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AMERICAN NATIONAL ADOPTION  
of an INTERNATIONAL STANDARD

**Safety of machinery —  
General principles for design —  
Risk assessment and risk  
reduction**

Adopted by the U.S. TAG to ISO/TC199 through the ANSI B11 Accredited Standards Committee

Secretariat and Accredited Standards Developer:

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by The American National Standards Institute



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**Contents**

Page

Foreword.....	vi
Introduction .....	vii
1 Scope.....	1
2 Normative references.....	1
3 Terms and definitions .....	1
4 Strategy for risk assessment and risk reduction.....	5
5 Risk assessment.....	9
5.1 General .....	9
5.2 Information for risk assessment.....	9
5.3 Determination of limits of machinery .....	10
5.3.1 General .....	10
5.3.2 Use limits.....	10
5.3.3 Space limits .....	11
5.3.4 Time limits .....	11
5.3.5 Other limits .....	11
5.4 Hazard identification .....	11
5.5 Risk estimation.....	13
5.5.1 General .....	13
5.5.2 Elements of risk .....	14
5.5.3 Aspects to be considered during risk estimation.....	16
5.6 Risk evaluation.....	18
5.6.1 General .....	18
5.6.2 Adequate risk reduction .....	18
5.6.3 Comparison of risks.....	18
6 Risk reduction .....	19
6.1 General .....	19
6.2 Inherently safe design measures .....	20
6.2.1 General .....	20
6.2.2 Consideration of geometrical factors and physical aspects.....	20
6.2.3 Taking into account general technical knowledge of machine design.....	21
6.2.4 Choice of appropriate technology.....	22
6.2.5 Applying principle of positive mechanical action.....	22
6.2.6 Provisions for stability.....	22
6.2.7 Provisions for maintainability.....	23
6.2.8 Observing ergonomic principles.....	23
6.2.9 Electrical hazards.....	24
6.2.10 Pneumatic and hydraulic hazards.....	24
6.2.11 Applying inherently safe design measures to control systems.....	25
6.2.12 Minimizing probability of failure of safety functions .....	30
6.2.13 Limiting exposure to hazards through reliability of equipment.....	30
6.2.14 Limiting exposure to hazards through mechanization or automation of loading (feeding)/ unloading (removal) operations .....	31
6.2.15 Limiting exposure to hazards through location of setting and maintenance points outside danger zones.....	31
6.3 Safeguarding and complementary protective measures.....	31
6.3.1 General .....	31
6.3.2 Selection and implementation of guards and protective devices.....	32
6.3.3 Requirements for design of guards and protective devices .....	37
6.3.4 Safeguarding to reduce emissions .....	40

This is a preview of "ANSI/ISO 12100:2012". [Click here to purchase the full version from the ANSI store.](#)

<b>6.3.5</b>	<b>Complementary protective measures .....</b>	<b>41</b>
<b>6.4</b>	<b>Information for use.....</b>	<b>43</b>
<b>6.4.1</b>	<b>General requirements.....</b>	<b>43</b>
<b>6.4.2</b>	<b>Location and nature of information for use .....</b>	<b>43</b>
<b>6.4.3</b>	<b>Signals and warning devices .....</b>	<b>43</b>
<b>6.4.4</b>	<b>Markings, signs (pictograms) and written warnings.....</b>	<b>44</b>
<b>6.4.5</b>	<b>Accompanying documents (in particular — instruction handbook).....</b>	<b>45</b>
<b>7</b>	<b>Documentation of risk assessment and risk reduction.....</b>	<b>48</b>
<b>Annex A</b> (informative)	<b>Schematic representation of a machine .....</b>	<b>49</b>
<b>Annex B</b> (informative)	<b>Examples of hazards, hazardous situations and hazardous events .....</b>	<b>50</b>
<b>Annex C</b> (informative)	<b>Trilingual lookup and index of specific terms and expressions used in ISO 12100.....</b>	<b>60</b>
<b>Bibliography</b> .....		<b>72</b>

## 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 2.

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.

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.

ISO 12100 was prepared by Technical Committee ISO/TC 199, *Safety of machinery*.

This first edition of ISO 12100 cancels and replaces ISO 12100-1:2003, ISO 12100-2:2003 and ISO 14121-1:2007, of which it constitutes a consolidation without technical change. It also incorporates the Amendments ISO 12100-1:2003/Amd.1:2009 and ISO 12100-2:2003/Amd.1:2009. Documentation (e.g., risk assessment, type-C standards) based on these replaced documents need not be updated or revised.

## National adoption of this International Standard as an American National Standard

ISO 12100 was published in 2010 as an editorial combination of three separate standards: ISO 12100-1:2003, 12100-2:2003 and ISO 14121-1:2007 plus related amendments. These three standards were very minimal revisions of EN 292:1991 / ISO/TR 12100:1992, and EN 1050 carried out by a special Working Group composed of experts from ISO, CEN, IEC and CENELEC.

To complete this combination of the three separate standards into a single ISO standard, ISO/TC 199 agreed that only editorial changes would be permitted – **no technical changes were considered**. As a result, ISO 12100:2010 contains language largely unchanged from the original publication in the early 1990s.

ANSI B11.GSR (2008) began by using the ISO 12100 and 14121 standards as a guide and then updating the ~20 year span by incorporating current knowledge and information on machinery safety. The B11 GSR document was further revised, updated and published in December 2010 as **ANSI B11.0-2010 Safety of Machinery – General Requirements and Risk Assessment**.

**Readers interested in the most recent and current information on the general topic of *Safety of Machinery* should use ANSI B11.0 – 2010: Safety of Machines; General Requirements and Risk Assessment.**

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## Introduction

The primary purpose of this International Standard is to provide designers with an overall framework and guidance for decisions during the development of machinery to enable them to design machines that are safe for their intended use. It also provides a strategy for standards developers and will assist in the preparation of consistent and appropriate type-B and type-C standards.

The concept of safety of machinery considers the ability of a machine to perform its intended function(s) during its life cycle where risk has been adequately reduced.

This International Standard is the basis for a set of standards which has 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-B1 standards on particular safety aspects (for example, safety distances, surface temperature, noise);
  - type-B2 standards on safeguards (for example, two-hand controls, interlocking devices, pressure-sensitive devices, guards);
- **type-C standards** (machine safety standards) dealing with detailed safety requirements for a particular machine or group of machines.

This International Standard is a type-A standard.

When a type-C standard deviates from one or more technical provisions dealt with by this International Standard or by a type-B standard, the type-C standard takes precedence.

It is desirable that this International Standard be referred to in training courses and manuals to convey basic terminology and general design methods to designers.

ISO/IEC Guide 51 has been taken into account as far as practicable at the time of drafting of this International Standard.

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# Safety of machinery — General principles for design — Risk assessment and risk reduction

## 1 Scope

This International Standard specifies basic terminology, principles and a methodology for achieving safety in the design of machinery. It specifies principles of risk assessment and risk reduction to help designers in achieving this objective. These principles are based on knowledge and experience of the design, use, incidents, accidents and risks associated with machinery. Procedures are described for identifying hazards and estimating and evaluating risks during relevant phases of the machine life cycle, and for the elimination of hazards or the provision of sufficient risk reduction. Guidance is given on the documentation and verification of the risk assessment and risk reduction process.

This International Standard is also intended to be used as a basis for the preparation of type-B or type-C safety standards.

It does not deal with risk and/or damage to domestic animals, property or the environment.

NOTE 1 Annex B gives, in separate tables, examples of hazards, hazardous situations and hazardous events, in order to clarify these concepts and assist the designer in the process of hazard identification.

NOTE 2 The practical use of a number of methods for each stage of risk assessment is described in ISO/TR 14121-2.

## 2 Normative references

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

IEC 60204-1:2005, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

NFPA 79-2012, *Electrical Standard for Industrial Machinery* may be substituted for the North American market.

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

**3.1 emergency operation:** all actions and functions intended to end or avert an emergency situation.

**3.2 emergency situation:** hazardous situation needing to be urgently ended or averted.

NOTE: An emergency situation can arise:

- during normal operation of the machine (for example, due to human interaction, or as a result of external influences); or
- as a consequence of a malfunction or failure of any part of the machine.

**3.3 emergency stop / emergency stop function:** function which is intended to:

- avert arising or reduce existing hazards to persons, damage to machinery or to work in progress, and
- be initiated by a single human action.

NOTE: ISO 13850 gives detailed provisions.