in mechanical engineering	13.06.2023	21.11.2023	on request	on request	08.09.2023	on request
Automated guided vehicles and their integration into the production environment	23.05.2023	on request	12.09.2023	on request	07.03.2023	on request
Safety in integrated robotic manufacturing plants	25.05.2023	on request	13.09.2023	on request	08.03.2023	on request
Human-Robot Collaborations	26.05.2023	on request	14.09.2023	on request	09.03.2023	on request

Seminar topics	Wuppertal	Ulm	Wettenberg	Bremen	Online	In-house
Explosion protection compact seminar	17.11.2022 09.11.2023	on request	23.05.2023	05.10.2023	01.02.2023	on request

Seminar topics	Wuppertal	Kirkel	Wettenberg	Lübeck	Online	In-house
Safety-oriented design of battery production plants	24.05.2023	22.11.2022 11.09.2023	on request	on request	10.03.2023	on request

Seminar topics	Wuppertal	Ulm	Wettenberg	Bremen	Online	In-house
Products						
Basic workshop Safety control PSC1	on request	on request	26.09.2023	on request	on request	on request
Expert workshop Safety Control PSC1	on request	on request	27.09.2023	on request	on request	on request
Basics and inspection of opto-electronic protective devices according to BetrSichV **(seminar objective: Competent person)**	**Mühldorf** 26.10.2022 | 25.10.2023					

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The label on this product guarantees responsible treatment of the world's forests. The greenhouse gas emissions released during the production of this catalogue have been offset through investment in the "LAYA energy-efficient wood stoves" project in India.

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K.A. Schmersal GmbH & Co. KG

Möddinghofe 30
42279 Wuppertal

Phone: +49 202 6474-932
info-de@tecnicum.com
www.tecnicum.com