

STN	Aditívna výroba kovov Životné prostredie, zdravie a bezpečnosť Časť 1: Požiadavky na bezpečnosť strojov PBF-LB (ISO/ASTM 52938-1: 2025)	STN EN ISO/ASTM 52938-1 18 8527
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Additive manufacturing of metals - Environment, health and safety - Part 1: Safety requirements for PBF-LB machines (ISO/ASTM 52938-1:2025)

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 09/25

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EN ISO/ASTM 52938-1

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Additive manufacturing of metals - Environment, health and safety - Part 1: Safety requirements for PBF-LB machines (ISO/ASTM 52938-1:2025)

Fabrication additive de métaux - Environnement, hygiène et sécurité - Partie 1: Exigences de sécurité pour les machines PBF-LB (ISO/ASTM 52938-1:2025)

Additive Fertigung von Metallen - Umwelt, Gesundheit und Sicherheit - Teil 1: Sicherheitsanforderungen für PBF-LB-Maschinen (ISO/ASTM 52938-1:2025)

This European Standard was approved by CEN on 30 May 2025.

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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

EN ISO/ASTM 52938-1:2025 (E)

Contents	Page
European foreword.....	3
Annex ZA (informative) Relationship between this European Standard and the essential requirements of Directive 2006/42/EC aimed to be covered	4

European foreword

This document (EN ISO/ASTM 52938-1:2025) has been prepared by Technical Committee ISO/TC 261 "Additive manufacturing" in collaboration with Technical Committee CEN/TC 438 "Additive Manufacturing" the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by January 2026, and conflicting national standards shall be withdrawn at the latest by January 2026.

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 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/ASTM 52938-1:2025 has been approved by CEN as EN ISO/ASTM 52938-1:2025 without any modification.

EN ISO/ASTM 52938-1:2025 (E)**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)/ subclause(s) of this EN	Remarks/Notes
1.1.2 (a)	4, 5, 6	
1.1.2. (c)	4, 5, 6	
1.1.2. (d)	4, 5, 6	
1.1.2. (e)	4, 5, 6	
1.1.3. Materials and products	4.11, 4.12	
1.1.5. Design of machinery to facilitate its handling	4.3.1, 4.11, 4.12	
1.1.6. Ergonomics	4.12	
1.2.1. Safety and reliability of control systems	4.2.4, 4.2.4.1, 4.2.4.7, 4.2.4.8, 4.2.4.9, 4.11	
1.2.2. Control devices	4.2.3, 4.2.4, 4.12	
1.2.3. Starting	4.2.4.2	
1.2.4.1. Normal stop	4.2.4.4	
1.2.4.3. Emergency stop	4.2.4.5	
1.2.5. Selection of control or operating modes	4.2.4.1, 4.2.4.7, 4.2.4.8, 4.2.4.9, 4.3.2.1.2, 4.12	
1.2.6. Failure of the power supply	4.2.4.2, 4.14	
1.3.1. Risk of loss of stability	4.3.1	
1.3.7. Risks related to moving parts	4.3.2	

The relevant Essential Requirements of Directive 2006/42/EC	Clause(s)/ subclause(s) of this EN	Remarks/Notes
1.3.8. Choice of protection against risks arising from moving parts	4.2.2	
1.4. Required characteristics of guards and protective devices	4.2	
1.4.1. General requirements	4.2.1	
1.4.2. Special requirements for guards	4.2.2	
1.4.2.1. Fixed guards	4.2.2.1	
1.4.2.2. Interlocking movable guards	4.2.2.2	
1.4.3. Special requirements for protective devices	4.2.2.3	
1.5.1. Electricity supply	4.4.1, 4.5	
1.5.2. Static electricity	4.4.2	
1.5.3. Energy supply other than electricity	4.9, 4.10	
1.5.5. Extreme temperatures	4.5	
1.5.6. Fire	4.11.3	
1.5.7. Explosion	4.11.3	
1.5.8. Noise	4.7, Annex C	
1.5.9. Vibrations	4.6	
1.5.11. External radiation	4.2.4.1	
1.5.12. Laser radiation	4.8	
1.5.13. Emissions of hazardous materials and substances	4.11	
1.5.15. Risk of slipping, tripping or falling	4.3.3	
1.6.1. Machinery maintenance	4.11, 6.2	
1.6.2. Access to operating positions and servicing points	4.11, 4.2.4.8, 4.3.3, 4.4.1, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10	
1.6.3. Isolation of energy sources	4.4.1, 4.8, 4.9, 4.10, 4.13	
1.6.4. Operator intervention	4.2.4, 4.3.2, 4.5, 4.7, 4.11, 4.11.2, 4.11.4, 6.2	
1.6.5. Cleaning of internal parts	4.11.1, 6.2	
1.7.1. Information and warnings on the machinery	6, 7	

EN ISO/ASTM 52938-1:2025 (E)

The relevant Essential Requirements of Directive 2006/42/EC	Clause(s)/ subclause(s) of this EN	Remarks/Notes
1.7.1.1. Information and information devices	4.2.3, 6.1	
1.7.2. Warning of residual risks	6, 7	
1.7.3. Marking of machinery	7	
1.7.4. Instructions	6	
1.7.4.1. General principles for the drafting of instructions	6.1	
1.7.4.2. Contents of the instructions	6, Annex C	
1.7.4.3. Sales literature	Annex C, C.9	

WARNING 1 Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

Table ZA.2 — Normative references from Clause 2 of this document and their corresponding European publications

Column 1 Reference in Clause 2	Column 2 International Standard Edition	Column 3 Title	Column 4 Corresponding European Standard Edition
ISO/ASTM 52900:2021	ISO/ASTM 52900:2021	<i>Additive manufacturing — General principles — Fundamentals and vocabulary</i>	EN ISO/ASTM 52900:2021
ISO 3744:2010	ISO 3744:2010	<i>Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane</i>	EN ISO 3744:2010
ISO 3746:2010	ISO 3746:2010	<i>Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a</i>	EN ISO 3746:2010

Column 1 Reference in Clause 2	Column 2 International Standard Edition	Column 3 Title	Column 4 Corresponding European Standard Edition
		<i>reflecting plane</i>	
ISO 4413:2010	ISO 4413:2010	<i>Hydraulic fluid power — General rules and safety requirements for systems and their components</i>	EN ISO 4413:2010
ISO 4414:2010	ISO 4414:2010	<i>Pneumatic fluid power — General rules and safety requirements for systems and their components</i>	EN ISO 4414:2010
ISO 4871:1996	ISO 4871:1996	<i>Acoustics — Declaration and verification of noise emission values of machinery and equipment</i>	EN ISO 4871:2009
ISO 11201:2010	ISO 11201:2010	<i>Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections</i>	EN ISO 11201:2010
ISO 11202:2010	ISO 11202:2010	<i>Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions applying approximate environmental corrections</i>	EN ISO 11202:2010
ISO 11553-1 :2020	ISO 11553-1:2020	<i>Safety of machinery — Laser processing machines — Part 1: Laser safety requirements</i>	EN ISO 11553-1:2020
ISO/TR 11688- 1:1995	ISO/TR 11688- 1:1995	<i>Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: planning</i>	EN ISO 11688-1:2009
ISO 12100:2010	ISO 12100:2010	<i>Safety of machinery — General principles for design — Risk assessment</i>	EN ISO 12100:2010

EN ISO/ASTM 52938-1:2025 (E)

Column 1 Reference in Clause 2	Column 2 International Standard Edition	Column 3 Title	Column 4 Corresponding European Standard Edition
		<i>and risk reduction</i>	
ISO 13849-1:2023	ISO 13849 1:2023	<i>Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design</i>	EN ISO 13849-1:2023
ISO 13849-2:2012	ISO 13849-2:2012	<i>Safety of machinery — Safety-related parts of control systems — Part 2: Validation</i>	EN ISO 13849 2:2012
ISO 13850:2015	ISO 13850:2015	<i>Safety of machinery — Emergency stop function — Principles for design</i>	EN ISO 13850:2015
ISO 13855:2024	ISO 13855:2024	<i>Safety of machinery — Positioning of safeguards with respect to the approach of the human body</i>	EN ISO 13855:2024
ISO 14118:2017	ISO 14118:2017	<i>Safety of machinery — Prevention of unexpected start-up</i>	EN ISO 14118:2018
ISO 14119:2024	ISO 14119:2024	<i>Safety of machinery — Interlocking devices associated with guards — Principles for design and selection</i>	EN ISO 14119:2024
ISO 14120:2015	ISO 14120:2015	<i>Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards</i>	EN ISO 14120:2015
ISO 14122-1:2016	ISO 14122-1:2016	<i>Safety of machinery — Permanent means of access to machinery — Part 1: Choice of fixed means and general requirements of access</i>	EN ISO 14122-1:2016
ISO 20607:2019	ISO 20607:2019	<i>Safety of machinery — Instruction handbook — General drafting principles</i>	EN ISO 20607:2019
ISO 80079-36:2016	ISO 80079-36:2016	<i>Explosive atmospheres - Part 36: Non-electrical equipment for explosive atmospheres - Basic method</i>	EN ISO 80079-36:2016

Column 1 Reference in Clause 2	Column 2 International Standard Edition	Column 3 Title	Column 4 Corresponding European Standard Edition
		<i>and requirements</i>	
IEC 60079-0:2017	IEC 60079-0:2017	<i>Explosive atmospheres - Part 0: Equipment - General requirements</i>	EN IEC 60079-0:2018
IEC 60204-1:2016	IEC 60204-1:2016	<i>Safety of machinery — Electrical equipment of machines — Part 1: General requirements</i>	EN 60204-1:2018
IEC 60529:1989	IEC 60529:1989	<i>Degrees of protection provided by enclosures (IP Code)</i>	EN 60529:1991
IEC 60825-1:2014	IEC 60825-1:2014	<i>Safety of laser products — Part 1: Equipment classification and requirements</i>	EN 60825-1:2014
IEC 60825-4:2022	IEC 60825-4:2022	<i>Safety of laser products — Part 4: Laser guards</i>	EN 60825-4:2024
IEC 61000-6- 2:2016	IEC 61000-6- 2:2016	<i>Generic standards - Immunity standard for industrial environments</i>	EN IEC 61000-6-2:2019
IEC 61310-1:2007	IEC 61310-1:2007	<i>Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, acoustic and tactile signals</i>	EN 61310-1:2008
IEC 61496-1:2020	IEC 61496-1:2020	<i>Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests</i>	EN IEC 61496-1:2020
IEC 61496-2:2020	IEC 61496-2:2020	<i>Safety of machinery — Electro-sensitive protective equipment — Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs)</i>	EN IEC 61496-2:2020
IEC 61496-3:2018	IEC 61496-3:2018	<i>Safety of machinery — Electro-sensitive protective equipment — Part 3: Particular requirements for active opto-electronic protective devices responsive to diffuse</i>	EN IEC 61496-3:2019

EN ISO/ASTM 52938-1:2025 (E)

Column 1 Reference in Clause 2	Column 2 International Standard Edition	Column 3 Title	Column 4 Corresponding European Standard Edition
		<i>Reflection (AOPDDR)</i>	
IEC 61800-5-2:2016	IEC 61800-5-2:2016	<i>Adjustable speed electrical power drive systems — Part 5-2: Safety requirements — Functional</i>	EN 61800-5-2:2017
IEC 62477-1:2022	IEC 62477-1:2022	<i>Safety requirements for power electronic converter systems and equipment — Part 1: General</i>	EN IEC 62477-1:2023

The documents listed in the Column 1 of Table [ZA.2], in whole or in part, are normatively referenced in this document, i.e. are indispensable for its application. The achievement of the presumption of conformity is subject to the application of the edition of Standards as listed in Column 4 or, if no European Standard Edition exists, the International Standard Edition given in Column 2 of Table [ZA.2].

WARNING 1 Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

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International Standard

ISO/ASTM 52938-1

Additive manufacturing of metals — Environment, health and safety —

Part 1: Safety requirements for PBF-LB machines

*Fabrication additive de métaux — Environnement, hygiène et
sécurité —*

Partie 1: Exigences de sécurité pour les machines PBF-LB

**First edition
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ISO/ASTM 52938-1:2025(en)**Contents**

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	3
4 Safety requirements and measures	3
4.1 General.....	3
4.2 Protective measures.....	3
4.2.1 General.....	3
4.2.2 Safeguards.....	3
4.2.3 Control devices.....	4
4.2.4 Control systems.....	4
4.3 Protection against mechanical hazards.....	7
4.3.1 Stability.....	7
4.3.2 Moving parts.....	7
4.3.3 Protection against slipping, tripping or falling.....	8
4.4 Protection against electrical hazards.....	8
4.4.1 General.....	8
4.4.2 Protection from electrostatic phenomena.....	8
4.5 Protection against thermal hazards.....	8
4.6 Vibration reduction measures.....	9
4.7 Noise reduction measures.....	9
4.8 Protection against laser radiation hazards.....	10
4.9 Protection against pneumatic hazards.....	10
4.10 Protection against hydraulic hazards.....	10
4.11 Protection against hazards generated by materials and substances.....	10
4.11.1 Metal powder handling and recovery.....	10
4.11.2 Particles during part removal from powder bed and post-processing.....	11
4.11.3 Explosion and fire hazards.....	11
4.11.4 Hazards generated by inert gases.....	13
4.12 Protection against ergonomic hazards.....	13
4.13 Hazards generated by overpressure.....	13
4.14 Hazards generated by failure of power supply.....	13
5 Verification of safety requirements and/or measures	14
5.1 General.....	14
5.2 Verification based on noise emission values.....	15
6 Information for use	16
6.1 General.....	16
6.2 Cleaning and maintenance.....	16
6.3 Handling.....	17
7 Marking	17
Annex A (informative) List of significant hazards	19
Annex B (normative) Overview of required performance level (PLr)	23
Annex C (normative) Noise test code	24
Bibliography	29

ISO/ASTM 52938-1:2025(en)**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.

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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 261, *Additive manufacturing*, in cooperation with ASTM Committee F42, *Additive Manufacturing Technologies*, on the basis of a partnership agreement between ISO and ASTM International with the aim to create a common set of ISO/ASTM standards on additive manufacturing, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 438, *Additive manufacturing*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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.

ISO/ASTM 52938-1:2025(en)**Introduction**

The ISO/ASTM 52938 series provides technical safety requirements for the design and manufacturing of additive manufacturing (AM) machinery for use in the industry. It concerns designers, manufacturers, suppliers and importers of the machines specified in the Scope. It also includes a list of informative items that the manufacturer will need to give to the user.

Environment, health and safety requirements for use of AM machines using metallic feedstocks are addressed in ISO/ASTM 52931:2023.

This document is a type-C standard as stated in ISO 12100:2010.

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

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

Additive manufacturing of metals — Environment, health and safety —

Part 1: Safety requirements for PBF-LB machines

1 Scope

This document deals with the technical requirements and the means for their verification for additive manufacturing (AM) machines using a bed of metallic powder, pyrophoric feedstock excluded, and a laser herein designated as machine.

This document deals with all significant hazards, hazardous situations or hazardous events during all phases of the life of the machine (ISO 12100:2010, 5.4), as listed in [Annex A](#), caused by AM machines using a bed of metallic powder and a laser when used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer.

This document does not deal with hazards which can occur:

- during the design and construction phase of the laser beam powder bed fusion (PBF-LB) machine itself;
- operating in potentially explosive atmospheres.

This document does not apply to technologies other than AM metals PBF-LB.

This document is not applicable to machines manufactured before the date of its publication.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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/ASTM 52900:2021, *Additive manufacturing — General principles — Fundamentals and vocabulary*

ISO 3744:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane*

ISO 3746:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane*

ISO 4413:2010, *Hydraulic fluid power — General rules and safety requirements for systems and their components*

ISO 4414:2010, *Pneumatic fluid power — General rules and safety requirements for systems and their components*

ISO 4871:1996, *Acoustics — Declaration and verification of noise emission values of machinery and equipment*

ISO 11201:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections*

ISO/ASTM 52938-1:2025(en)

- ISO 11202:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions applying approximate environmental corrections*
- ISO 11553-1:2020, *Safety of machinery — Laser processing machines — Part 1: Laser safety requirements*
- ISO/TR 11688-1:1995, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning*
- ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*
- ISO 13849-1:2023, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*
- ISO 13849-2:2012, *Safety of machinery — Safety-related parts of control systems — Part 2: Validation*
- ISO 13850:2015, *Safety of machinery — Emergency stop function — Principles for design*
- ISO 13855:2024, *Safety of machinery — Positioning of safeguards with respect to the approach of the human body*
- ISO 14118:2017, *Safety of machinery — Prevention of unexpected start-up*
- ISO 14119:2024, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection*
- ISO 14120:2015, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*
- ISO 14122-1:2016, *Safety of machinery — Permanent means of access to machinery — Part 1: Choice of fixed means and general requirements of access*
- ISO 20607:2019, *Safety of machinery — Instruction handbook — General drafting principles*
- ISO 80079-36:2016, *Explosive atmospheres — Part 36: Non-electrical equipment for explosive atmospheres — Basic method and requirements*
- IEC 60079-0:2017, *Explosive atmospheres - Part 0: Equipment - General requirements*
- IEC 60204-1:2016, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*
- IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
- IEC 60825-1:2014, *Safety of laser products — Part 1: Equipment classification and requirements*
- IEC 60825-4:2022, *Safety of laser products — Part 4: Laser guards*
- IEC 61000-6-2:2016, *Generic standards - Immunity standard for industrial environments*
- IEC 61310-1:2007, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, acoustic and tactile signals*
- IEC 61496-1:2020, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests (all parts)*
- IEC 61496-2:2020, *Safety of machinery — Electro-sensitive protective equipment — Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs)*
- IEC 61496-3:2018, *Safety of machinery — Electro-sensitive protective equipment — Part 3: Particular requirements for active opto-electronic protective devices responsive to diffuse Reflection (AOPDDR)*
- IEC 61800-5-2:2016, *Adjustable speed electrical power drive systems — Part 5-2: Safety requirements — Functional*
- IEC 62477-1:2022, *Safety requirements for power electronic converter systems and equipment — Part 1: General*

ISO/ASTM 52938-1:2025(en)

EN 614-1:2006+A1:2009, *Safety of machinery — Ergonomic design principles — Part 1: Terminology and general principles*

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koniec náhľadu – text ďalej pokračuje v platenej verzii STN