

Focus on BGIA's work

Institut für Arbeitsschutz der Deutschen Gesetzlichen Unfallversicherung

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SISTEMA software for the assessment of safe controls on machines

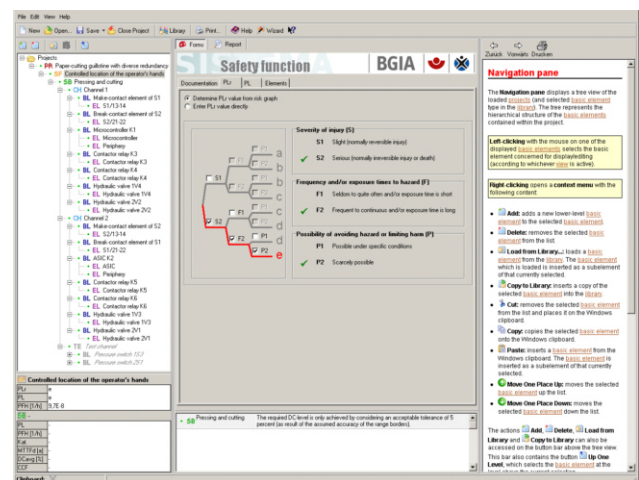
Problem

For well over a decade, safety-related parts of machine controls have been designed and evaluated in accordance with the EN 954-1 safety standard. In order for greater consideration to be given to new technologies such as electronics and software, this standard required thorough revision. In the revised standard, EN ISO 13849-1:2006, proven deterministic characteristics and new requirements concerning the probability of failure are combined in a practicable manner.

These methods for calculation of the probability of failure and handling of reliability data are still relatively unknown in the machine construction sector. Despite simple approaches, their implementation remains complex in practice. In order to promote acceptance of the new methods among machine manufacturers, control system manufacturers, users and test bodies, tools are required which enable application errors to be avoided during the design, integration and evaluation of safety-related aspects.

Activities

One of several tools developed at the BGIA is the SISTEMA PC program for the safe control of machines. Essentially, this tool enables users to calculate the probability of failure including the attained Performance Level for control systems, whether planned or already implemented, and to do so quickly and easily. The requirements for the program were defined following systematic examination of the standard in its final form, and with the incorporation of users' experience with a software prototype developed beforehand.



SISTEMA user interface with risk graph

The various methods set out in the standard are modelled in the software such that users need only enter their data in manageable input dialogs with tree structure, and the result is calculated automatically and continuously updated.

Besides robust analysis functions, user-friendly functionality has also been implemented, such as the results prognosis, and a database for standard components and control structures which have already been analysed. The serviceability of the software is enhanced by documentation of the results in the form of a report and by the preparation of a number of localized language versions. The user interface has been programmed largely independently of the database for projects, safety functions and components. Testers at the BGIA trialled the program by evaluating real-case control systems. In addition, many example circuits were analysed. These are being published in a BGIA Report.

Results and Application

The SISTEMA software utility provides manufacturers and developers of safety-related machine controls with comprehensive support during evaluation of safety in the context of the new EN ISO 13849-1 standard. The tool, which runs on Windows, enables its user to model the structure of the safety-related control components based upon the "designated architectures", and ultimately permits automated analysis of the reliability values at different levels of detail, including that of the attained Performance Level. The libraries supplied contain certain standard elements, blocks and complete subsystems. Users can add to these as desired. They also have the option of installing further library modules, such as project-specific and machine-specific libraries from machine manufacturers, containing re-usable objects. Component manufacturers can also support their customers by creating libraries of reliability data for their products.

SISTEMA is freeware, and can be downloaded from the BGIA's website following registration. SISTEMA is also available in English; further language versions are planned.

Area of Application

Test departments of the German institutions for statutory accident insurance and prevention; manufacturers and operators of safety components and machines

Additional Information

- www.dguv.de/bgia, Webcode: [e34183](#) (SISTEMA download, further literature)
- www.dguv.de/bgia/13849e, Webcode [e89507](#) (Further information on EN ISO 13849)
- EN ISO 13849-1:2006 Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design.

Expert Assistance:

BGIA, Division 5: Accident prevention – Product safety

Literature Requests:

BGIA, Central division

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BGIA – Institut für Arbeitsschutz der
Deutschen Gesetzlichen Unfallversicherung
Alte Heerstr. 111
53757 Sankt Augustin
Germany

Edited by: M. Hauke, Dr M. Huelke

Phone: +49 2241 231-02/Fax: +49 2241 231-2234

e-mail: bgia@dguv.de

Internet: www.dguv.de/bgia