

---

---

**Safety of machinery — Basic concepts,  
general principles for design —**

**Part 2:  
Technical principles**

*Sécurité des machines — Notions fondamentales, principes généraux  
de conception —*

*Partie 2: Principes techniques*



Reference number  
ISO 12100-2:2003(E)

**PDF disclaimer**

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

© ISO 2003

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

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.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

Page

Foreword .....	iv
Introduction .....	v
1 Scope .....	1
2 Normative references .....	1
3 Terms and definitions .....	1
4 Inherently safe design measures .....	1
4.1 General .....	1
4.2 Consideration of geometrical factors and physical aspects .....	2
4.3 Taking into account the general technical knowledge regarding machine design .....	3
4.4 Choice of an appropriate technology .....	3
4.5 Applying the principle of the positive mechanical action of a component on another component .....	4
4.6 Provisions for stability .....	4
4.7 Provisions for maintainability .....	4
4.8 Observing ergonomic principles .....	5
4.9 Preventing electrical hazard .....	6
4.10 Preventing hazards from pneumatic and hydraulic equipment .....	6
4.11 Applying inherently safe design measures to control system .....	6
4.12 Minimizing the probability of failure of safety functions .....	11
4.13 Limiting exposure to hazards through reliability of equipment .....	12
4.14 Limiting exposure to hazards through mechanization or automation of loading (feeding) /unloading (removal) operations .....	13
4.15 Limiting exposure to hazards through location of the setting and maintenance points outside of danger zones .....	13
5 Safeguarding and complementary protective measures .....	13
5.1 General .....	13
5.2 Selection and implementation of guards and protective devices .....	13
5.3 Requirements for the design of guards and protective devices .....	19
5.4 Safeguarding for reducing emissions .....	21
5.5 Complementary protective measures .....	22
6 Information for use .....	25
6.1 General requirements .....	25
6.2 Location and nature of the information for use .....	25
6.3 Signals and warning devices .....	25
6.4 Markings, signs (pictograms), written warnings .....	26
6.5 Accompanying documents (in particular, instruction handbook) .....	27
Bibliography .....	30

## 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 12100-2 was prepared by Technical Committee ISO/TC 199, *Safety of machinery*.

This edition cancels and replaces ISO/TR 12100-2:1992, which has been technically revised.

ISO 12100 consists of the following parts, under the general title *Safety of machinery — Basic concepts, general principles for design*:

- *Part 1: Basic terminology, methodology*, expressing the basic overall methodology to be followed when designing machinery and when producing safety standards for machinery, together with the basic terminology related to the philosophy underlying this work;
- *Part 2: Technical principles*, giving advice on how this philosophy can be applied using available techniques.

## Introduction

The primary purpose of ISO 12100 is to provide designers with an overall framework and guidance to enable them to produce machines that are safe for their intended use. It also provides a strategy for standard makers.

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

This 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 all 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 (e.g. safety distances, surface temperature, noise);
  - type-B2 standards on safeguards (e.g. 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 standard is a type-A standard.

The subject of numerous clauses or subclauses of this standard is also dealt with, in a more detailed manner, in other type-A or B standards.

When a type-C standard deviates from one or more provisions dealt with by Part 2 of this standard or by a type-B standard, the type-C standard takes precedence.

It is recommended that this standard be incorporated in training courses and manuals to convey basic terminology and general design methods to designers.