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EN ISO 13849-1

What is a safety related control system?

A control system in a machine should be regarded as being safety-related if it contributes to reducing the occurrence of a hazardous situation or if it is required to function correctly to maintain or achieve safety. The functions carried out by a safety-related control system are termed safety functions.

Generally safety functions either prevent the initiation of a hazard or detect the onset of a hazard. Safety-related control systems should be designed and configured to be reliable (bearing in mind the consequences of any failure) and to perform the necessary functions to achieve or maintain a safe state or mitigate the consequences of a hazard. The main standard to use from a machinery safety perspective is EN ISO 13849-1.

BS EN ISO 13849-1

Provides safety requirements and guidance on the principles for the design and integration of safety-related parts of control systems, including the design of software. For these parts of safety-related parts of control systems, it specifies characteristics that

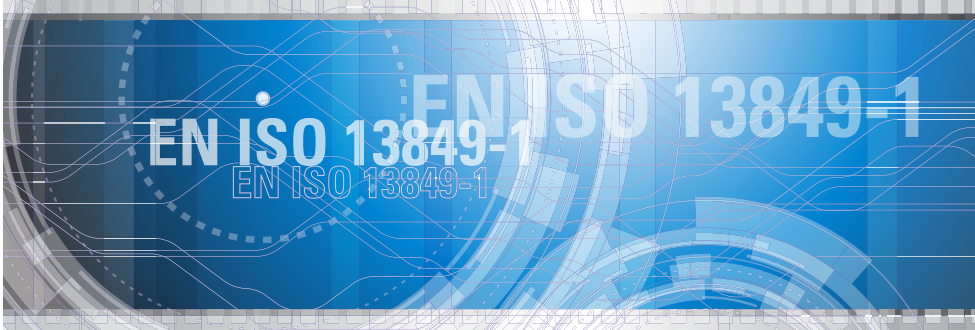
include the performance level required for carrying out safety functions. It applies to safety related parts of control systems, regardless of the type of technology and energy used (electrical, hydraulic, pneumatic, mechanical, etc.), for all kinds of machinery.

BS EN ISO 13849-1 is intended to give guidance to those involved in the design and assessment of control systems on aspects such as categories or performance levels specification. As part of the overall risk reduction strategy of a machine, a designer will often choose to achieve some measure of risk reduction through the application of safeguards employing one or more safety functions. Parts of machinery control systems that are assigned to provide safety functions are called safety-related parts of control systems and these can consist of hardware and software and can either be separate from the machine control system or an integral part of it. In addition to providing safety functions, safety related parts of control systems can also provide operational functions (e.g. two handed controls as a means of process initiation).



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The initial part of the assessment requires carrying out a risk analysis to identify the safety performance level (PL) appropriate to the hazards associated with the machine, a procedure that is covered by EN ISO 13849-1. The engineer will then design a control system to meet this PL, by considering the category, carefully selecting the components used and, carrying out detailed calculations involving the mean time to dangerous failure for these components, along with diagnostic coverage and common cause failures.

Validation

Having defined the performance level, the next step is to validate this, to ensure that the design and specification of equipment used will in fact meet the performance level and the requirements of the standard. Validation is covered by EN ISO 13849-2 which states:

“The validation shall demonstrate that each safety-related part meets the requirements of ISO 13849-1, in particular:

- the specified safety characteristics of the safety functions provided by that part, as set out in the design rationale, and
- the requirements of the specified category [see ISO 13849-1, clause 6]

Validation should be carried out by persons who are independent of the design of the safety-related part(s).”

The validation process should re-examine the design, look at the implementation of the safety related parts of a control system and, in some cases, verify its functionality by testing. Validation must also take into account the environmental conditions in which the machine will operate and be fully documented to show that it has been properly carried out.

Solution

Validation, while mandatory, is a far from trivial exercise. In fact, many machine manufacturers may well find that they lack the in-house resources and expertise needed to properly validate the safety related parts of a control system in their products. In such cases, the services of an expert consultant, such as Laidler Associates, will be required. An additional benefit of using services of this type is that the requirement for validation to be carried out by persons who are independent of the design process will be automatically satisfied.

Laidler Associates can provide advice and assistance with all aspects of the process of complying with EN ISO 13849-1 including initial risk analysis, validation and documentation.

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Laidler Associates • TÜV SÜD Group
Belasis Business Centre • Coxwold Way • Billingham
Cleveland • TS23 4EA • United Kingdom
Tel: +44 (0)1642 345637 • Fax: +44 (0)1642 345643 • Email: enquire@laidler.eu