



- 1 *Assembly cell with human-robot cooperation.*
- 2 *Human-robot cooperation in a welding application.*

IMPLEMENTING ROBOT APPLICATIONS SAFELY WITH AND WITHOUT HUMAN-ROBOT COOPERATION

Safe robot systems

Besides the “classical” robot systems behind safety fences, new technologies for monitoring the work envelope and interacting with robots offer the option to at least partially automate processes that were previously performed manually. This gives companies the chance to make further savings and optimize work processes with the aid of robotics through constant manufacturing quality and increased production capacity.

All robot applications in production processes fall under the Machinery Directive. To ensure operator safety throughout the complete lifecycle of such a system, applications are subject to a number of requirements regarding the use of safety-rated components and design measures. At the same time, economic system targets need to be met. Consequently, the costs involved in creating a safe robot system that adheres

to CE-label requirements must remain within the budget planned for the automation plant.

Methodical planning and cost estimations based on expert knowledge and long-standing experience help companies make sound assessments and decisions. This applies particularly to partially-automated applications because their increased safety requirements are often linked to added costs.

Risk assessment

A key step when evaluating the safety of a robot application is firstly to conduct a risk assessment. This enables the potential risks and resulting safety measures to be identified and evaluated in accordance with current norms and guidelines (e.g. ISO 12100, ISO 13849, ISO 10218-1/-2).

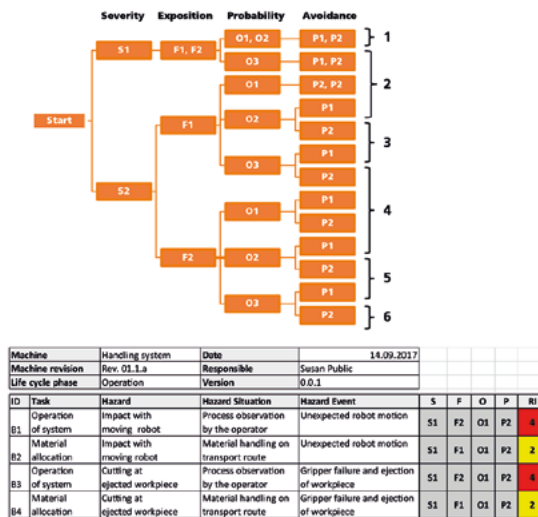
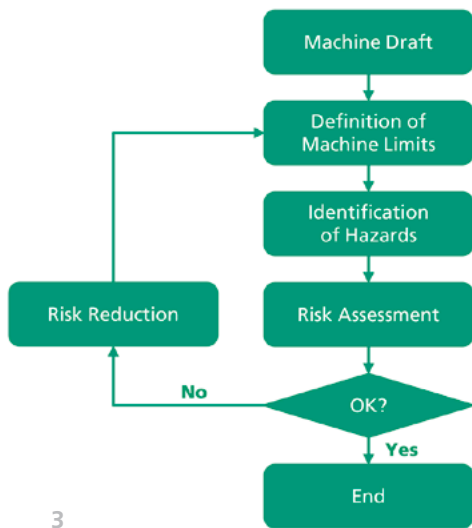
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Machine	Handling system	Date	14.09.2017
Machine revision	Rev. 01.1.a	Responsible	Susan Public
Life cycle phase	Operation	Version	0.0.1

ID	Task	Hazard	Hazard Situation	Hazard Event	S	F	O	P	RI
B1	Operation of system	Impact with moving robot	Process observation by the operator	Unexpected robot motion	S1	F2	O1	P2	1
B2	Material allocation	Impact with moving robot	Material handling on transport route	Unexpected robot motion	S1	F1	O1	P2	2
B3	Operation of system	Cutting at ejected workpiece	Process observation by the operator	Gripper failure and ejection of workpiece	S1	F2	O1	P2	4
B4	Material allocation	Cutting at ejected workpiece	Material handling on transport route	Gripper failure and ejection of workpiece	S1	F1	O1	P2	2



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Together with the experts from Fraunhofer IPA, companies can determine the general constraints and requirements of their automation system in the form of a workshop right at the start of the design phase. This makes sure that the implemented solution will withstand a critical safety appraisal.

Development of safety measures

Fraunhofer IPA would be happy to advise you on the components to use, helping you to develop robot applications with and without human-robot cooperation (HRC). In the process, the experts examine your specific environmental conditions, as well as the resulting requirements concerning the design and configuration of appropriate safety measures. By adapting the specific safety measures at an early stage, the complexity – and thus the engineering, investment and maintenance costs – of a robot application can be significantly reduced.

Collision force measurements

In addition to expertises on the design and assessment of safe HRC applications, Fraunhofer IPA also has the measuring instruments and know-how it needs to collect and analyze data to verify force and pressure limits in HRC operations as required by ISO/TS 15066. In this way, the acceptable residual collision risk for HRC applications with defined handover positions can be appropriately assessed and documented.

Our services

Our development support is based on our long-standing experience in designing and implementing industrial robot applications in productions. You benefit from our expert knowledge of the components and system solutions available on the market for safely operating production stations with robots, especially HRC systems.

Thanks to our growing number of modules for tailored safety solutions for HRC applications, productivity figures - and thus the return on investment - can be optimized. This enables any uncertainties regarding implementation to be already sorted out during the design phase.

We would be delighted to provide assistance, helping you with anything from the design right through to the acceptance of a safe robot application in your production facilities. This involves developing safety and interaction concepts and the corresponding layout, choosing and designing hardware components for tools, control components, as well as suitable additional sensor systems and the accompanying implementation of the risk assessment process. Get in touch with us.

3 Iterative cycle of a risk assessment.

4 Handling cell for workpiece separation.