
**Safety of machinery — Safety-related parts
of control systems —**

Part 100:
**Guidelines for the use and application of
ISO 13849-1**

*Sécurité des machines — Parties des systèmes de commande relatives à la
sécurité —*

*Partie 100: Lignes directrices pour l'utilisation et l'application de
l'ISO 13849-1*



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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

Attention is drawn to the possibility that some of the elements of this part of ISO 13849 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TR 13849-100 was prepared by Technical Committee ISO/TC 199, *Safety of machinery*.

ISO 13849 consists of the following parts, under the general title *Safety of machinery — Safety-related parts of control systems*:

- *Part 1: General principles for design*
- *Part 100: Guidelines for the use and application of ISO 13849-1*

Introduction

ISO 13849-1 was published in 1999 and from experience gained it is clear that there have been difficulties in understanding how ISO 13849-1 is to be used. The present Technical Report gives advice on how to avoid misinterpretations.

ISO 13849-1 gives guidance on the principles to be followed in:

- designing safety-related parts of control systems (ISO 13849-1:1999, clause 4);
- the characteristics of safety functions (ISO 13849-1:1999, clause 5);
- the requirements for the categories of safety-related parts of control systems (ISO 13849-1:1999, clause 6).

Feedback from users indicates that the scope of ISO 13849-1 is not fully understood. Therefore it should be emphasised that ISO 13849-1 does not give guidance on:

- the systematic application of the risk reduction process to the selection of the categories of safety-related parts of the control system;
- the application of the risk reduction process to the overall safety requirements of the machine (see ISO 13849-1:1999, step 2 in Figure 1);
- the detailed implementation of safety-related parts utilising different technologies, and in particular when different technologies are combined within one safety function.

An amendment to/revision of ISO 13849-1:1999 is being prepared to incorporate the ideas of this Technical Report, together with some additional points. Upon its publication, this Technical Report will be withdrawn.

This Technical Report is based on CR 954-100, published by the European Committee for Standardization (CEN).

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Part 100:

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1 Scope

This Technical Report provides guidance on the appropriate use and interpretation of ISO 13849-1:1999. It also gives further information on the following topics:

- how the control system contributes to reducing risk in the machine;
- what is meant by the safety-related parts of the control system in relation to safety functions;
- the proper selection and use of categories;
- the role of annex B of ISO 13849-1:1999.

2 Correct use of ISO 13849-1:1999

The issues presented in ISO 13849-1:1999 are complex. Its clauses are interrelated and cannot be used alone. It is therefore necessary to take into account ALL clauses of ISO 13849-1:1999.

3 Explanation of the design procedures

The overall design procedure is given in ISO/TR 12100-1:1992, clause 5. Part of this process is a risk assessment, the principles of which are given in ISO 14121. This risk assessment covers the whole machine life cycle. If it is found that there are risks which must be reduced, then appropriate measures must be chosen. ISO/TR 12100-2:1992 gives guidance on the measures for risk reduction.

Part of the risk reduction process is to determine the safety functions (ISO/TR 12100-1:1992, 3.13) of the machine. This includes the safety functions of the control system, e.g. emergency stop function, start and restart (see ISO 13849-1:1999, clause 5).

A safety function may be implemented by one or more safety-related parts of the control system. The designer may use any of the technologies available, singly or in combination. A safety function can also be an operational function, e.g. a two-hand control as a means of cycle or process initiation.

A typical safety function is given in Figure 1 showing safety-related parts (SRP) for:

- input (SRP_a);
- logic/processing (SRP_b);
- output/power control elements (SRP_c);
- interconnecting means (i_{ab} , i_{bc}), e.g. electrical, optical.

NOTE 1 Safety-related parts consist of one or more components; components consist of one or more elements.

NOTE 2 All interconnecting means are included in the safety-related parts.

NOTE 3 An example of a safety function is shown in Figure 2 and the associated text.