**Safety requirements of applicable standards and directives**

**Analysing and evaluating risks when using robotics applications**

**Getting from the original idea to actual implementation of a robotics application is often a lengthy process. Technical aspects aren’t the only important consideration along the way. Legal regulations and standards also need to be complied with. Machinery Directive 2006/42/EC is the key legislation in terms of health and safety, but various DIN standards and, potentially, in-house regulations also need to be adhered to. After all, manufacturers have an obligation to carry out comprehensive risk assessments on their machinery and develop appropriate safety concepts. This is intended to rule out, or at least minimise, hazards and potential health risks.**

Any company that builds machinery or robotics applications is responsible for their safety. Potential risks when operating the machinery need to be identified in advance and reduced by taking appropriate safety precautions. Machinery Directive 2006/42/EC therefore also focuses on user and product safety. This directive has been enacted in German legislation in the form of the 9th Ordinance to the Product Safety Act (9. ProdSV). Over and above the Machinery Directive, however, other European directives may also apply, such as the EMC Directive for electrical equipment. At the start of the safety appraisal, manufacturers thus need to determine which directive applies to the machine in question and, accordingly, which standards must be complied with. After all, the specific standards required for the risk assessment depend on the type of machine. Moreover, in-house regulations also need to be adhered to.

**Are robotics solutions machines?**

The first step in the case of robotics applications is to clarify whether they are classed as completed or partly completed machinery. For example, a fully functional robotic arm is regarded as partly completed machinery. However, as soon as this arm fulfils a specific purpose – as would be the case for a robot used to load a CNC milling machine – it is designated as completed machinery. Depending on this classification, various health and safety requirements need to be met, further proof of machine safety provided and technical documentation prepared. In addition to the Machinery Directive, ISO 10218-1 and ISO 10218-2 also include important information about the safe design and integration of robotics applications.

**Purpose of a risk assessment**

A safety concept for robotics applications includes a risk assessment. Even before a machine is built, for instance, hazards need to be identified, risks appraised and evaluated, and safety precautions defined. This risk assessment is an important part of the technical documentation. The EN ISO 12100 standard provides basic information about performing a risk assessment. It includes general design principles, key definitions and explanations of technical terminology. A risk assessment involves several steps. The first of these is to define the machine’s limits of application and use. Next, hazards need to be identified and risks appraised. These three aspects are also referred to as the risk analysis, which is followed by an evaluation of the risks. Appropriate safety precautions are also required and, if appropriate, risk reduction measures. The risk matrix in DIN EN ISO 13849 is extremely useful when it comes to classifying risks and defining the necessary safety fixtures.

**Identifying and evaluating all hazards**

When designing robotics solutions, it is fundamentally important to ensure staff can still see the automated process. In addition to the obvious accident and injury risks, all other types of hazards associated with a robotics application need to be identified. These include ergonomic and mechanical hazards such as sharp-edged or pointed workpieces. Electrical hazards must also be taken into consideration, as must hazards resulting from harmful dusts and gases. Once the potential risks have been analysed, the actual hazards that these pose are evaluated. That means ascertaining how likely it is that the potential risk will occur and lead to damage/injury. The extent of the potential damage/injury and the number of people affected also need to be assessed. One other example of a key factor in this regard is how often and for how long staff are in the danger area.

**Design-related and technical risk reduction measures**

The manufacturer or supplier must apply an appropriate safety concept to reduce the risk. In the first instance, a design-based solution needs to be found for each hazard that has been identified, so that the relevant risk can be avoided. Protective enclosures are one common example of design-related measures. However, the safety precautions taken must not introduce any new hazards. If design-based solutions are not an option, technical safety measures must be included in the planning. A light barrier could be used to automatically shut down systems when a hazard occurs, for instance. Should technical measures not be feasible either, warning symbols/notices and the user guide must make users aware of the residual risk – flagging up an electrical hazard due to incorrect connection or the absence of earthing, for example.

**Risk assessment as a basis for a declaration of conformity**

Carrying out and documenting risk assessments is a key part of the process involved in evaluating and assessing conformity. Consequently, a prior analysis and evaluation of risks is required for both a legally valid declaration of conformity and a CE marking. Manufacturers must supply comprehensive documentation indicating how they addressed the risks of a robotics application. The declaration of conformity also includes information about the analyses and tests carried out, along with details of the measures taken and the associated results. The CE marking proves the conformity of a robotics application in line with the Machinery Directive. It is located on the specification plate, which also contains important information about the manufacturer and the application.

item has produced a guide entitled [Realising robotics applications safely](https://welcome.item24.com/realising-robotics-safely) that explains risk assessment processes and the safety principles to consider in the human-robot collaboration context. The item Academy also offers a [training module](https://academy.item24.com/goto.php?target=sahs_3212&client_id=item24) covering the different robot designs and the various standards and directives that need to be complied with.

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**Caption 1:** Before robotics applications are used, manufacturers must identify potential risks associated with machine operation and take appropriate safety precautions in accordance with Machinery Directive 2006/42/EC.

**Caption 2:** The first step in the case of robotics applications is to clarify whether they are classed as completed or partly completed machinery. A fully functional robotic arm is regarded as partly completed machinery, but as soon as it fulfils a specific purpose, it is designated as completed machinery.

**Caption 3:** It is important to ensure staff can still see the automated process. In addition to the obvious accident and injury risks, all other types of hazards associated with a robotics application need to be identified.

**About item**

item Industrietechnik GmbH is the pioneer in building kit systems for industrial applications and a partner of the manufacturing industry across the entire globe. Today, the item product portfolio comprises more than 4,000 high-quality components designed for use in machine bases, work benches, automation solutions and lean production applications. The company has received a string of awards for products with ground-breaking industrial design and end-to-end ergonomics.

item is spearheading digital engineering by driving forward the digitalisation of processes with software tools developed in-house. The item Academy offers training at various levels, with on-demand training and online courses available in multiple languages.

Headquartered in Solingen, Germany, item has subsidiaries in various countries. Some 900 employees worldwide harness their know-how and passion to develop innovative solutions and services. Twelve sites make sure the company is always close to customers in Germany, with a global logistics chain ensuring swift delivery times for all components.

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