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Editorial

Occupational safety during the coronavirus pandemic

The global coronavirus pandemic has shed new light on many aspects of everyday life. Covid-19 has also highlighted a previously neglected aspect of occupational health and safety – protecting employees from the risks of infection.

The coronavirus pandemic is far from over. In addition, recent years have shown that new pathogens can emerge at any time, all of them capable of triggering unforeseen pandemics. SARS, swine flu, MERS-CoV are just some examples. Consequently, prevention and effective protection in the workplace will be useful tools in the future, just as they are now.

tec.nicum has responded to this challenge and amended its range of services. In this issue, you will discover the additional services that we are offering our customers, including our new support ticket and the 'Risk assessment for infection prevention.'

Following the strict lockdown in the spring, we are now able to offer seminars again, taking into account the current coronavirus hygiene and social distancing measures. The new demonstration model developed by Schmersal to support training courses on the topic of practical design and implementation of safety equipment is showcased on page 8.

In spite of coronavirus, traditional health and safety topics remain firmly on the agenda – top priority is the risk assessment, something that needs to be taken into account in the early planning stage of new machinery and when converting existing machinery. A white paper from tec.nicum outlines the methods that should be followed to ensure that risk assessments are carried out easily and efficiently. Here, we share some extracts from the white paper. The full text can be found on the tec.nicum website.

You can find information on industrial robot safety in the article that guest author Dr Matthias Umbreit has contributed to this issue of MRL News. He is a specialist in robotics in the wood and metal department of the DGUV (German Social Accident Insurance)

We hope that this issue of MRL News is full of information that is useful to you! Please send us your feedback!

Best regards
The editorial team

tec.nicum Support Ticket

Due to the coronavirus pandemic, customer visits are currently limited. Nevertheless, tec.nicum would like to continue to advise its customers on issues of machine and plant safety. tec.nicum, the service division of Schmersal, is currently responding to queries promptly via the Support Ticket tec.nicum (STT) service: the tec.nicum Support Ticket allows customers to send their queries at any time either in writing or by telephone. tec.nicum will then promptly designate a period for processing the query, or where applicable, will respond directly. Response times are typically no more than one business day.

An STT module comprises 10 x 1 hour of support time and responses to queries by telephone or e-mail. Depending on the assignment, e.g. support for SISTEMA applications, responses to queries may be delivered via TeamViewer sessions or Skype meetings.

Alternatively, hourly assignment without calling from a Support Ticket tec.nicum is also possible. In that case, processing times will be agreed on a case-by-case basis.

tec.nicum would be happy to put together a customised offer on request, and can be contacted at:
info-de@tecnicum.com

Seminars from the tec.nicum academy

Due to the coronavirus pandemic, we decided to cancel all seminar events in the spring, including dates in tec.nicum on tour, as a precaution for all participants. Our seminars have since resumed, including tec.nicum on tour, which will be holding an event in Wettenberg in November. Topics of the Lunch & Learn seminars: The safety of machinery and product liability, a brief presentation of product innovations from the Schmersal Group and human/robot collaboration.

A compact seminar on explosion protection is also scheduled for November as part of our regular seminar programme.

Coronavirus hygiene and social distancing measures will be in place for all seminars. In addition, we also ask participants to bring their own mouth and nose covering.

Ongoing coronavirus developments mean that short-term changes are always a possibility, so we ask that you check our website for the latest dates: https://www.tecnicum.com/academy/seminarkalender/

Industrial robot safety – what's new?

It has been clear for some time now – industrial robots are in demand, and their sales and installation figures are constantly on the rise. According to the International Federation of Robotics, the number of units and systems installed worldwide in 2018 rose by six per cent to 422,271. In Germany, that number rose by 26 per cent to 26,723.

Industrial robots appear to be the ultimate 'rationalisation tool,' and as such, they are viewed critically by the public. But, they also perform jobs that are burdensome or dangerous to people – disinfection robots were even deployed in hospitals during the coronavirus pandemic[1]. Notwithstanding the increasing numbers of industrial robot systems in place, the accident figures published by the German Social Accident Insurance (DGUV) remain low: in 2018, there were 169 notifiable accidents involving industrial robots in Germany, while there were 35,732 occupational accidents with stationary machinery. The low accident figures are the result of years of standardisation work and the high level of safety associated with it. It is essential that this is maintained and expanded upon.

Safety requirements

The most important standards that apply to industrial robots are EN ISO 10218-1 for 'pure' industrial robots and EN ISO 10218-2 for robot integrations or robot plants. These standards are listed in the EU Official Journal under the EC Machinery Directive 2006/42/EC and satisfy the presumption of conformity: For machinery and plants constructed in accordance with these standards, it is assumed that the EC directives have been observed.

Both standards are currently being revised. An official draft is available for EN ISO 10218-1. Possible changes:

- Requirements on safety-related control systems: The current EN ISO 10218-1:2012 formulates the requirements on safety-related control systems in a relatively general way: they must be consistent with Category 3 and Performance Level (PL) 'd' in accordance with EN ISO 13849-1, irrespective of the type of robot or safety function. Individual assignment of the PL and Category to the safety function, as is standard practice in other product standards, is currently being planned. Safety functions include the emergency-stop, enabling switch and position monitoring.

- Classification of robots into classes: Additional designs have been added to familiar robot models in recent years, such as the six-axis industrial robots and gantry robots. We have seen the creation of models of robot suitable for collaborative operation (e.g. lightweight robots), whose risk potential is significantly lower than that of known industrial robot models on account of their design. These differences in risk are not taken into consideration in EN ISO 10218-1:2012. Classification into classes based on readily available risk parameters such as weight or maximum force is now intended to rectify this situation. One of the objectives is to assign a low PL to robots in a lower class, and a high PL to robots in a higher class.

But caution must be exercised, as much can still change. A second draft standard should be anticipated.

In addition to the aforementioned European standards, EC directives are also applicable within the EU. Principal among these is the EC Machinery Directive, transposed into law in Germany by the 9th regulation of the Product Safety Act. As part of an EC conformity assessment, the following documentation must be made available by the manufacturer (integrator) for industrial robots systems being brought to market for the first time:

- EC Declaration of Conformity with CE marking on the machine
- Operating manual
- Risk assessment (delivery by agreement)
- Technical documentation (delivery by agreement)

The manufacturer does not have to supply the risk assessment with the system, but must retain it for inspection by the authorities. If the future operator wishes the risk assessment to be provided, he must specify this in the specifications. The same also applies to the technical documentation.

Pure industrial robots without tools or devices are considered to be 'incomplete machinery.' These do not need an EC Declaration of Conformity, but do require a Declaration of Incorporation. An EC Declaration of Conformity and CE marking are required only with the finished system (integration).

An overview of the safety requirements can be found in DGUV Information 209-074'Industrial robots', available from BGHM or DGUV or online[2].

Risk of accident

More than three quarters of all serious occupational accidents on industrial robot systems occur during troubleshooting activities. If production is disrupted, perhaps due to jammed parts or soiled sensors, employees sometimes attempt to enter the danger zone when the machine has not been properly shut down in order to rectify the fault.

In some cases, poorly designed safety equipment grants access to the danger zone; in some cases, it is deliberately bypassed. In many cases, robots are only in a software stop while such risky actions are being carried out. The high range and speed of sudden robot movements are usually underestimated, sometimes with serious accidents as a result. Instructions must refer to this specific hazard. Causes of manipulation, such as inadequacies in the operating and system concept, must be openly addressed and eliminated during operation.

Experts from DGUV and BGHM can provide support.

Collaborative robot systems

Collaborative robot systems, also known as cobots, work in ‘fence-less’ operation with people. In the industrial sector, ISO/TS 15066 also applies to cobots, in addition to the aforementioned standards.

The forces and pressures of the robot, including tool, must be limited in the event of contact with persons, in order to ensure that injuries do not occur. Trade associations and research institutes have carried out comprehensive investigations to determine biomechanical limit values which have been incorporated into the writings of DGUV, BGHM and into international standardisation. DGUV Information FBHM 080 summaries the key requirements for cobots[3]. Experts from BGHM are currently developing a web-based planning aid.

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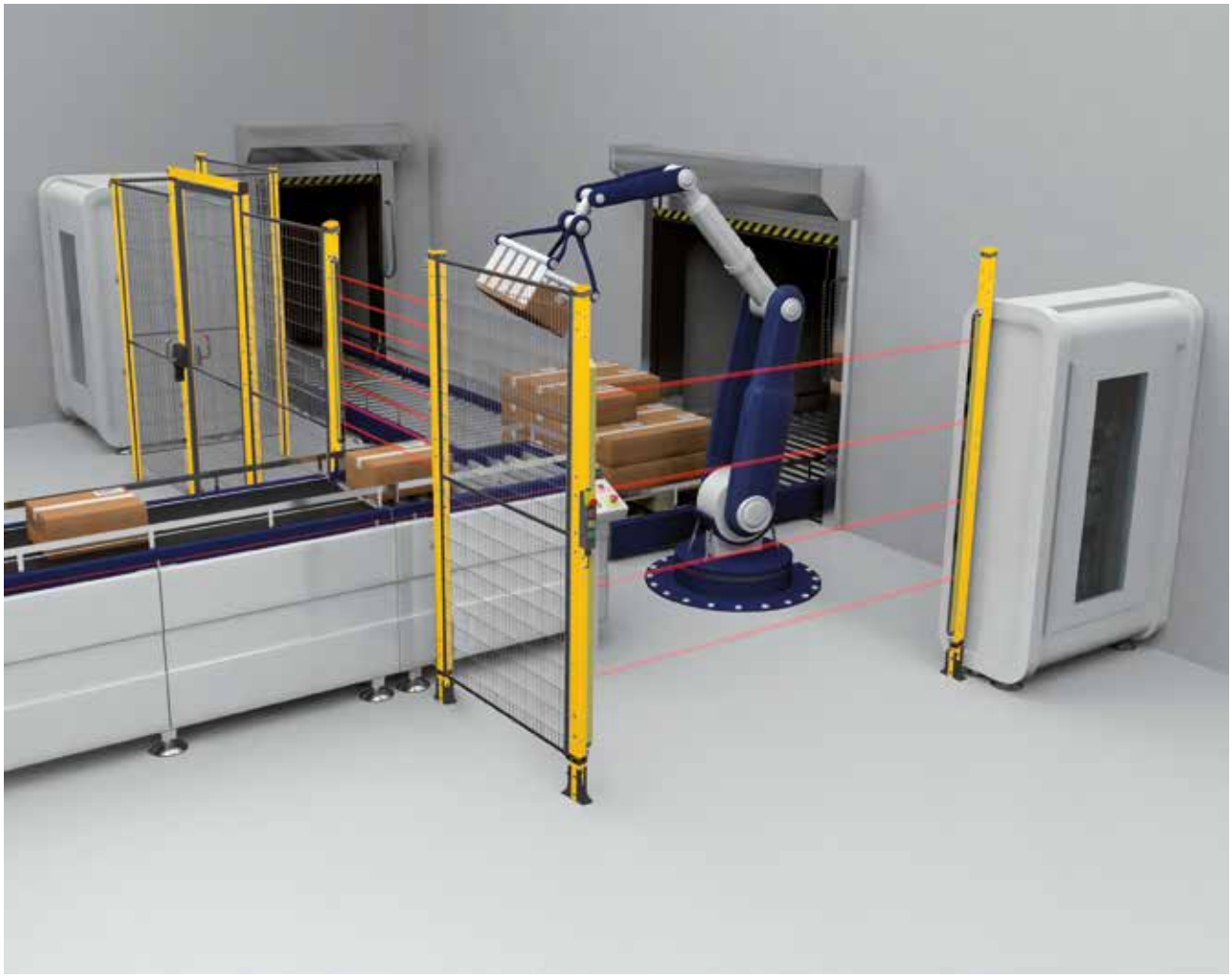


Further standards for robotics

In addition to ISO 10218-1, which has been in place since the 1980s, the following additional standards are also relevant to the safety of machinery.

	Standard	Title	Harmonised in accordance with the EC Machinery Directive
Industrial sector	DIN EN ISO 10218-1:2012-01	Industrial robots Safety requirements – Part 1: Robots (ISO 10218-1:2011); German version EN ISO 10218-1:2011	Yes
	DIN EN ISO 10218-2:2012-06	Industrial robots – Safety requirements – Part 2: Robot systems and integration (ISO 10218-2:2011); German version EN ISO 10218-2:2011	Yes
	DIN ISO/TS 15066:2017-04; DIN SPEC 5306:2017-04	Robots and robotic devices – Collaborative robots (ISO/TS 15066:2016)	No
	ISO/TR 20218-1:2018-08	Robotics – Safety design for industrial robot systems – Part 1: End-effectors	No
	ISO/TR 20218-2:2017-12	Robotics – Safety design for industrial robot systems – Part 2: Manual load/unload stations	No
Non-industrial sector	DIN EN ISO 13482:2014-11	Robots and robotic devices – Safety requirements for personal care robots (ISO 13482:2014); German version EN ISO 13482:2014	Yes
	ISO/TR 23482-1:2020-02	Robotics – Application of ISO 13482 – Part 1: Safety-related test methods	No

Author: Dr Matthias Umbreit, specialist in robotics in the wood and metal department of the DGUV (German Social Accident Insurance)

Literature:

[1] Heer, Carsten: Robots help to fight coronavirus worldwide, www.econ-news.de, www.ifr.org, Frankfurt, 31 March 2020

[2] DGUV Information 209-074 (2015). Publisher: Deutsche Gesetzliche Unfallversicherung e.V. (DGUV), Glinkastraße 40, 10117 Berlin

[3] FBHM-080 Publisher: Wood and Metal Department at DGUV, Machines, Systems and Manufacturing Automation Section, c/o Berufsgenossenschaft Holz und Metall, Postfach 3780, 55027 Mainz

tec.nicum now offering companies risks assessment for infection prevention

Against the backdrop of the ongoing coronavirus pandemic, tec.nicum is now offering to carry out and document risk assessments for infection prevention.

Article 5 of the German Occupational Health and Safety Act obliges employers to assess and document the risks to their employees in the workplace. In addition, they must also determine which occupational health and safety measures need to be put in place. This obligation also includes an assessment of the risks of infection. It is precisely this aspect of operational risk assessments that has posed the biggest challenge to companies since the onset of the coronavirus pandemic. New government safety and hygiene requirements have had to be implemented at very short notice, which has proved tricky.

Meet the legal requirements and identify risks to your business

'With the "Risk assessments for infection prevention," we would like to prepare companies to help them cope with future waves of infection and support them in developing a concept of measures,' explains Siegfried Wolf, Head of the tec.nicum academy and tec.nicum consulting.

Carrying out and documenting the risk assessment not only satisfies the legal requirements, but also records business risks that could have serious economic consequences.

In addition, tec.nicum is also offering a one-day seminar on risk assessments/infectious diseases, which provides information on biological hazards and their prevention as well as pointing out aids and protective measures that can help companies to more easily implement occupational health and safety requirements. The seminar is intended primarily for occupational health and safety specialists, safety officers, infection prevention assistants and coronavirus officers.

Both the seminar and risk assessment are provided by omnicon engineering GmbH, which has been a part of the Schmersal Group since 2019. By acquiring omnicon, Schmersal has been able to expand the capacities of its tec.nicum service division.

Lived practice rather than grey theory

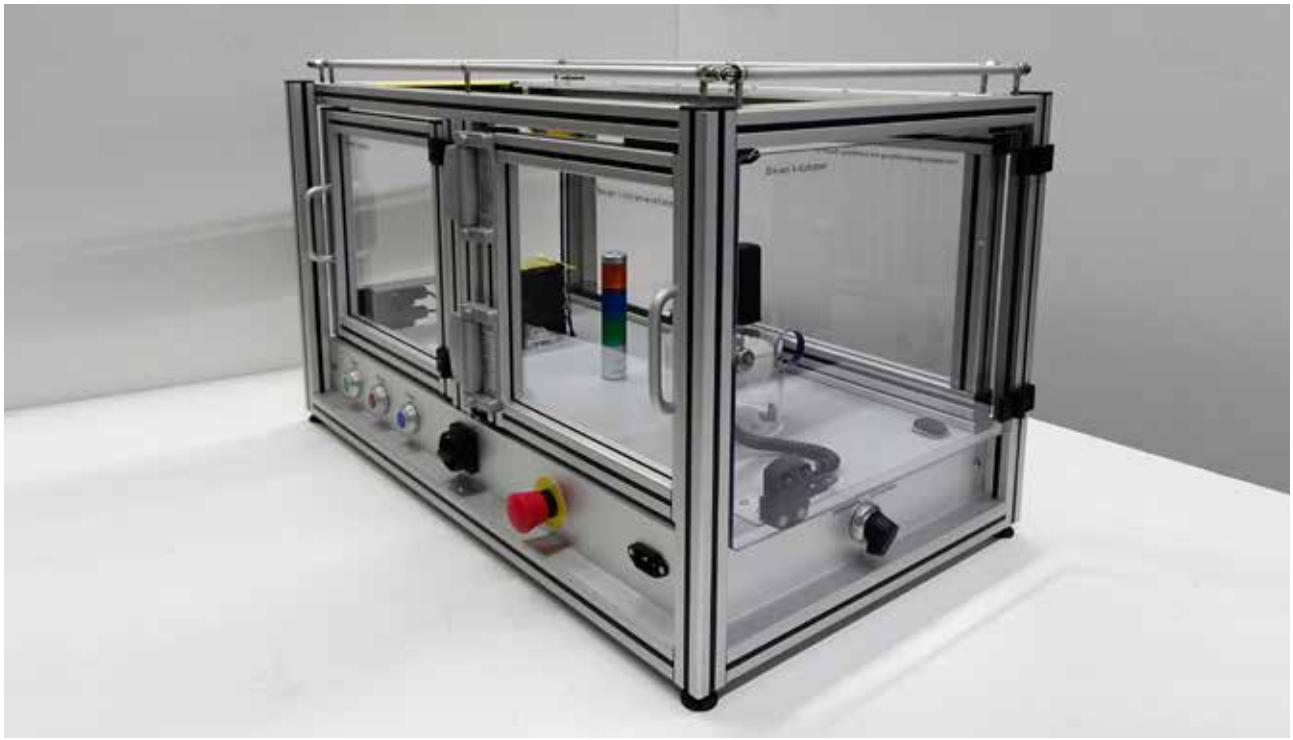
Trade associations, accident insurance institutions and companies are increasingly relying on demonstration models that use Schmersal components to illustrate the practical design and implementation of safety equipment on machines and plants as part of training courses on the topic of machine safety.

In many training courses, information events and exhibitions, safety switchgear devices and other individual functional safety components are presented only individually, and the function of complete safety equipment is seldom demonstrated. Consequently, interested parties cannot always gain sufficient knowledge of how typical design and assembly errors can be avoided. Similarly, they also fail to learn how the safety equipment can be purposefully integrated into the safety-related section of the machine control system and how it is integrated into a complete system.

As such, a demonstration model for safety equipment must demonstrate the complete system and its operation in conjunction with the control system. This is the only way to clearly demonstrate correct operation and, at design level, the standard and practice-oriented assembly of guards and protective devices in presentations and training courses.

In order to be able to convey the topic of machine safety to safety specialists, control engineers, mechanical engineers, supervisors, etc. in a practice-oriented way during training and continued training sessions, trade associations have, for many years, been using mobile teaching systems developed by Schmersal. These teaching systems have so far enabled two to three-thousand participants per year to try out the systems and understand and appreciate their functionality. In addition, the mobile teaching systems are also used at trade fairs to demonstrate safety solutions in action.

The mobile teaching systems have been designed so that they can be moved between training rooms within a training facility. These complex teaching systems are not suitable for transport and use away from offices, facilities, trade fair halls, etc. As such, Schmersal has developed a new, compact demonstration model that can be transported in a transport box in the boot of a passenger car.



The new transportable demonstration model from Schmersal.

New, compact demonstration model

The new, compact demonstration model has seven applications, each of which demonstrates and clarifies a common protection function of the safety equipment. These include:

- Locking of movable guards with the AZ17 or RSS260 safety switches
- Locking device with interlock of movable guards with the AZM300 and AZM40
- Safety door monitoring with a TESK hinge switch
- Optoelectronic safety equipment – SLC445 safety light grid with finger protection
- 'Setup' operating mode on moving guards with safety switchgear device with operating mode selector switch and three-stage ZSD6 enabling switch for operation of the 'machine' at reduced speed in setup mode
- Optional: Protective field monitoring with a SICK safety camera

Positioning monitoring of the guards and optical safety equipment at control level is achieved with SRB-E series safety relay modules – types SRB-E 204 and SRB-E 402.

Concept and documentation

In designing the demonstration model, emphasis was placed on practical application of standards EN ISO 14119 (Safety of machinery – Interlocking devices associated with guards), EN ISO 13849-1 (Safety of machinery – Safety-related parts of control systems) and the Machinery Directive 2006/42/EC.

Even though the demonstration model has been developed solely for demonstration purposes, it is still a complete machine in accordance with the Machinery Directive. Consequently, tec.nicum has carried out a risk assessment and compiled an operating manual to complete the project.

In addition, they have also compiled an instructor manual to advise instructors on the specifics of each safety solution that needs to be addressed during training sessions.

The safety devices installed serve as a comprehensive illustration of the application options for safeguarding potential danger points. These danger points are of course not available on the machine model.

This compact demonstration model allows training sessions to be delivered at different locations with ease. The fully functional safety solutions not only demonstrate the right selection, assembly and application of components to interested parties, but also give an insight into the wide range of products available from Schmersal. Schmersal uses this model for small trade fairs and exhibitions. Other trade associations, such as IFA, SUVA/CH and VBG and Bayer's prevention departments have also expressed an interest in acquiring the model.

Frank Schmidt (r.), Head of Standards, Committees and Association Work at Schmersal, presents a mobile teaching system in the BGHM training center.

Risk assessments made easy

Basic information and practical tips for execution

All machinery manufacturers are obliged to carry out a risk assessment to determine the applicable health and safety requirements that apply to their machinery, and to design their machinery accordingly. In some cases, a risk assessment may also be mandatory for machine operators. In many cases, however, there is uncertainty about the process that needs to be followed. A white paper from tec.nicum outlines methods for simple and efficient risk assessment and highlights special aspects of risk assessments of robot workstations. The following are some extracts from that white paper; the full white paper can be downloaded at the link below: https://www.tecnicum.com/consulting/risikobeurteilung-gemaess-iso-121002010/

Legal basis

The risk assessment is required by law and is consequently not a voluntary activity by a company. It is mandatory in accordance with the Machinery Directive 2006/42/EC in order to issue a Declaration of Conformity for a machine. The Declaration of Conformity is a prerequisite for affixing the CE marking. CE marking is, in turn, mandatory for bringing a machine onto the market in the European Economic Area. The Machinery Directive states the following: 'The machinery manufacturer [...] must ensure that a risk assessment is carried out in order to determine the health and safety requirements that apply to the machinery. The machinery must then be designed and constructed taking into account the result of the risk assessment.'

With the conformity assessment procedure, the manufacturer determines conformity of the machinery with all requirements of the Machinery Directive 2006/42/EC, in particular with the fundamental health and safety requirements. This proof is provided by compiling technical documentation, whereby there is no detailed specification regarding the form and layout of the documentation. Although this technical documentation must be made available to the competent national authorities on request, the machinery manufacturer is not obliged to pass it on to customers. This is because the risk assessment could contain considerable technical expertise that the manufacturer wishes to protect. It is, however, worthwhile for the manufacturer to prepare thorough, detailed documentation, especially for the prevention of liability risks. Manufacturers and/or distributors of machinery and plants will have to deal with product safety law, warranty and product liability law and perhaps even criminal law in the event of a safety-related product defect.

When is a risk assessment obligatory for the operator of machinery?

The machinery fleet operated by production companies is frequently changing, sometimes as a result of expansions and modernisations. Within these changes, the question then arises as to whether a 'significant change' has occurred. If it has, the operator of the machinery who made the 'significant change' becomes the manufacturer and must therefore take into account all directives and any standards relating to machine safety that apply to a manufacturer. As a consequence, a risk assessment in line with the applicable directives must be carried out for the related changes and a conformity assessment procedure must be followed that results in the renewed CE marking of the machine. This may, in some circumstances, mean that additional measures need to be implemented to achieve conformity.

According to an interpretation paper published in April 2015 by the German Federal Ministry for Labour and Social Affairs (BMAS) with the participation of the German Federal Institute for Occupational Safety and Health (BAuA), whether or not a change is significant is determined by whether or not there is a new hazard. If this hazard leads to a new or elevated risk, then it is a significant change.

In addition, the operator also becomes the manufacturer if it has assembled several complete and/or incomplete machines into an overall machine or interlinked them to form a plant. These terms are also referred to in the Machinery Directive:

The essential characteristic of an incomplete machine is that it is unable to fulfil a specific function. 'Interlinked machines' or 'machine plants' satisfy the criteria for 'assemblies of machinery' if they form a production-related link and a safety-related link, through either

a) the (spatial) arrangement
b) the common production objective (joint manufacture of a specific product) or
c) a joint, higher-level functional control system. In this sense, a simple emergency-stop link is not considered a safety-related link or 'assembly of machinery.'

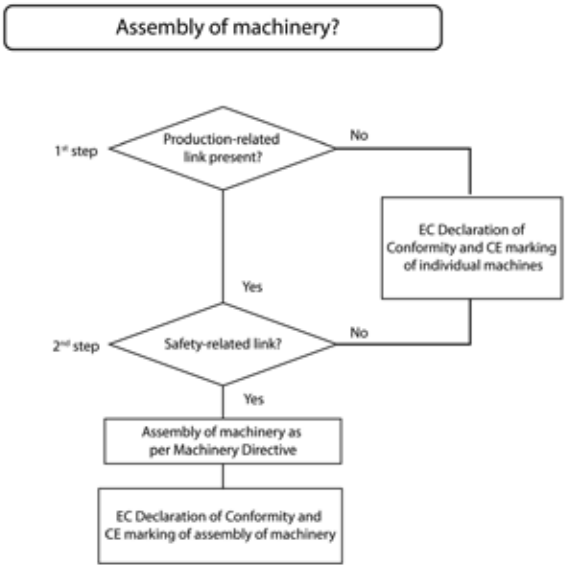


Figure: German Federal Institute for Occupational Safety and Health (BAuA)

Start at the beginning – the right time for a risk assessment

A risk assessment should not be carried out only once a new machine has been fully assembled. To begin with, the Machinery Directive stipulates that a machine must be 'designed and constructed taking into account the results of the risk assessment.'

Secondly, the obligatory three-stage process for risk reduction (see 5) requires 'inherently safe design' as the primary solution model. This can, however, only be achieved in the planning phase. Thirdly, once the machine has been constructed, it is often no longer possible to identify design errors (e.g. incorrectly selected parts). Fourthly, dangers that are only identified at the end of the design process can usually only be eliminated or minimised with increased technical and financial outlay.

It is, therefore, worthwhile to consult machinery safety specialists during the planning stage for a new machine or plant – e.g. an external service provider. They offer a neutral and unbiased view and can provide tips on how safety solutions can best be designed to be as cost efficient as possible and ensure that they do not restrict plant availability and productivity during later operation.

Furthermore, the risk assessment is not a one-off process that simply needs to be ticked off on a list, but rather an 'iterative' process to support the design, i.e. it is a process that needs to be repeated several times and until the risks have been sufficiently eliminated or minimised. Any retrofit or conversion of a machine may, however, result in certain safety functions or parts of the safety concept needing to be revised, in which case the risk assessment will need to be adapted or supplemented.

You can download the complete tec.nicum white paper at:

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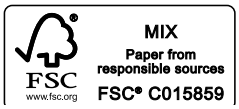
The greenhouse gas emissions released during the production of this catalogue have been offset through investment in the "LAYA energy-efficient wood stoves" project in India.



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tec.nicum

K.A. Schmersal GmbH & Co. KG
Möddinghofe 30
42279 Wuppertal
Telefon: +49 202 6474-932
info-de@tecnicum.com
www.tecnicum.com