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Robotar och robotutrustning – Säkerhetskrav för industrirobotar –
Del 1: Robotar (ISO 10218-1:2011)

Robots and robotic devices – Safety requirements for industrial robots –
Part 1: Robots (ISO 10218-1:2011)

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Europastandarden EN ISO 10218-1:2011 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN ISO 10218-1:2011.

Denna standard ersätter SS-EN ISO 10218-1:2008, utgåva 2.

The European Standard EN ISO 10218-1:2011 has the status of a Swedish Standard. This document contains the official version of EN ISO 10218-1:2011.

This standard supersedes the Swedish Standard SS-EN ISO 10218-1:2008, edition 2.

Förhållandet till övriga delar under samma huvudtitel - Utdrag ur Förord i ISO 10218-1:2011 / Relations to other parts under the same general title - Extract from the Foreword of ISO 10218-1:2011

ISO 10218 consists of the following parts, under the general title *Robots and robotic devices – Safety requirements for industrial robots:*

- Part 1: Robots
- Part 2: Robot systems and integration

Upplysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna upplysningar om svensk och utländsk standard.

Information about the content of the standard is available from the Swedish Standards Institute (SIS), telephone +46 8 555 520 00. Standards may be ordered from SIS Förlag AB, who can also provide general information about Swedish and foreign standards.

Denna standard är framtagen av kommittén för Robotar och robotutrustning, SIS/TK 278.

Har du synpunkter på innehållet i den här standarden, vill du delta i ett kommande revideringsarbete eller vara med och ta fram andra standarder inom området? Gå in på www.sis.se - där hittar du mer information.

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 10218-1

July 2011

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Supersedes EN ISO 10218-1:2008

English Version

Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots (ISO 10218-1:2011)

Robots et dispositifs robotiques - Exigences de sécurité pour les robots industriels - Partie 1: Robots (ISO 10218-1:2011)

Industrieroboter - Sicherheitsanforderungen - Teil 1: Roboter (ISO 10218-1:2011)

This European Standard was approved by CEN on 21 April 2011.

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 CEN-CENELEC Management Centre or to any CEN member.

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Foreword

This document (EN ISO 10218-1:2011) has been prepared by Technical Committee ISO/TC 184 "Automation systems and integration" in collaboration with Technical Committee CEN/TC 310 “Advanced automation technologies and their applications” the secretariat of which is held by BSI.

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 January 2012, and conflicting national standards shall be withdrawn at the latest by January 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 10218-1:2008.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive.

For relationship with EU Directive, see informative Annex ZA, which is an integral part of this document.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of ISO 10218-1:2011 has been approved by CEN as a EN ISO 10218-1:2011 without any modification.

Introduction

ISO 10218 has been created in recognition of the particular hazards that are presented by industrial robots and industrial robot systems.

This part of ISO 10218 is a type-C standard as outlined in ISO 12100.

When provisions of a type-C standard are different from those which are stated in type-A or type-B standards, the provisions of the type-C standard take precedence over the provisions of the other standards for machines that have been designed and built in accordance with the provisions of the type-C standard.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the Scope of this part of ISO 10218.

Hazards associated with robots are well recognized, but the sources of the hazards are frequently unique to a particular robot system. The number and type(s) of hazard(s) 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 purpose, and the way in which it is installed, programmed, operated and maintained.

NOTE Not all of the hazards identified by ISO 10218 apply to every robot, nor will the level of risk associated with a given hazardous situation be the same from robot to robot. Consequently, the safety requirements, or the protective measures, or both, can vary from what is specified in ISO 10218. A risk assessment can be conducted to determine what the protective measures should be.

In recognition of the variable nature of hazards with different uses of industrial robots, ISO 10218 is divided into two parts. This part of ISO 10218 provides guidance for the assurance of safety in the design and construction of the robot. Since safety in the application of industrial robots is influenced by the design and application of the particular robot system integration, ISO 10218-2 provides guidelines for the safeguarding of personnel during robot integration, installation, functional testing, programming, operation, maintenance and repair.

This part of ISO 10218 has been updated based on experience gained in developing the ISO 10218-2 guidance on system and integration requirements, in order to ensure it remains in line with minimum requirements of a harmonized type-C standard for industrial robots. Revised technical requirements include, but are not limited to, definition and requirements for singularity, safeguarding of transmission hazards, power loss requirements, safety-related control circuit performance, addition of a category 2 stopping function, mode selection, power and force limiting requirements, marking, and updated stopping time and distance metric and features.

This part of ISO 10218 is not applicable to robots that were manufactured prior to its publication date.

Robots and robotic devices — Safety requirements for industrial robots —

Part 1: Robots

1 Scope

This part of ISO 10218 specifies requirements and guidelines for the inherent safe design, protective measures and information for use of industrial robots. It describes basic hazards associated with robots and provides requirements to eliminate, or adequately reduce, the risks associated with these hazards.

This part of ISO 10218 does not address the robot as a complete machine. Noise emission is generally not considered a significant hazard of the robot alone, and consequently noise is excluded from the scope of this part of ISO 10218.

This part of ISO 10218 does not apply to non-industrial robots, although the safety principles established in ISO 10218 can be utilized for these other robots.

NOTE 1 Examples of non-industrial robot applications include, but are not limited to, undersea, military and space robots, tele-operated manipulators, prosthetics and other aids for the physically impaired, micro-robots (displacement less than 1 mm), surgery or healthcare, and service or consumer products.

NOTE 2 Requirements for robot systems, integration, and installation are covered in ISO 10218-2.

NOTE 3 Additional hazards can be created by specific applications (e.g. welding, laser cutting, machining). These system-related hazards need to be considered during robot design.

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.

ISO 9283:1998, *Manipulating industrial robots — Performance criteria and related test methods*

ISO 10218-2, *Robots and robotic devices — Safety requirements for industrial robots — Part 2: Robot systems and integration*

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

ISO 13849-1:2006, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

ISO 13850, *Safety of machinery — Emergency stop — Principles for design*

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

IEC 62061:2005, *Safety of machinery — Functional safety of safety-related electrical, electronic and programmable electronic control systems*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100 and the following apply.

3.1
actuating control
mechanical mechanism within a control device

EXAMPLE A rod which opens contacts.

3.2
automatic mode
operating mode in which the robot control system operates in accordance with the task programme

[ISO 8373:1994, definition 5.3.8.1]

3.3
automatic operation
state in which the robot is executing its programmed task as intended

NOTE Adapted from ISO 8373:1994, definition 5.5.

3.4
collaborative operation
state in which purposely designed robots work in direct cooperation with a human within a defined workspace

3.5
collaborative workspace
workspace within the safeguarded space where the robot and a human can perform tasks simultaneously during production operation

3.6
drive power
energy source or sources for the robot actuators

3.7
end-effector
device specifically designed for attachment to the mechanical interface to enable the robot to perform its task

EXAMPLE Gripper, nutrunner, welding gun, spray gun.

[ISO 8373:1994, definition 3.11]

3.8
energy source
electrical, mechanical, hydraulic, pneumatic, chemical, thermal, potential, kinetic or other source of power

3.9
hazardous motion
motion that is likely to cause personal physical injury or damage to health

3.10
industrial robot
automatically controlled, reprogrammable multipurpose manipulator, programmable in three or more axes, which can be either fixed in place or mobile for use in industrial automation applications

NOTE 1 The industrial robot includes:

— the manipulator, including actuators;

— the controller, including teach pendant and any communication interface (hardware and software).

NOTE 2 This includes any integrated additional axes.

NOTE 3 The following devices are considered industrial robots for the purpose of this part of ISO 10218:

— hand-guided robots;

— the manipulating portions of mobile robots;

— collaborating robots.

NOTE 4 Adapted from ISO 8373:1994, definition 2.6.

3.11
industrial robot system
system comprising:

— industrial robot;

— end-effector(s);

— any machinery, equipment, devices, external auxiliary axes or sensors supporting the robot performing its task

NOTE 1 The robot system requirements, including those for controlling hazards, are contained in ISO 10218-2.

NOTE 2 Adapted from ISO 8373:1994, definition 2.14.

3.12
limiting device
means that restricts the maximum space by stopping or causing to stop all robot motion

3.13
local control
state of the system or portions of the system in which the system is operated from the control panel or pendant of the individual machines only

3.14
manual mode
control state that allows for the direct control by an operator

NOTE 1 Sometimes referred to as teach mode where programme points are set.

NOTE 2 Adapted from ISO 8373:1994, definition 5.3.8.2.

3.15
pendant
teach pendant
hand-held unit linked to the control system with which a robot can be programmed or moved

[ISO 8373:1994, definition 5.8]

3.16 Programme

3.16.1
control programme
inherent set of instructions which defines the capabilities, actions, and responses of a robot

NOTE This type of programme is fixed and usually not modified by the user.

[ISO 8373:1994, definition 5.1.2]