

Industrial robots —

Part 6: Recommendations for safety

The European Standard EN 775:1992 has the status of a British Standard

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Advanced Manufacturing Technology Standards Policy Committee (AMT/-) to Technical Committee AMT/3, upon which the following bodies were represented:

- Advanced Manufacturing Technology Research Institute
- British Computer Society
- British Robot Association
- Department of Trade and Industry (MT Division)
- Health and Safety Executive
- Information Systems Committee of the Universities Funding Council
- SATRA Footwear Technology Centre
- Society of British Aerospace Companies Limited
- Society of Motor Manufacturers and Traders Limited
- Swift Project Consortium

This British Standard, having been prepared under the direction of the Advanced Manufacturing Technology Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 1 May 1992

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The following BSI references relate to the work on this standard:
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National foreword

This Part of BS 7228 has been prepared under the direction of the Advanced Manufacturing Technology Standards Policy Committee and is related to ISO 10218:1992 *Manipulating industrial robots — Safety*, published by the International Organization for Standardization (ISO).

This Part of BS 7228 has been prepared as a result of international discussions in which the UK took an active part.

In 1992 the European Committee for Standardization (CEN) accepted ISO 10218:1992, with Common Modifications, as European Standard EN 775:1992.

BS 7228 will be published in Parts and Sections. Whilst not essential, it is recommended that each Part of the standard should be read with reference to the others. The list of Parts currently published or in preparation is as follows.

- *Part 1: Glossary of terms;*
 - *Part 2: Guide to definitions of coordinate systems and motions;*
 - *Part 3: Specification for the presentation of characteristics by the manufacturer;*
 - *Part 4: Performance criteria and testing;*
 - *Section 4.1: Methods for comprehensive testing;*
 - *Section 4.2: Methods for comparison testing;*
 - *Part 5: Mechanical interfaces;*
 - *Section 5.1: Specification for circular form (form A);*
- NOTE Further Sections of Part 5 may follow for other types of mechanical interface.
- *Part 6: Recommendations for safety.*

Cross-references

International standard	Corresponding British Standard
	BS 7228 <i>Industrial robots</i>
ISO 9946:1991	Part 3:1991 <i>Specification for the presentation of characteristics by the manufacturer</i> (Identical)
ISO/TR 8373:1988	Part 1:1989 <i>Glossary of terms</i> (Identical)

The Technical Committee has reviewed the provisions of IEC 204-1¹⁾, ISO 6385:1981, to which normative reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 16, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

¹⁾ To be published. (Revision of IEC 204-1:1981).

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Descriptors: Mechanics, manipulators, industrial robots, accident prevention, safety, design, equipment specifications, control devices, safety devices, programming: computers, performance tests, maintenance, installation, utilization, repairs

English version

Manipulating industrial robots – Safety

(ISO 10218:1992 modified)

Robots manipulateurs industriels – Sécurité
(ISO 10218:1992 modifiée)

Industrieroboter – Sicherheit
(ISO 10218:1992 modifiziert)

This European Standard was approved by CEN on 1992-10-14. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

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Foreword

This European Standard has been prepared under a mandate given to CEN by the Commission of the European Communities and the European Free Trade Association, and supports essential requirements of EC Directive(s).

In 1991, ISO/DIS 10218 was submitted to the CEN Primary Questionnaire procedure.

Following the result of this procedure, and the result of CEN/BTS2 AH6 investigation of the conformity between the Essential health and safety requirements in Annex I of the Machinery Directive (89/392/EEC) and the safety requirements in ISO 10218, CEN BTS2 (Resolution 8/1992) agreed to submit ISO 10218:1992, amended with common modifications, to formal vote.

The document was accepted and in accordance with the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 1993, and conflicting national standards shall be withdrawn at the latest by April 1993.

Endorsement notice

The text of the International Standard ISO 10218:1992 was approved by CEN as a European Standard with agreed common modifications as given below.

- In addition to the requirements given in ISO 10218, EN 292-1 and EN 292-2 apply to the safety of manipulating industrial robots.
- When definitions given in ISO 10218 differ from EN 292-1, the definitions in EN 292-1 shall be applied. The following terms have different definitions:

Term	Subclause for definition in:	
	ISO 10218	EN 292-1
Enabling device	3.2.3	3.23.2
Guard	3.2.4	3.22
Hazard	3.2.5	3.5
Hold-to-run control	3.2.7	3.23.3
Interlock	3.2.8	3.23.1
Presence sensing device	3.2.15	3.23.5
Risk	3.2.19	3.7
Safeguarding	3.2.24	3.19

- The strategy for selecting safety measures in EN 292-1 (5) shall be superimposed upon the requirements of 4.2.3 of ISO 10218.
- The concept of lockout/tagout as defined in ISO 10218 (3.2.10) shall not be used. The requirements of EN 292-2 (6.2.2) for isolation and energy dissipation shall apply in 5.4 of ISO 10218 instead of the requirement for isolation of power source by means of lockout/tagout.
- The manufacturer(s) shall design, and shall provide instructions for, the robot and robot system so that it can be used safely (as described in clauses 8 and 9).

Introduction to the European standard

ISO 10218 was not written within all the considerations of the Machinery Directive and the European published/draft standards of type A and B. Therefore, common modifications have been introduced in this European Standard (see endorsement notice).

It should be noted that this standard covers requirements for the basic robot and robot system. When a robot is used as part of a complex installation it is usually provided with some form of tool or device and interacts with other machinery. This standard does not cover the safety of the tools or devices or the risks arising from the use of the robot in such installations.

Introduction

This International Standard has been created in recognition of the particular hazards which exist in manufacturing automation systems incorporating manipulating industrial robots.

Hazards are well recognized but the sources of the hazards are frequently unique to a particular robot system. The number and types of hazards are directly related to the nature of the automation process and the complexity of the installation.

The risks associated with these hazards vary with the type of robot used and its application and the way in which it is installed, programmed, operated, and maintained.

In recognition of the variable nature of hazards with application of industrial robots, this International Standard provides guidance for the assurance of safety in design and construction of robots. Since safety in the application of industrial robots is influenced by the design and application of the particular robot system, a supplementary, though equally important, purpose is to provide guidelines for the safeguarding of personnel during installation, functional testing, programming, operation, maintenance, and repair of robots and robot systems.

1 Scope

This International Standard provides guidance on the safety considerations for the design, construction, programming, operation, use, repair, and maintenance of manipulating industrial robots and robot systems as defined in clause 3. It does not apply to other types of robots although the safety principles established in this International Standard may be utilized for these other types.

NOTE For the purpose of this International Standard, the term "robot" means manipulating industrial robot.

For systems comprising multiple robots and/or associated material handling equipment or mobile robots, this International Standard may be used for the robot system portion of the equipment.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 204-1:—²⁾, *Electrical equipment of industrial machines — Part 1: General requirements*.

ISO 6385:1981, *Ergonomic principles of the design of work systems*.

ISO/TR 8373:1988, *Manipulating industrial robots — Vocabulary*.

ISO 9946:1991, *Manipulating industrial robots — Presentation of characteristics*.

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 General terms

3.1.1 person

any individual

3.1.2 personnel

persons specifically employed and trained in the use and care of a robot system

3.2 Specific terms

NOTE The terms which are referenced to ISO/TR 8373 are those which have been duplicated from that document.

3.2.1 arm [primary axes]

an interconnected set of links and powered joints comprising members of the longitudinal shape which supports, positions, and orientates a wrist and/or end effector

[ISO/TR 8373:1988, 3.2]

²⁾ To be published. (Revision of IEC 204-1:1981.)