



SLOVENSKI STANDARD
oSIST ISO/DIS 10218-1:2009
01-december-2009

**Roboti in robotske naprave - Varnostne zahteve - 1. del: Industrijski roboti
(ISO/DIS 10218-1:2009)**

Robots and robotic devices - Safety requirements - Part 1: Industrial robots (ISO/DIS 10218-1:2009)

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Robots pour environnements industriels - Exigences de sécurité - Partie 1: Robots industriels (ISO/DIS 10218-1:2009)

https://standards.iteh.ai/catalog/standards/sist/1558cda4-3273-40d4-a627-351d8ed2467d/sist-en_iso_10218-1_2009

Ta slovenski standard je istoveten z: prEN ISO 10218-1

ICS:

25.040.30	Industrijski roboti. Manipulatorji	Industrial robots. Manipulators
-----------	---------------------------------------	------------------------------------

oSIST ISO/DIS 10218-1:2009

en



DRAFT INTERNATIONAL STANDARD ISO/DIS 10218-1

ISO/TC 184/SC 2

Secretariat: SIS

Voting begins on:
2009-08-27

Voting terminates on:
2010-01-27

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Robots and robotic devices — Safety requirements —

Part 1: Industrial robots

Robots pour environnements industriels — Exigences de sécurité —

Partie 1: Robot industriel

(Revision of first edition of ISO 10218-1:2006 and of ISO 10218-1:2006/Cor.1:2006)

ICS 25.040.30

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO-lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five-month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

In accordance with the provisions of Council Resolution 15/1993 this document is circulated in the English language only.

Conformément aux dispositions de la Résolution du Conseil 15/1993, ce document est distribué en version anglaise seulement.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

ISO/DIS 10218-1

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.

iTeh STANDARD PREVIEW

(standards.iteh.ai)

[SIST EN ISO 10218-1:2011](https://standards.iteh.ai/catalog/standards/sist/1558cda4-3273-40d4-a627-351d8ed2467d/sist-en-iso-10218-1-2011)

<https://standards.iteh.ai/catalog/standards/sist/1558cda4-3273-40d4-a627-351d8ed2467d/sist-en-iso-10218-1-2011>

Copyright notice

This ISO document is a Draft International Standard and is copyright-protected by ISO. Except as permitted under the applicable laws of the user's country, neither this ISO draft nor any extract from it may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, photocopying, recording or otherwise, without prior written permission being secured.

Requests for permission to reproduce should be addressed to 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
Web www.iso.org

Reproduction may be subject to royalty payments or a licensing agreement.

Violators may be prosecuted.

Contents

Page

Foreword	iv
Introduction.....	v
1 Scope.....	1
2 Normative references.....	1
3 Terms and definitions	2
4 Hazard identification and risk assessment.....	7
5 Design requirements and protective measures	8
5.1 General	8
5.2 General requirements	8
5.3 Actuating controls.....	9
5.4 Safety-related control system performance (hardware/software).....	10
5.5 Robot stopping functions.....	11
5.6 Reduced speed control.....	12
5.7 Operational modes	13
5.8 Pendant controls	14
5.9 Control of simultaneous motion	15
5.10 Collaborative operation requirements	16
5.11 Singularity protection	17
5.12 Axis limiting	17
5.13 Movement without drive power.....	19
5.14 Provisions for lifting.....	19
5.15 Electrical connectors	19
6 Information for Use	19
6.1 General	19
6.2 Instruction handbook.....	19
6.3 Marking.....	21
Annex A (normative) List of significant hazards	22
Annex B (normative) Stopping time and distance metric.....	24
Annex C (informative) Functional characteristics of 3-position enabling device	26
Annex D (informative) Optional features	27
Annex E (informative) Methods for labelling.....	29
Bibliography.....	30

ISO/DIS 10218-1

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 10218-1 was prepared by Technical Committee ISO/TC 184, *Automation systems and integration*, Subcommittee SC 2, *Robots and robotic devices*.

This second edition cancels and replaces the first edition (ISO 10218-1:2006), which has been technically revised.

This revised International Standard updates the document based on experience gained in developing the Part 2 guidance on system and integration requirements and 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 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.

ISO 10218 consists of the following parts, under the general title *Robots and robotic devices — Safety requirements*:

- *Part 1: Industrial robot*
- *Part 2: Industrial robot system and integration*

Introduction

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

This document is a type C standard as stated in ISO 12100-1.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this document.

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

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 1 Not all of the hazards identified by ISO 10218 apply to every robot and nor will the level of risk associated with a given hazardous situation be the same from robot to robot. Consequently the safety requirements and/or protective measures may vary from what is specified in ISO 10218. A risk assessment may 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; Part 1 provides guidance for the assurance of safety in 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, Part 2 will provide guidelines for the safeguarding of personnel during robot integration, installation, functional testing, programming, operation, maintenance and repair.

NOTE 2 While audible noise is generally considered a hazard associated with the industrial environment, the robot as defined in 3.18 cannot be considered the final machine, rather the robot system as defined in 3.20 is the machine for noise consideration. Therefore the hazard due to noise will be dealt with in ISO 10218-2.

ISO 10218 is not applicable to robots which were manufactured prior to its publication date.

Robots and robotic devices — Safety requirements —

Part 1:

Industrial 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, as defined in Clause 3. 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, but will be fully covered in Part 2 for the robot system or the complete machine.

This part of ISO 10218 does not apply to non-industrial robots although the safety principles established in ISO 10218 may be utilized for these other robots. 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 1 Requirements for robot systems, integration, and installation are covered in Part 2.

NOTE 2 Additional hazards may be created by specific applications (e.g. welding, laser cutting, machining). These hazards may 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 12100-1, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology*

ISO 12100-2, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles*

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*

ISO 13855, *Safety of machinery — Positioning of protective equipment with respect to the approach speeds of parts of the human body*

ISO 14121, *Safety of machinery — Principles for risk assessment*

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

ISO/DIS 10218-1

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

IEC 61000-6-2, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity for industrial environments*

IEC 61000-6-4, *Electromagnetic compatibility (EMC) — Part 6: Generic standards — Section 4: Emission standard for industrial environments*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100-1 and the following apply.

3.1

actuating control

a) mechanical mechanism within a control device

EXAMPLE A rod which opens contacts.

b) device which initiates a (un)locking sequence

EXAMPLE Specialized key.

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

[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

cycle

single execution of a task programme

[ISO 8373:1994, definition 6.22]

3.7

drive power

energy source or sources for the robot actuators

3.8**end-effector**

device specifically designed for attachment to the mechanical interface to enable the robot to perform its task

EXAMPLES Gripper, nutrunner, welding gun, spray gun.

[ISO 8373:1994, definition 3.11]

3.9**energy source**

any electrical, mechanical, hydraulic, pneumatic, chemical, thermal, potential, kinetic, or other sources of power

3.10**hazardous motion**

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

3.11**limiting device**

device that restricts the maximum space by stopping or causing to stop all robot motion and is independent of the control programme and the task programmes

3.12**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

3.13**manual mode**

control state that allows the generation, storage, and playback of positional data points

[ISO 8373:1994, definition 5.3.8.2 modified]

3.14**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]

3.15 Programme**3.15.1****control programme**

inherent set of instructions which defines the capabilities, actions, and responses of a robot system

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

[ISO 8373:1994, definition 5.1.2]

3.15.2**task programme**

set of instructions for motion and auxiliary functions that define the specific intended task of the robot system

NOTE 1 This type of programme is normally generated by the user.

NOTE 2 An application is a general area of work, a task is specific within the application.

[ISO 8373:1994, definition 5.1.1]

ISO/DIS 10218-1

3.15.3

task programming

act of providing the **task programme** (3.16.2)

[ISO 8373:1994, definition 5.2.1]

3.15.4

programmer

person designated to prepare the task programme

[ISO 8373:1994, definition 2.17]

3.15.5

programme path

path traced by the TCP during the execution of a task programme

3.15.6

programme verification

execution of a task programme for the purpose of confirming the robot path and process performance

NOTE Verification may include the total programme path or a segment of the path. The instructions may be executed in a single instruction or continuous instruction sequence. Verification is used in new applications and in fine tuning/editing of existing ones.

3.16

protective stop

type of interruption of operation that allows an orderly cessation of motion for safeguarding purposes and which retains the programme logic to facilitate a restart

3.17

robot

industrial robot

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

NOTE 1 The robot includes:

- the manipulator (including actuators);
- the controller including teach pendant, and any communication interface (hardware and software).

NOTE 2 This includes any additional axes which are controlled by the robot controller.

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.

[ISO 8373:1994, definition 2.6 modified]

3.18

robot actuator

powered mechanism that converts electrical, hydraulic, or pneumatic energy to effect motion