



**tec.nicum**

Services relating to machine safety and industrial safety

# Introduction



Heinz and Philip Schmersal, Executive Directors of the Schmersal Group

Functional machine safety is a complex theme. There are different requirements for the different roles for handling machines and systems.

The **manufacturers** of machines need to ensure that they comply with the regulations and laws based on regional machinery directives. By contrast, the operators of machines are subject to the regulations in the equipment directives for health, safety and the environment and at the same time, may be subject to specific national requirements. But this is not only an obligation for manufacturers and operators. Machine and plant importers and dealers are on sensitive ground, as they are subject to specific regulations. And it is not unusual for existing applications to be subject to modernisation either independently or with the help of **system integrators**, which involves a range of other complexities and clearly defined processes to be complied with.

For these complex legal and technical issues, more and more companies are seeking advice from qualified specialists. In the Schmersal Group, tec.nicum is the department for services relating to machine and plant safety. Its specialists have excellent expertise in the field of safety technology and many years of experience from numerous projects with machine constructors and in conjunction with associations and institutions.

The tec.nicum team designs and implements projects and safety solutions in all lifecycle phases, such as development, manufacturing, sales, operation, modernisation (retrofitting) and decommissioning of machines and systems all over the world. The Functional Safety Engineers at tec.nicum are certified by TÜV Rheinland to form a close-knit global network of expert advisers.

This means tec.nicum makes a significant contribution to making the industrial world safer – based on the motto of

**excellence in safety**

The experts at tec.nicum aim to offer customers a capable, product and manufacturer-neutral consultancy on all the latest statutory guidelines and support them in designing their machines and workplaces to be norm-compliant.

tec.nicum offers a broad range of complementary services – from training and consultancy via design and engineering to integration of safety solution. tec.nicum sets great store by the objectivity of all its consultancy services and solution ideas.

This brochure gives an overview of the comprehensive range of tec.nicum services.

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## The four global pillars of tec.nicum

When development engineers and production planners are developing new machines or modifying existing ones, they need to comply with the applicable national laws. For example, in Europe, the machines must meet the requirements of Machinery Directive 2006/42/EU. However, in Brazil, it is Machinery Directive NR 12 which needs to be complied with. One of the focuses of the work carried out by the TÜV Rheinland certified engineers in terms of functional safety (FSE) is in the associated mandatory risk assessment. In Europe, compliance with the Machinery Directive is certified by means of a CE label.

The operators of machines and systems must comply with the guidelines on health, safety and the environment (HSE) as defined in Europe in Article 153 EC or in the USA by OSHA – also known under the collective heading of safety in the workplace.

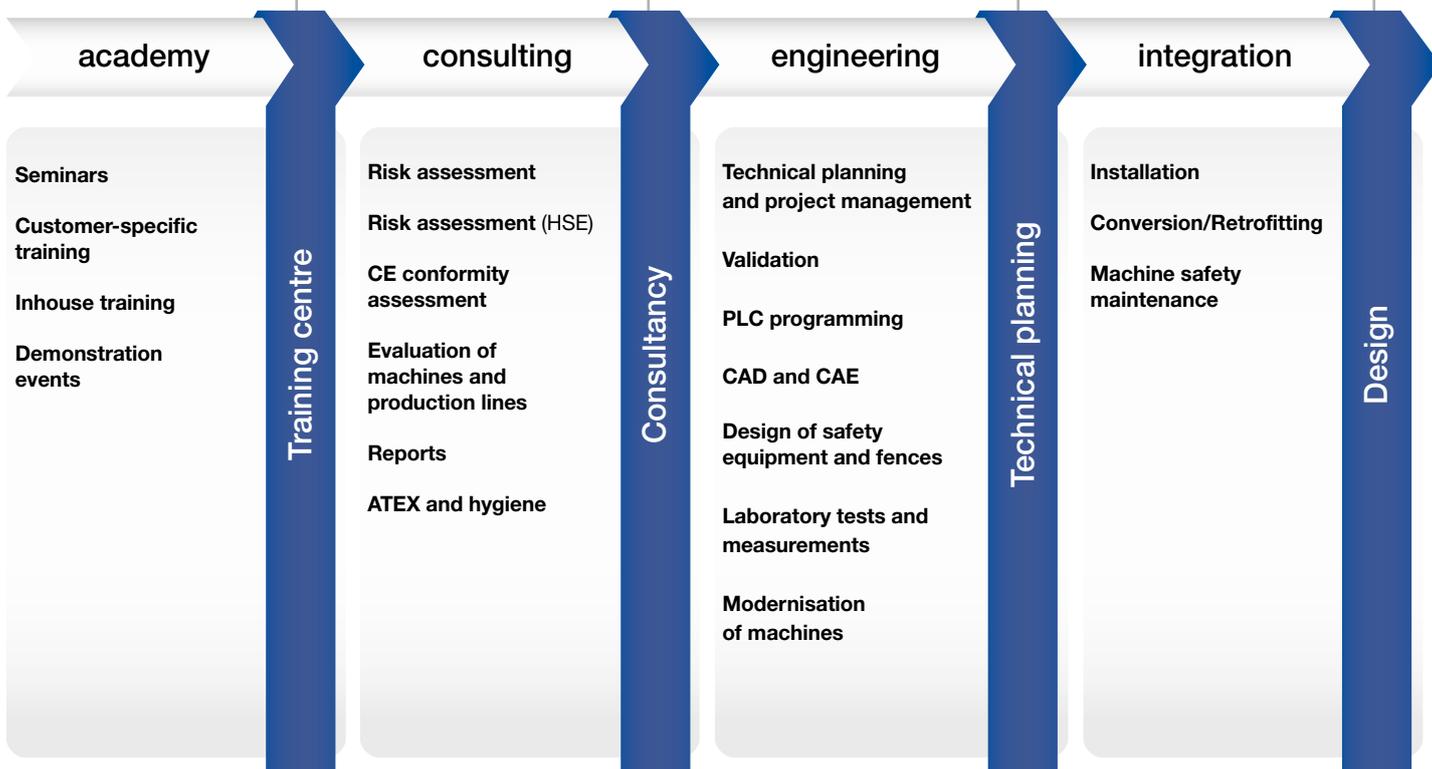
The tec.nicum academy develops made-to-measure training programmes which are tailored to the individual specialist interests and requirements of those taking part. These include, for example, two to three-day workshops. On the first day, the expert knowledge is communicated in a block of theory. On the second and, if applicable, the third day, the participants can implement what they have learned in practice under the expert supervision of the speakers based on a current project within their company.

The expert staff at tec.nicum have sound knowledge of the legal framework conditions, for example:

- Technical safety advice based on ISO 12100:2010, which serves as the global basis for the relevant national standards
- The design and / or upgrade of production machines and systems based on the regional or national guidelines, laws and ordinances applicable
- Functional safety for validation and certification in accordance with ISO 13849-1, ISO 13849-2 and IEC 62061
- Sound knowledge on applied safety technology
- Know-how on standardised EU norms and statutory regulations
- Expertise on calculation of technical safety indices
- Guidelines for tests and inspections

Overall, the range at tec.nicum covers four columns all over the world: learning in the academy section, consultancy services in the consultancy section, designing safety solutions in the engineering section and practical implementation in the integration section.

ANSI  
 9. ProdSV  
 RD 681/2003  
 BetrSichV  
 SI 2008/1597  
 RD 681/2003  
 EMC 2004/108/EC  
 NR 12  
 ISO 13849-1  
 ISO 13849-2  
 DL 2003, n. 233  
**ISO 12100**  
**MD 2006/42/EC**  
 RD 1215/1997  
 ISO 14119  
 IEC 62061  
 NFPA





## Learning – tec.nicum academy Seminars and training

### **SEM** Seminars and trainings

The tec.nicum academy offers a comprehensive range of seminars and training on machine and plant safety.

Example training subjects include:

- Methods of assessing risks and hazards
- Current technologies and functionality of safety systems
- Legal questions on directives, for example the Machinery Directive
- Machine and plant safety standards
- Application-specific topics, e.g. EMC, fluidics, explosion protection
- Safety in the workplace, and much more
- Testing safety equipment in accordance with the industrial safety act

The range of training and seminars is rounded off by product-specific workshops.

The content of the training is taught in the relevant national language, either in-house on the client's premises or at the academy.

You can find the courses currently on offer from the national tec.nicum academy organisations at: [www.tecnicum.com](http://www.tecnicum.com)



## Consultancy services – tec.nicum consulting

### Analysis and documentation

#### **CON** Technical support

The experts at tec.nicum can provide expertise and experience for every life-cycle phase of machine and plant construction. They provide information about relevant legislation and standards for machine safety and occupational health and safety, draw up concepts for the safe overhaul of old and existing machines and provide recommendations in terms of the protective equipment suitable in each case and which complies with the standards.



tec.nicum employees are available to their customers on an hourly basis and provide support on your premises or by telephone or online.

#### **HZD** Evaluation of machines (risk assessment)

tec.nicum carries out technical safety inspections on existing machines, systems and product lines. Where adjustments are required to ensure the machines meet the working directives for health, safety and the environment and specific national legislation, tec.nicum can provide recommendations.

For old or modified machines and system, the tec.nicum engineers evaluate whether the current system or the modifications made satisfy the applicable technical safety requirements.

When evaluating machines from the operator's perspective, tec.nicum proceeds as follows:

- Analysis of existing documentation
- Description of the machines and the processes
- Checklist of mandatory criteria to be fulfilled
- Assessment in accordance with ISO 12100:2010, which serves as the global basis for the relevant national standards

Operators who are amalgamating multiple existing machines into a new unit or system must request separate CE conformity in Europe. In this case, tec.nicum offers the RSK and optional MDI modules in addition to the HZD module.



## Consultancy services – tec.nicum consulting

### Analysis and documentation

#### **RSK** Risk assessment to ISO 12100:2010

Based on ISO 12100:2010, the tec.nicum specialists carry out risk assessment and a comprehensive assessment of all hazards relating to the machines and systems. They also analyse machines for conformity with the applicable standards and norms.

Based on the results of these investigations, they derive recommendations and corrective action, in order to ensure that the machines comply with the various applicable guidelines.

All the results of the investigations are fed into a comprehensive final report. Priority is given to an optimum balance between appropriate safety and maintaining maximum productivity.

- Risk assessment in accordance with ISO 12100:2010, which serves as the basis for the relevant national standards
- Identification and assessment of risks and hazards
- Reference to functional safety
- Reference to applicable legal regulations, e.g. by means of (standardised) norms
- Working out plan of action to minimise risk

Optional additional TDC module: production of conformity recommendation, e.g. CE based on MD in Europe.



**TDC** Technical documentation (modular design up to conformity recommendation)

The production and maintenance of technical documents is a major principle of machine and industrial safety. Modern quality processes are based on a seamless chain of documentation, which represents a key element of product and process safety, accident prevention and for clarifying liability issues in the event of an accident.

In order to make this process as efficient as possible, tec.nicum draws up the necessary technical documentation based on the information provided by the customer. This can contain the following:

- Checklists based on product standards
- Risk assessments
- Evaluation of proposed solutions
- Electrical wiring diagrams including pneumatic and hydraulic processes where applicable
- Electrical measurements
- Certificates
- Design and validation of safety functions and systems
- Technical data, tables, manuals and maintenance schedules
- Drafting of a conformity recommendation. e.g. CE in accordance with MD in Europe





## Consultancy services – tec.nicum consulting

### Analysis and documentation

#### **MDI** Compliance

Manufacturers wishing to sell machines in specific regions of the world are subject to the local regional trading and quality requirements and increasing requirements in terms of safety technology.

In Europe, this is expressed in Machinery Directive 2006/42/EU. Evidence is provided by complying with EU conformity and the associated CE mark, which is considered a "passport for machines and systems".

The MDI module combines various service modules with a view to cover the whole process of evidencing conformity to regional machinery directives.

#### **HYG** Hygienic Design

The design and conversion or retrofitting of machines to meet the principles of "Hygienic Design" is a challenging task.

As well as requirements in terms of resistance to chemical substances, the high IP69K protection class for high-pressure cleaning of components also plays a decisive role. It is considered the standard for machines and systems in the food, bottling and (primary) packaging processes and in the pharmaceuticals industry. These basic requirements are the content of norms and recommendations from various leading instructions such as EHEDG, FDA, IFS, NSF, USDA, etc.

In line with the HYG module, tec.nicum supports its customers on the development of optimum designs for their machines and systems.

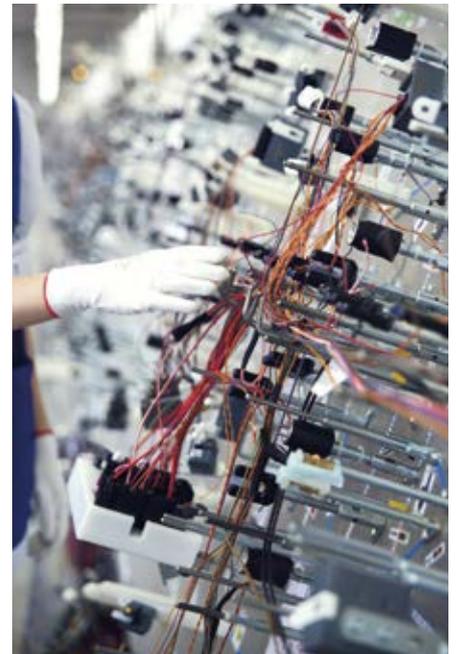


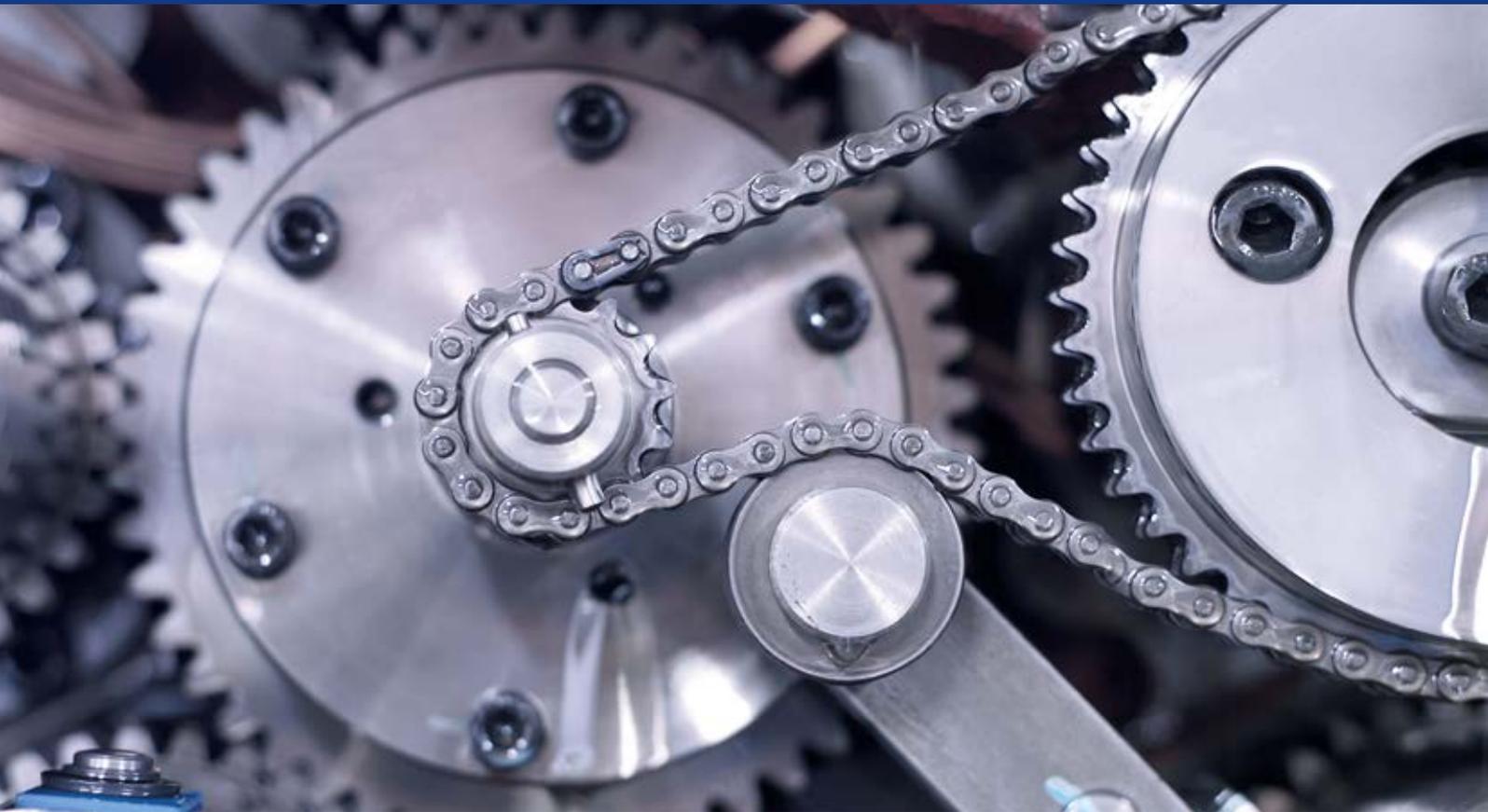
#### **AEX** Explosive-endangered areas

The requirements of explosion protection apply in many areas of industry, not only in the chemicals industry, but also, for example, in cosmetics and food production where powdered or gaseous ingredients or end products are processed, produced or stored.

tec.nicum offers the following explosion protection services:

- Classification by EX zones
- Documentation of explosion protection measures
- Technical implementation in potentially explosive environments
- Validation of devices based on applicable regulations





## Technical planning – tec.nicum engineering

### Design and programming

#### **PRJ** Technical project planning

One of the most important phases in the modification of a machine or production line is engineering prior to the conversion work. This lays the foundations for the quality of subsequent implementation. The aim is to develop technical safety solutions for machines and systems.

The model includes:

- CAD-based electrical, pneumatic and hydraulic circuit diagrams
- Production of the process handbook
- Programming of the software.

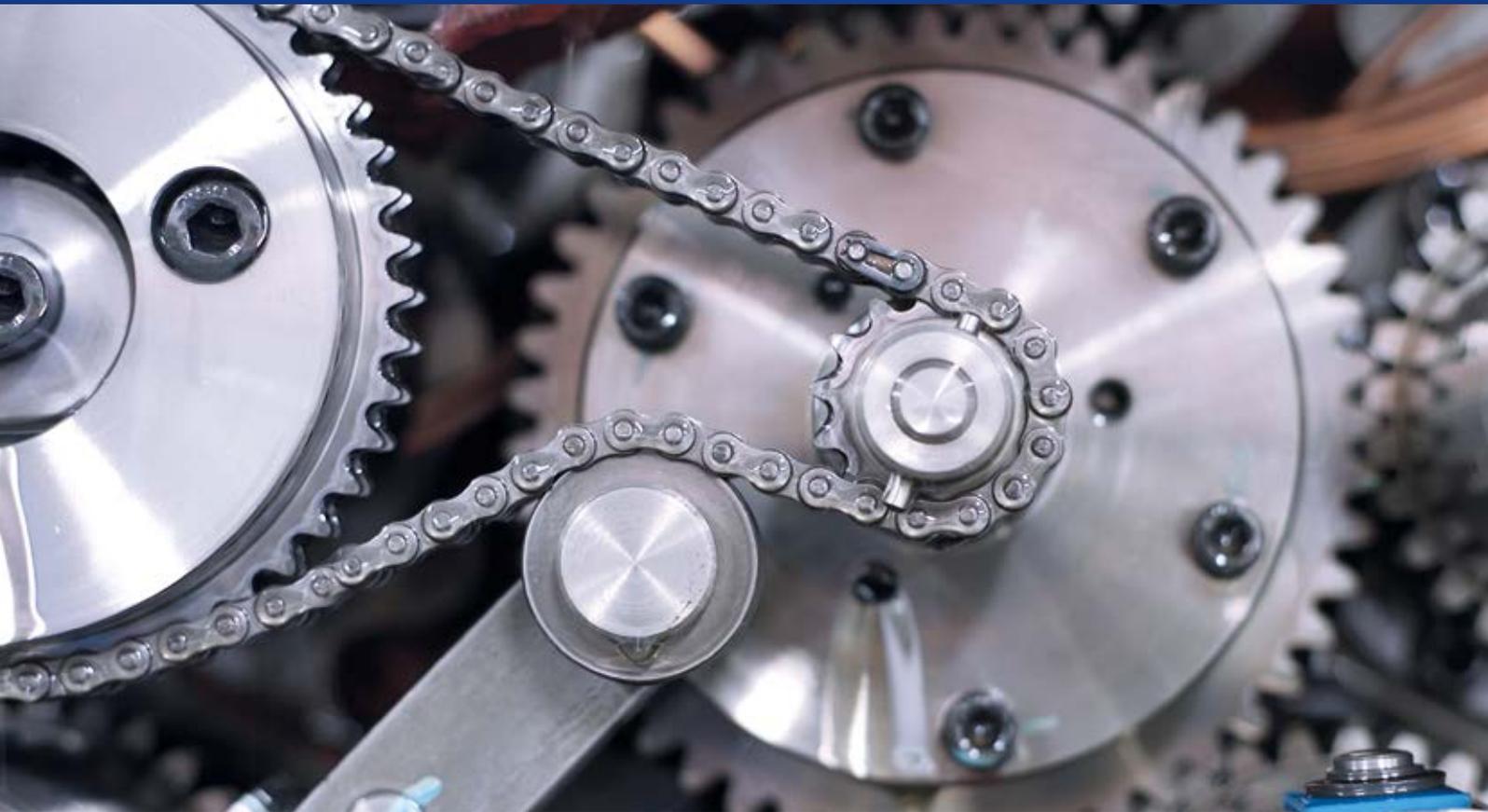
tec.nicum defines the necessary safety elements and investigates the PL, SIL and PFH<sub>0</sub>-values required. At the same time, the specialist tec.nicum personnel can show you the best way to implement the modification.

#### **VAL** Validation of safety functions to ISO 13849-2

Based on ISO 13849-2, tec.nicum produces all the documents (validation plan, error lists, calculations, etc.) and carries out the validation of safety functions by means of analysis and testing.

tec.nicum checks circuit diagrams for the electrical, pneumatic and hydraulic systems and calculates the performance level (PL) and PFH<sub>0</sub>\* for each safety function. The results of the validation are documented in drawings generated by expert personnel.

\* Probability of dangerous failure per hour



#### **RET** Machine modification and upgrade (retrofitting)

The tec.nicum experts can carry out all kinds of modification projects, from planning through commissioning or turnkey handover of the fully-compliant machine.

The engineers proceed as follows:

- Analysis of the status quo of measures already taken
- On-site recording of all data and areas of action
- Recording of all the necessary information (mechanical, electrical, hydraulic and pneumatic)
- Drafting of an initial action list, generic diagrams and sketches (CAD / CAE), including presentation as part of a first technical meeting
- Agreement of action lists and drafting of final plans and programs
- Draft, design and procurement of materials, safety equipment, control cabinets, safety components, fence systems, etc.
- Installation of equipment and peripherals with subsequent commissioning and approval
- Employee training
- Safety tests and approval of the whole installation
- Handover of full project documentation.

In modification projects, the tec.nicum specialists consider the specific risks and individual requirements such as system accessibility, to ensure the most efficient solution can be developed in the most economic way possible.





## Technical planning – tec.nicum engineering

### Design and programming

#### **MES** Measurements

For example, tec.nicum carries out run-on time measurements (STM) on hazardous machine movements in order to calculate what safety distances to hazard areas need to be complied with in accordance with EN 13857:2011. The following measurements are also offered: electromagnetic compatibility (EMC), noise (NOI), vibrations (VIB), etc.

#### **TST** Technical tests

tec.nicum carries out the tests required by ISO 60204-1 and checks whether the requirements are fulfilled for the certification of electric and electronic devices in Europe in accordance with the Machinery Directive 2006/42/EU:

- Test for consistent safety potential
- Test of the insulation resistance
- Stress test and measurement of residual voltage
- Test of dielectric strength





## Implementation – tec.nicum integration

### Execution and assembly

#### **MPI GU** Installation of protective equipment and safety fences

tec.nicum has extensive experience in the planning and implementation of complex protective equipment for various industries. These include, for example, the food and packaging industry, the automotive industry, paper manufacturing, metal processing and chemicals and pharmaceuticals.

tec.nicum's technical safety solutions are tailored to the individual requirements of the respective industry and the relevant company. Examples include hygiene-compliant safety doors for food processing, process adaptations for potentially explosive areas or protective equipment with special access options.

This involves the planning and installation of fixed or moving protective equipment and complete machine housing in a wide range of materials.

#### **SPR** Installation and integration of safety components

The tec.nicum engineers support the mechanical engineers and operators in implementing norm-compliant safety solutions for their machines and systems.

Support during configuration, programming and commissioning:

- Programming and integration of safety PLC
- Configuration and assembly of opto-electronic safety products (AOPD)
- Installation of
  - safety terminal strips, safety mats, etc.
  - safety switches and interlocks
  - safety sensors to meet ATEX requirements
  - safety sensors to meet the requirements of the food industry
- Conversion of control cabinets based on the PL required



Functional machine safety is a complex business which involves complying with a range of norms and directives. tec.nicum offers all machine manufacturers, operators and distributors completely product and manufacturer-neutral consultancy on all the latest statutory regulations and supports them in ensuring their machines and workplaces are designed to comply with the relevant standards.

tec.nicum's services cover four areas:

- Learning – tec.nicum academy
- Consultancy Services – tec.nicum consulting
- Technical planning – tec.nicum engineering
- Design – tec.nicum integration

The experts at tec.nicum implement all sorts of safety-related projects for their customers – from analysis of the status quo through planning and documentation to the final handover of the finished, norm-compliant machine. tec.nicum offers companies a global network of TÜV Rheinland-certified Functional Safety Engineers, so the services of the international tec.nicum organisation can be accessed quickly and easily wherever the customer is. tec.nicum experts not only have sound knowledge of the applicable regional and national guidelines, laws and ordinances, they also have technical know-how and extensive experience in project implementation.

tec.nicum sets great store by the objectivity of all its consultancy services and solution ideas.



## academy



- Seminars
- Customer specific training
- Inhouse-training
- Demonstration events



## consulting



- Risk analysis
- Risk assessments
- CE conformity procedure
- Calculation of safety functions
- Validation
- Assessment of machines and production lines



## engineering



- Design of protective equipment
- Technical planning and project management
- PLC programming
- CAD and CAE
- Planning machinery retrofits



## integration



- Installation of protective equipment
- Conversion/retrofitting

The details and data referred to have been carefully checked.  
Technical amendments and errors possible.

