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Clearly Documented Machine Safety.
From risk assessment to safety evaluation.

Safety Risk Assessment and Safety Evaluation Tool

siemens.com/safety-integrated
Safe machine concepts without detours.

The requirements of the new 2006/42/EC machinery directive on functional safety – which define the protection of humans, machines and production goods – came into effect on December 29, 2009. Machine manufacturers and operators have to adjust to changed procedures and regulations in order to ensure continued competitiveness, export capability and liability security. These challenges can be perfectly mastered with the services offered by the Siemens Safety Integrated portfolio: Safety Risk Assessment Management and Safety Evaluation Tool.

New machinery directive requirements
The aspect of functional safety mainly focuses on the correct function of a machine’s or system’s control devices and safeguards. The new requirements of the 2006/42/EC machinery directive address the subjects of risk assessment, requirements placed upon documentation and suitable safety systems, conformity evaluation as well as machine manufacturers outside the European Union.

Recognition, control and consistent documentation of risks
Compliance with the new machinery directive and resulting export capability and liability security can be ensured by application of the EN ISO 13849-1 or EN 62061 standards. The safety verification requested by both standards is intended to prove the employed safety solution’s attainment of the SIL/PL value determined within the scope of risk assessment. A clearly structured risk assessment thus represents the basis for safety validation!

Consequently, risk assessment represents the first step towards safe machine concepts – already during the machine’s planning phase. Such assessment should be carried out by competent qualified staff and incorporated in the machine’s technical documentation.
Protective measures for risk reduction which are described by means of safety functions can be derived from risk assessment. The safety function’s solution is then verified and evaluated until the safety integrity level requested in the risk assessment is attained. In this context, standard-compliant documentation not only serves as proof, but also ensures consistent legal compliance and is indispensable for the CE declaration of conformity. Our Safety Integrated service portfolio supports you with the easy and reliable attainment of this target as follows:

1. Safety Risk Assessment Management:
   We offer competent support already from the beginning of the planning phase. Within the scope of a one-day training and with the help of professional documentation tools, our TÜV-tested method for standard-compliant risk assessment implementation in accordance with EN ISO 14121-1 resp. EN ISO 12100:2010 facilitates safe machine concepts with minimum expenditures.

2. Safety Evaluation Tool:
   Our TÜV-tested online tool supports you with the evaluation and documentation of your machine’s safety functions.
Maximum safety right from the start – with Safety Risk Assessment Management.

What are the requirements of the new machinery directive? How can these requirements be utilized efficiently? Today, protective design measures are often overdimensioned and cause unnecessary costs. The clearly structured procedure of risk assessment provides reliability and reduces costs both in terms of engineering and hardware. We offer comprehensive support already at the beginning of the planning phase: Safety Risk Assessment Management – the TÜV-tested method for standard-compliant risk assessment implementation in accordance with EN ISO 14121-1 resp. EN ISO 12100:2010.
As early as during the planning phase, Safety Risk Assessment Management provides perfect support with regard to the machinery directive’s requirements. Your advantage: Identified design measures for risk reduction can already be incorporated during the construction phase – doing away with cost-intensive and laborious reworks on an already constructed machine.

**Integrated support with Safety Risk Assessment Management**

Safety Risk Assessment Management comprises a comprehensive package, including instructions, templates and check lists for the preparation of a seamless, clearly structured and correspondingly comprehensible documentation. With Safety Risk Assessment Management, you will benefit from a thorough research of directives and standards as well as from a clear method for risk assessment jointly developed with the TÜV (German Technical Inspectorate). All it takes is a one-day training! Subsequent TÜV acceptance can be arranged for rapidly and effortlessly upon request.

**Advantages of the method:**

- Clear information on each step and clear instructions regarding machine protection on the basis of design measures or other measures, right down to the definition of safety functions of technical safeguards in accordance with EN 62061 or EN ISO 13849-1 – without additional tools.

- This structured approach of risk assessment offers advantages for all staff members from construction (mechanics, electrics, hydraulics, pneumatics) and engineering involved in machine production.

**SITRAIN course: ST-RAM**


The target of this one-day seminar aims at making the process of risk assessment as necessary step for CE marking transparent and comprehensible on the basis of a specific method. Seminar participants will be introduced to the method of risk assessment in accordance with EN ISO 14121-1 resp. EN ISO 12100:2010 on the basis of pre-fabricated templates with the help of a real example.

Further information is available at: [www.siemens.com/sitrain-safetyintegrated](http://www.siemens.com/sitrain-safetyintegrated)
Step-by-step approach for safe machine concepts:

A. Description of the machine

B. Definition of machine areas and hazard zones

C. Risk assessment

D. Risk-reducing protective measures based on the realization of safety functions

E. Validation of safety functions: including evaluation and documentation with the Safety Evaluation Tool

The result:

- Comprehensible documentation of a machine’s risk assessment
- Safe machine concepts
- CE conformity
- Correct application of the machinery directive and new standards

Advantages offered by the TÜV-tested method

- Easy implementation thanks to:
  - multiple usage of text blocks for further risk assessments of similar machines as well as for technical documentation
  - uniform terms for all involved departments
- Time and cost savings
- Consistent legal compliance through application of harmonized standards
GS-Steuerungstechnik GmbH benefits from Safety Risk Assessment Management.

“The documents provide excellent support as they offer sound readability and comprehensibility thanks to the definition and consistent use of uniform terms.”

GS-Steuerungstechnik GmbH is an innovative company in the field of control technology which has amongst others specialized in the retrofitting and production of friction welding and special-purpose machines. The company opted for Safety Risk Assessment Management by Siemens for the reliable risk assessment of its new friction welding system – and was able to implement the assessment autonomously and with minimum time expenditures after a brief introduction to the method.

The easily and effortlessly applicable risk assessment method supported a joint understanding of the safety-technical correlations of mechanics, hydraulics and electrics. This is underlined by the following compliment made by GS-Steuerungstechnik GmbH: “Thank you for your support! The documents provide excellent support as they offer sound readability and comprehensibility thanks to the definition and consistent use of uniform terms.”
From risk assessment to the result report.

The trainings and tools offered by our Safety Integrated portfolio support you with the easy, rapid and safe conversion to the new machinery directive. The example below demonstrates the successful risk assessment implementation on the basis of Safety Risk Assessment Management and the evaluation documentation of your machine’s safety concepts. Our Safety Evaluation Tool supports you on the way to standard-compliant machine documentation.
Procedure

Four hazard areas were determined for a machine on the basis of risk assessment:

1. Access to the machine area
2. Area around the handling machine during maintenance
3. Material discharge
4. Stopping of the conveyor belt
5. Stopping of the complete system

For protection of the hazard zones, four safety functions with specific requirements in terms of safety integrity (e.g. SIL 2 or PL d) have to be implemented as risk-reducing measures. These measures are analyzed, evaluated, modified within the scope of an iterative process if required, evaluated anew and then realized.

Technical protective measures

The following solutions were determined as result:

1. Protective fence with door monitoring
2. Protection during zone-dependent maintenance with slow speed or stop
3. Non-contact monitoring of material discharge
4. EMERGENCY-STOP on the conveyor belt
5. Global EMERGENCY-STOP

Documentation

For safety verification in the machine documentation, each safety function has to be evaluated with the selected components in accordance with manufacturer specifications. Application of the EN 62061 or EN ISO 13849-1 standards facilitates such evaluation in order to attain compliance with the machinery directive. The Safety Evaluation Tool offers valuable support with this process.

The Safety Evaluation Tool for the EN 62061 and EN ISO 13849-1 standards takes you to your goal directly. This TÜV-tested online tool from the Safety Integrated portfolio by Siemens facilitates the fast and reliable evaluation of your machine’s safety functions. As a result, you are provided with a standard-compliant report which can be integrated in the documentation as proof of safety.
Safe machine concepts without any detours

With the Safety Evaluation Tool, you opt for the easy way for your machine's safety verification as the online tool guides the user through the evaluation process step-by-step – from specification of the safety system's structure to component selection down to determination of the attained safety integrity level (SIL/PL).

When starting a new project, the safety zones are analyzed initially, after which the safety functions are created (step 1 to 3). In the next step, subsystems are created and filled with data (step 4). After evaluation of the overall result, the final report is output which provides clear status information at all times (step 5 and 6).

Safety Evaluation Tool – advantages at a glance

- Safety regarding the standards’ application: automatic calculation on the basis of currently applicable standards
- Rapid result: standard-compliant report
- TÜV-tested tool
- Reduced time expenditures for safety function evaluation
- Rapid access to current product data
- Comfortable archiving: Projects can be saved and called up as required
- Rapid and easy handling: comprehensive, pre-defined example libraries
- Free use of the online tool*
- Global service and support

(* only the usual costs for Internet access accrue)

The Safety Evaluation Tool forms part of Safety Integrated, the intelligent safety solution by Siemens with a comprehensive product portfolio. Our certified safety technology complies with all relevant standards and is already incorporated in the Safety Evaluation Tool.

Further information on how to realize increased safety and productivity is available at:

www.siemens.com/safety-integrated
Step 1

Definition of a safety function

e.g. safety function “zone-dependent maintenance”

- Key switch is set to maintenance.
  ➔ Modular safety system generates signal for reduced speed (safely limited speed) of the frequency converter
  ➔ Release of the position switch’s door tumbler and opening of the door

Step 2

Selection of the standard to be used for calculation

- EN 62061 or
- EN ISO 13849-1
Step 3

Description of the safety function

The safety function “zone-dependent maintenance” consists of the subsystems detection (position switch), evaluation (modular safety system) and reaction (drive).

Entry of the required PL or SIL

<table>
<thead>
<tr>
<th>Detection</th>
<th>Evaluation</th>
<th>Responding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position switch</td>
<td>Modular safety system</td>
<td>SINAMICS S120</td>
</tr>
</tbody>
</table>

Step 4

Creation of subsystems or SRP/CS, detection, evaluation and reaction

Data entry:
Product selection from database

Result:
Safety Integrity Level (SIL) or Performance Level (PL) and PFHD of the subsystem or SRP/CS
Step 5

Determination of the overall result

- Achieved SIL: SIL 2
- Achieved PFHD: 5.53 E-00

Step 6

Generation of result report for machine documentation

TÜV Rheinland®
Precisely Right.
Siemens supports you!

As partner for all safety issues, we not only offer corresponding safety-related and certified products and systems, but also consistently provide you with up-to-date know-how of international standards and regulations. We offer a comprehensive range of trainings and services for machine manufacturers and system operators throughout the entire life cycle of safety-technical systems and machines.

You require further information?

More detailed information is available via the following links:

Training/standards training: SITRAIN Safety
Contact: www.siemens.com/sitrain-safetyintegrated

Information on Safety Integrated:
www.siemens.com/safety-integrated

Service & Support:
www.support.automation.siemens.com
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