
**Safety of machinery — Relationship
with ISO 12100 —**

**Part 2:
How ISO 12100 relates to ISO 13849-1**

Sécurité des machines — Relation avec l'ISO 12100 —

Partie 2: Relation entre l'ISO 12100 et l'ISO 13849-1

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 199, *Safety of machinery*.

ISO/TR 22100 consists of the following parts, under the general title *Safety of machinery — Relationship with ISO 12100*:

— *Part 2: How ISO 12100 relates to ISO 13849-1*

How ISO 12100 relates to type-B and type-C standards and the implementation of ergonomics in safety standards are to form the subjects of future parts 1 and 3.

Introduction

The use of ISO 12100 and ISO 13849-1 has shown that readers have experienced difficulty in understanding how these two documents work together. This document has been prepared to guide readers in how the standards are to be used to achieve tolerable risk for a machine in general and for the safety-related parts of the control system, in particular.

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Safety of machinery — Relationship with ISO 12100 —

Part 2:

How ISO 12100 relates to ISO 13849-1

1 Scope

This part of ISO/TR 22100 describes the general relationship between ISO 12100 and ISO 13849-1 used to reduce the risk of harm. It focuses on the use of safety-related parts of control systems in relation to risk assessment and the risk reduction process.

NOTE The explanations about the relationship to ISO 12100 given in this document are relevant for ISO 13849-1 but could be applied in a similar manner to IEC 62061.

2 Normative reference

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 13849-1, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

[ISO/TR 22100-2:2013](https://standards.iteh.ai/catalog/standards/sist/95d8a77b-c1e3-43d5-b177-52f561446f6a/iso-tr-22100-2-2013)

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3 General structure of the system of machinery safety standards

Standards on safety of machinery have the following structure:

- **type-A standards** (basic safety standards) giving basic concepts, principles for design, and general aspects that can be applied to machinery;
- **type-B standards** (generic safety standards) dealing with one safety aspect or one type of safeguard that can be used across a wide range of machinery;
- **type-C standards** (machine safety standards) dealing with detailed safety requirements for a particular machine or group of machines.

As shown in [Figure 1](#), ISO 12100 is the type-A standard specifying the general principles for safety of machinery and applies to all machinery. ISO 13849-1 is a typical type-B standard addressing a particular aspect and can be used across a wide range of machinery.

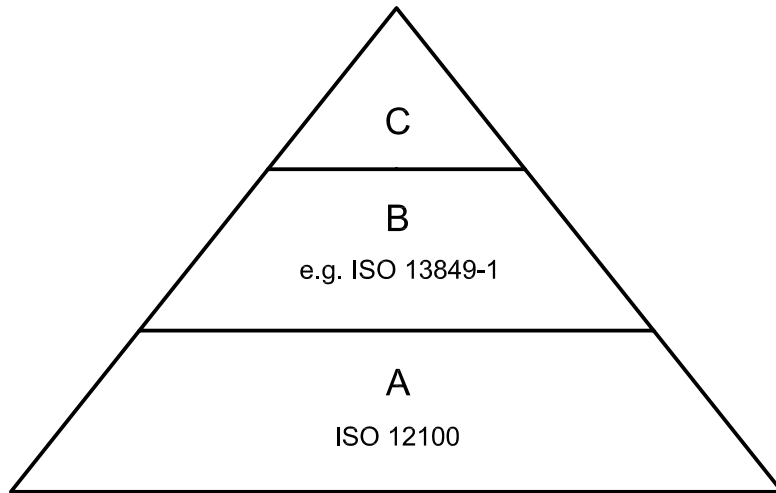


Figure 1 — General structure of the system of machinery safety standards

4 The risk assessment and risk reduction process

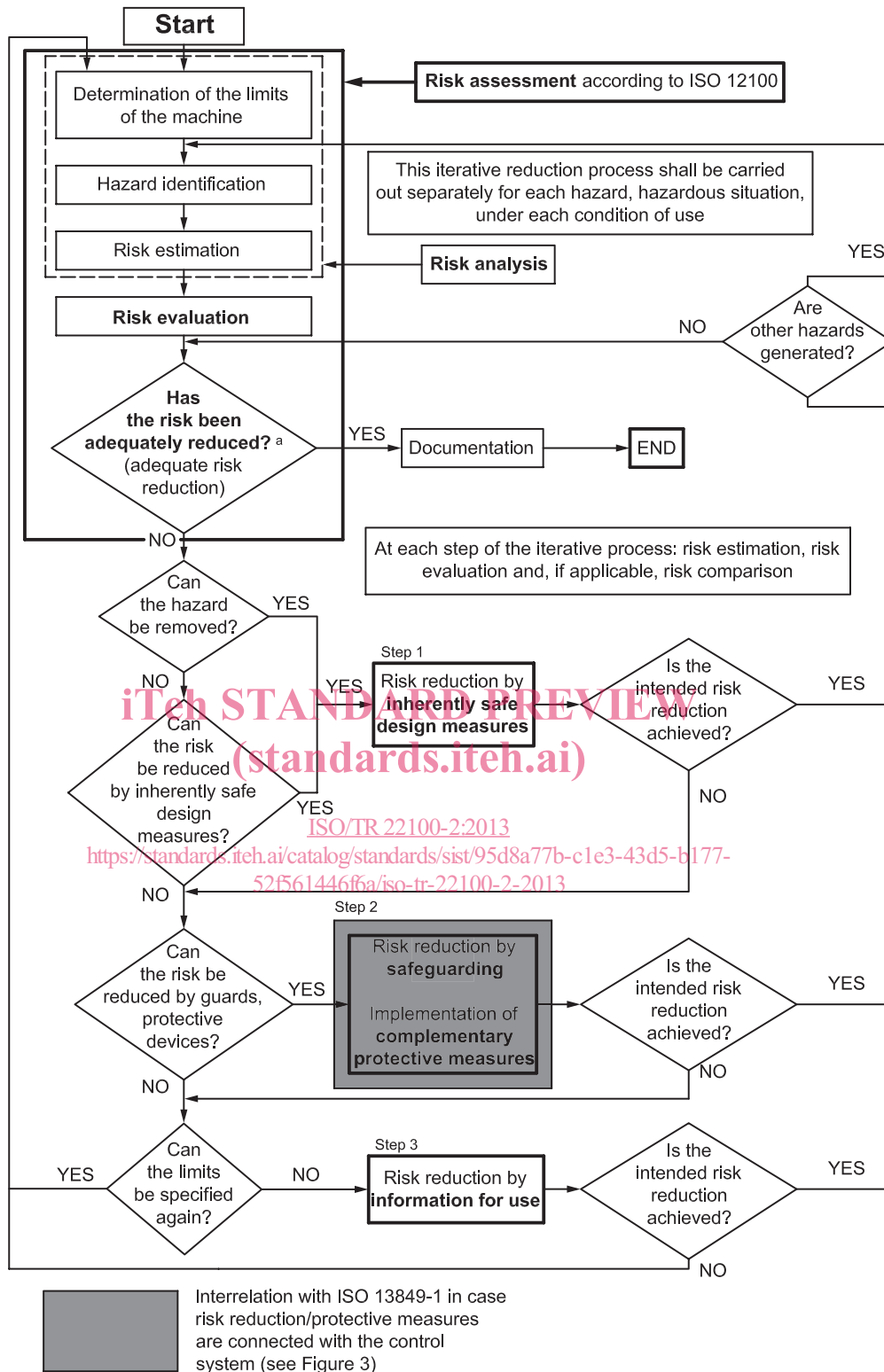
The fundamental International Standard for safety of machinery is ISO 12100. Machinery manufacturers should work through the risk assessment and risk reduction process described in ISO 12100 to identify hazards, estimate risks, and reduce risks adequately (tolerable risk).

Figure 2 shows the risk assessment and risk reduction process according to ISO 12100 and contains additional information regarding its interrelation with ISO 13849-1.

As shown in Figure 2, ISO 13849-1 is relevant for cases where a risk assessment according to ISO 12100 has initiated a risk reduction measure (e.g. interlocking guard) that relies on a safety-related control system. In those cases, the safety-related control system has to perform a safety function. The application of ISO 13849-1 is restricted to those cases only.

In the risk assessment and risk reduction process of ISO 12100 (iterative three-step method), the hazards related to a machine shall be identified and the risk estimated. As shown in Figure 2, risk estimation initially occurs prior to risk reduction. The initial risk is estimated using one of various risk scoring systems or methods (see ISO/TR 14121-2). It should be noted that the method given in ISO 13849-1 is primarily intended to be used for safety functions carried out by safety-related control systems. For example, a resulting category or performance level makes no sense for a slipping hazard or falling hazard.

When a control system with safety functions is selected as a protective/risk reduction measure (such as a guard door interlock) in accordance with ISO 12100, then ISO 13849-1 should be used to design and evaluate the safety-related parts of the control system. Only the part of the control system that is safety-related falls under the scope of ISO 13849-1. Not all aspects of the control system perform safety functions such as some proximity sensors, parts counters, or monitoring devices. There is no need to apply ISO 13849-1 to non-safety-related parts of the control system.



Key

^a The first time the question is asked, it is answered by the result of the initial risk assessment.

Figure 2 — Schematic representation of risk assessment and risk reduction process according to ISO 12100:2010, Figure 1