BSI Standards Publication

Robotics — Safety requirements

Part 1: Industrial robots

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National foreword

This British Standard is the UK implementation of EN ISO 10218-1:2025. It is identical to ISO 10218-1:2025. It supersedes BS EN ISO 10218-1:2011, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee AMT/10, Robotics.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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English Version

Robotics - Safety requirements - Part 1: Industrial robots (ISO 10218-1:2025)

Robotique - Exigences de sécurité - Partie 1: Robots industriels (ISO 10218-1:2025)

Robotik - Sicherheitsanforderungen - Teil 1: Industrieroboter (ISO 10218-1:2025)

This European Standard was approved by CEN on 3 January 2025.

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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 CEN-CENELEC Management Centre has the same status as the official versions.

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European foreword

This document (EN ISO 10218-1:2025) has been prepared by Technical Committee ISO/TC 299 "Robotics" 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of an identical text or by endorsement, at the latest by September 2025, and conflicting national standards shall be withdrawn at the latest by March 2027.

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

This document supersedes EN ISO 10218-1:2011.

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

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

Any feedback and questions on this document should be directed to the users’ national standards body/national committee. A complete listing of these bodies can be found on the CEN website.

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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Endorsement notice

The text of ISO 10218-1:2025 has been approved by CEN as EN ISO 10218-1:2025 without any modification.

Annex ZA
(informative)

Relationship between this European Standard and the essential requirements of Directive 2006/42/EC aimed to be covered

This European Standard has been prepared under a Commission's standardization request "M/396 Mandate to CEN and CENELEC for Standardisation in the field of machinery" to provide one voluntary means of conforming to essential requirements of Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast).

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Annex I of Directive 2006/42/EC

The relevant Essential Requirements of Directive 2006/42/EC	Clause(s)/sub-clause(s) of this EN	Remarks/Notes
1.1.2. a Principles of safety integration	5, 6, 7	
1.1.2. c Principles of safety integration	5, 6, 7	
1.1.2. d Principles of safety integration	5, 6, 7	
1.1.2. e Principles of safety integration	5, 6, 7	
1.1.3. Materials and products	5.1.2	
1.1.5. Design of machinery to facilitate its handling	5.1.3, 5.1.4, 7.5.18	
1.1.6. Ergonomics	5.2.5, 5.2.8.1, 5.2.8.4	
1.2.1. Safety and reliability of control systems	5.1.8, 5.2.2, 5.2.9, 5.3, 5.4, 5.5, 5.6, 5.7, 5.10, Annex C	
1.2.2. Control devices	5.1.13, 5.2.5, 5.2.7.2.3, 5.2.8, 5.2.9, 5.4.1, 5.4.2, 5.5.1, 5.5.2.2, 5.5.4.2, 5.6, 5.10.2	
1.2.3. Starting	5.2.7.1, 5.2.7.3, 5.2.8.5, 5.2.9, 5.5.2	
1.2.4.1. Normal stop	5.4.1, 5.4.4	
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1.2.4.3. Emergency stop	5.2.8.5, 5.4.1, 5.4.2	
1.2.5. Selection of control or operating modes	5.2.7	
1.2.6. Failure of the power supply	5.1.8, 5.1.10, 5.3, 5.5.2.1	
1.3.1. Risk of loss of stability	5.1.2, 5.1.3, 5.1.5, 7.5.4	

1.3.2. Risk of break-up during operation	5.1.2, 5.1.11, 5.1.13, 7.5.16	
1.3.4. Risks due to surfaces, edges or angles	5.1.2.4, 5.10.2	
1.3.7. Risks related to moving parts	5.1.2.4, 7.5.16	
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1.3.8.1. Moving transmission parts	5.1.2.4, 5.2.4	
1.3.9. Risks of uncontrolled movements	5.1.8, 5.1.12, 7.5.9, 7.5.16	
1.4.1. General requirements	5.5.4, 5.7, 5.10	
1.4.2.1. Fixed guards	5.1.2.4	
1.4.2.2. Interlocking movable guards	5.1.2.4, 5.2.4	
1.4.3. Special requirements for protective devices	5.3, Annex H	
1.5.1. Electricity supply	5.1.13	
1.5.2 Static electricity	5.1.12	
1.5.3. Energy supply other than electricity	5.1.13	
1.5.4. Errors of fitting	5.1.2.4, 5.1.13, 7.5.16	
1.5.5. Extreme temperature	5.1.6	
1.5.6. Fire	5.1.6	
1.5.7. Explosion		Not covered
1.5.8. Noise		Not covered
1.5.9 Vibrations	5.10.2	
1.5.10. Radiation		Not covered
1.5.11. External radiation		Not covered
1.5.12. Laser radiation	5.9	
1.6.3. Isolation of energy sources	5.1.12	
1.7.1. Information and warnings on the machinery	7.1, 7.4	
1.7.1.1. Information and information devices	5.2.5, 5.2.6, 5.2.8.1, 7.1	
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1.7.4. Instructions	7	
1.7.4.1. General principles for the drafting of instructions	7.5.1	

1.7.4.2. Contents of the instructions	7.1, 7.5	
1.7.4.3. Sales literature		Not covered
2.1.1. General		Not covered
2.1.2. Instructions		Not covered
2.2.1. General	5.10.2	
2.2.1.1. Instructions	7.5.16	
3. SUPPLEMENTARY ESSENTIAL HEALTH AND SAFETY REQUIREMENTS TO OFFSET HAZARDS DUE TO THE MOBILITY OF MACHINERY		Not covered
4.1.2.1. Risks due to lack of stability	5.1	
4.1.2.3. Mechanical strength	5.1.2	
4.1.2.4. Pulleys, drums, wheels, ropes and chains	5.1.2.3	
4.1.3. Fitness for purpose	5.1.2.3	
4.2.1. Control of movements	5.2.7, 5.5.4, 5.10.2	
4.3.3. Lifting machinery	7.3	
4.4.2. Lifting machinery	7.5.3	
5. SUPPLEMENTARY ESSENTIAL HEALTH AND SAFETY REQUIREMENTS FOR MACHINERY INTENDED FOR UNDER GROUND WORK		Not covered

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 299, *Robotics,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 310, *Advanced automation technologies and their applications,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 10218-1:2011), which has been technically revised.

The main changes are as follows:

— additional requirements for design;

— mode requirements;

— clarifying requirements for functional safety;

— robot classification (Class I and Class II) for functional safety requirements;

— test methodology to determine the maximum force per manipulator for Class I robots;

— adding requirements for cybersecurity to the extent that it applies to industrial robot safety;

— incorporating safety requirements for industrial robots intended for use in collaborative applications (formerly, the content of ISO/TS 15066).

A list of all parts in the ISO 10218 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

The ISO 10218 series has been created in recognition of the hazards that are presented by robotics in an industrial environment. This document addresses robots as partly completed machinery, while ISO 10218-2 addresses robots integrated into machinery (robot applications and cells).

This document is a type-C standard according to ISO 12100.

This document is of relevance for the following stakeholder groups representing the market players regarding robot safety:

— robot manufacturers (small, medium and large enterprises);

— robot application integrators (small, medium and large enterprises);

— health and safety bodies (regulators, accident prevention organisations, market surveillance, etc.).

Others can be affected by the level of safety achieved with the means of the document by the above mentioned stakeholder groups:

— robot application users/employers (small, medium and large enterprises);

— robot application users/employees (e.g. trade unions);

— service providers, e.g. for maintenance (small, medium and large enterprises);

The above-mentioned stakeholder groups have been given the possibility to participate in the drafting process of this document.

Robots and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the Scope of this document.

When provisions of a type-C standard are different from those that 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.

In recognition of the variable nature of hazards with different uses of industrial robots, the ISO 10218 series is divided into two parts. This document provides requirements for safety of the robot. For safety of the integration and commissioning of industrial robot applications, ISO 10218-2:2025 provides requirements for the safeguarding of operators during integration, commissioning, functional testing, programming, operation, maintenance and repair.

The ISO 10218 series deals with robotics in an industrial environment, which is comprised of workplaces where the public is excluded and the allowed people (operators) are working adults. Other standards cover topics such as general characteristics, coordinate systems and axis motions, mechanical interfaces performance criteria and related testing methods, and end-effectors.

For ease of reading this document, the words “robot” and “robot application” refer to “industrial robot” and “industrial robot application” as defined in this document.

This document has been updated based on experience gained since the release of the ISO 10218 series in 2011. This document remains aligned with the minimum requirements of a harmonized type-C standard for robots in an industrial environment.

Where appropriate, ISO/TS 15066:2016 on the safety of collaborative robot applications was added to the ISO 10218 series. Because human-robot collaboration relates to the application and not to the robot alone, most of the requirements of ISO/TS 15066 have been incorporated into ISO 10218-2:2025. Safety functions that enable a collaborative task can be part of the robot or can be provided by a protective device, or a combination.

It is important to emphasize that the terms “collaborative operation” and “collaborative robot” are not used in this document. Only the application can be developed, verified and validated as a collaborative application.

Robotics — Safety requirements —

Part 1: Industrial robots

1 Scope

This document specifies requirements for the inherently safe design, risk reduction measures and information for use of robots for an industrial environment.

This document addresses the robot as an incomplete machine.

This document is not applicable to the following uses and products:

— underwater;

— law enforcement;

— military (defence);

— airborne and space robots, including outer space;

— medical robots;

— healthcare robots;

— prosthetics and other aids for the physically impaired;

— service robots, which provide a service to a person and as such where the public can have access;

— consumer products, as this is household use to which the public can have access;

— lifting or transporting people.

NOTE 1 Requirements for robot integration and robot applications are covered in ISO 10218-2:2025.

NOTE 2 Additional hazards can be created by robot applications (e.g. welding, laser cutting, machining). These hazards are addressed during robot application design. See ISO 10218-2:2025.

This document deals with the significant hazards, hazardous situations or hazardous events when used as intended and under specified conditions of misuse which are reasonably foreseeable by the manufacturer.

This document does not cover the hazards related to:

— severe conditions (e.g. extreme climates, freezer use, strong magnetic fields) outside of manufacturer's specifications;

— underground use;

— use that has hygienic requirements;

— use in nuclear environments;

— use in potentially explosive environments;

— mobility when robots or manipulators are fixed to or part of driverless industrial trucks;