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JUURDEKUULUV LISAVARUSTUS. OSA 2: ÜLDISED
OHUTUSNÕUDED

Railway applications - Track - Road-rail machines and
associated equipment - Part 2: General safety
requirements

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

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Contents	Page
European foreword.....	6
Introduction	8
1 Scope.....	10
2 Normative references.....	11
3 Terms and definitions	16
4 List of significant hazards	17
5 General safety requirements and/or measures.....	17
5.1 General.....	17
5.2 Access and egress to and from working places	18
5.2.1 Cabs	18
5.2.2 Working places, places for control and maintenance outside of cabs	19
5.2.3 Walkways on the machine	19
5.3 Ergonomics.....	19
5.4 Cabs	20
5.4.1 Minimum dimensions in cabs	20
5.4.2 Cab floors	20
5.4.3 Emergency exit.....	20
5.4.4 Climatic conditions in cab	20
5.4.5 Protection from dust.....	20
5.4.6 Visibility from cabs and other permanent work places.....	21
5.4.7 Windows.....	24
5.4.8 Storage for documents and equipment.....	25
5.5 Seats	25
5.5.1 Seats for the operator(s)	25
5.5.2 Additional seats	25
5.6 Standing places	25
5.6.1 General.....	25
5.6.2 Risk of falling	25
5.6.3 Electrical risk from overhead lines	26
5.7 Edges and corners.....	26
5.8 Pipes and hoses.....	26
5.9 Communications between work positions.....	26
5.10 Prevention of derailment.....	26
5.10.1 General.....	26
5.10.2 Railhead clearing device - running, travelling and working mode	26
5.11 Stability and measures preventing overturning.....	26
5.11.1 Stability against overturning in road configuration.....	26
5.11.2 Stability against overturning in rail configuration	27
5.11.3 Operator protection	27
5.12 Emergency stopping devices.....	27
5.12.1 Emergency stopping devices for movement of the machine and working equipment.....	27
5.12.2 Action of emergency stopping devices	27
5.13 Moving parts and materials.....	28
5.14 Operators' controls and indicators.....	28
5.14.1 General requirements	28

5.14.2	Control systems.....	30
5.14.3	Starting system.....	32
5.14.4	Accidental activation.....	32
5.14.5	Pedals.....	32
5.14.6	Protection against uncontrolled motion in working mode.....	32
5.14.7	Control panels and indicators.....	32
5.14.8	Remote controls.....	32
5.15	Thermal hazards.....	33
5.16	Electrical system.....	34
5.16.1	Electrical equipment.....	34
5.16.2	Disconnection devices.....	34
5.16.3	Working environment.....	34
5.16.4	Conductors, cables and wiring practices.....	34
5.16.5	Batteries.....	34
5.16.6	Overhead contact line systems.....	35
5.16.7	Equipotential bonding.....	36
5.16.8	Specific requirements for urban rail machines for working with live overhead contact line systems.....	36
5.16.9	Antennae.....	37
5.17	Machine safety requirements related to electromagnetic compatibility.....	37
5.18	Emission of gas and particles.....	37
5.19	Pressurized systems.....	38
5.20	Fuel tanks and hydraulic tanks.....	38
5.21	Noise.....	39
5.22	Vibration.....	39
5.22.1	General.....	39
5.22.2	Whole body vibration.....	40
5.22.3	Hand arm vibration.....	40
5.23	Protection from the risks of fire.....	40
5.23.1	Fire fighting equipment.....	40
5.23.2	Material requirements.....	40
5.23.3	Fire detection devices.....	41
5.23.4	Fire extinguishing devices.....	41
5.23.5	Self-rescue devices.....	41
5.23.6	Built in fire extinguishing system.....	41
5.24	Braking systems.....	41
5.24.1	General.....	41
5.24.2	Special case for machines in running mode.....	43
5.24.3	Special case for machines on urban rail.....	43
5.24.4	Holding on gradients.....	44
5.24.5	Braking of trailing machines/vehicles.....	44
5.24.6	Continuous service air brake for trailing machines/vehicles.....	45
5.24.7	Remote application of brakes.....	45
5.25	Lighting.....	45
5.25.1	Lighting general.....	45
5.25.2	Lighting inside the machine.....	45
5.25.3	Lighting for working places/areas beside the machine.....	45
5.26	Warning systems.....	46
5.27	Maintenance.....	47
5.27.1	General.....	47
5.27.2	Frequent maintenance.....	47
5.27.3	Support devices.....	47
5.27.4	Unauthorized access to the engine compartment.....	47

5.28	Safe handling.....	47
5.29	Moveable machine components	47
5.30	Environmental temperature conditions.....	47
5.31	Storage of substances hazardous to health.....	48
6	Additional safety requirements or measures for specific machine functions	48
6.1	Conveyors.....	48
6.2	Cranes and lifting devices fixed on the machine.....	49
6.3	Transport of loads by machines used for lifting.....	49
6.4	Elevating work platforms.....	49
6.5	Rail profiling machines (grinding, milling or planing)	49
7	Verification of the conformity to the requirements and/or particular safety measures	49
7.1	General.....	49
7.2	Methods of verification	50
7.2.1	General.....	50
7.2.2	Visual check.....	50
7.2.3	Measurement.....	50
7.2.4	Functional test.....	50
7.2.5	Load test(s).....	50
7.2.6	Specific verification/measurements and other controls.....	50
8	Information for use	50
8.1	General.....	50
8.2	Instruction handbook.....	51
8.2.1	Specific information in instruction handbook	51
8.2.2	Restrictions of use.....	52
8.2.3	Mass of the machine in working condition	53
8.2.4	Stability of the machine	53
8.2.5	Conformance to the lateral limit of work	53
8.2.6	Opening and closing the machine	53
8.2.7	Locking of tools and equipment.....	53
8.2.8	Devices to prevent access to an operating track.....	54
8.2.9	Work places situated outside the running gauge	54
8.2.10	Warning systems	54
8.2.11	Testing of warning systems.....	54
8.2.12	Information for maintenance	54
8.2.13	Trailing loads.....	55
8.3	Warning signs and written warnings.....	55
8.4	Marking.....	55
Annex A	(normative) List of significant hazards.....	57
Annex B	(normative) Check list for conformity	60
Annex C	(normative) Noise test code (grade of accuracy 2)	66
C.1	Scope	66
C.2	Definitions	66
C.3	Determination of the emission sound pressure level at the working place and other specified positions	66
C.4	Sound power level determination	67
C.5	Installation and mounting conditions	67
C.6	Working conditions.....	67
C.7	Measurement uncertainties	70
C.8	Information to be recorded.....	70

C.9	Information to be reported	70
C.10	Declaration and verification of noise emission values	71
Annex D	(normative) Vibration test code	75
D.1	Scope	75
D.2	Measurement and degree of uncertainty (K) of whole body vibration (WBV)	75
D.2.1	General	75
D.2.2	WBV Vibration measurement	75
D.2.3	Reporting whole body vibration data	75
D.3	Measurement and degree of uncertainty (K) of hand arm vibration (HAV)	76
D.3.1	General	76
D.3.2	HAV Vibration measurement	76
D.3.3	Reporting hand arm vibration data	76
Annex E	(informative) Structure of European Standards for track construction and maintenance machines	77
Annex ZA	(informative) Relationship between this European Standard and the essential requirements of EU Directive 2006/42/EC aimed to be covered	79
Bibliography	85

European foreword

This document (EN 15746-2:2020) has been prepared by Technical Committee CEN/TC 256 "Railway applications", the secretariat of which is held by DIN.

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 June 2021, and conflicting national standards shall be withdrawn at the latest by June 2021.

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 15746-2:2010+A1:2011.

Principal amended clauses compared to EN 15746-2:2010+A1:2011:

- general All references updated to latest issue;
- 5.2.3 Requirements for walkways simplified;
- 5.4.6 Visibility requirements separated for running, travelling and working modes;
- 5.6.2 New requirements for risk of falling;
- 5.11.3 New requirements for operator protection;
- 5.12 Greater clarity provided for emergency stopping devices;
- 5.14.2 Requirements for control systems enhanced;
- 5.16.8 Alternative requirements for equipotential bonding on urban rail added;
- 5.18 Requirements for emissions enhanced;
- 5.20 Requirements for tanks enhanced;
- 5.23 Protection from risk of fire revised;
- 5.24 Braking requirements amended to accommodate urban rail;
- 5.29 New requirements for moveable components;
- 5.30 New requirements for environment;
- 5.31 New requirements for substances hazardous to health;
- 6.5 New requirements for rail profiling machines;
- Annexes All annexes reviewed and updated;
- Annex C Noise test code amended;
- Annex D New annex for vibration test.

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(s).

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

EN 15746, *Railway applications — Track — Road-rail machines and associated equipment*, is currently composed with the following parts:

- *Part 1: Technical requirements for travelling and working;*
- *Part 2: General safety requirements;*
- *Part 3: Technical requirements for running;*
- *Part 4: Technical requirements for running, travelling and working on urban rail.*

According to the CEN-CENELEC Internal Regulations, the national standards organisations 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, Turkey and the United Kingdom.

Introduction

This document is the second of a series of four parts of the European Standard: *Railway applications — Track — Road-rail machines and associated equipment*, dealing with railway specific risks of the road-rail machines when running, travelling and working on railway infrastructures:

- Part 1 covers the technical requirements for the machines in travelling and working modes, and is applicable for all machines.
- Part 2 covers the safety requirements for the machines in travelling and working modes; this is a document harmonized with the European Machinery Directive 2006/42/EC.
- Part 3 covers the essential requirements for the machines that have a running mode and run on tracks within the scope of the Railway Directive 2007/58/EC; this is a document harmonized with the Railway Interoperability Directive 2008/57/EC and its associated Technical Specifications for Interoperability (TSI).
- Part 4 covers the technical requirements for the machines that have a running mode on urban rail and/or for machines intended to have travelling and working modes on urban rail.

Part 1 defines requirements for approval of the machine for use on the railway. Depending on the decision of the Infrastructure Manager or National rules, the assessment of conformance could be by the Infrastructure Manager concerned, by a third party assessor or declaration of conformity by the manufacturer.

Part 2 defines requirements for the machine to be declared conformant by the manufacturer, except in the case of machines classified under Annex 4 of the Machinery Directive, which requires a conformity check in conjunction with a notified body.

Part 3 defines requirements for running on the European railway network. Assessment of conformity is by a notified body as prescribed in the Railway Interoperability Directive.

Part 4 defines requirements for approval of the machine for use on urban rail. Depending on the decision of the Urban Rail Manager or National rules the assessment of conformance could be by the Urban Rail Manager concerned, by a third party assessor or declaration of conformity by the manufacturer.

This document is a type C standard as stated in EN ISO 12100:2010. This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

- machine manufacturers (small, medium and large enterprises);
- health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.)

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

- machine users/employers (small, medium and large enterprises);
- machine users/employees (e.g. trade unions, organizations for people with special needs);
- service providers, e.g. for maintenance (small, medium and large enterprises);
- consumers (in case of machinery intended for use by consumers).

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

The machinery concerned and the extent to which hazards, hazardous situations and hazardous 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 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.

As far as possible this document sets out only the requirements that materials and equipment need to meet in the interest of safety, and it is assumed that persons operating machines are adequately trained.

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1 Scope

This document specifies the significant hazards, hazardous situations and events, common to self-propelled road-rail machines – henceforward referred to as machines – and associated equipment, arising due to the adaptation for their use on railway networks and urban rail networks. These machines are intended for construction, maintenance and inspection of the railway infrastructure, shunting and emergency rescue vehicles, when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer; see Clause 4.

This document deals with the common hazards during assembly and installation, commissioning, travelling on and off track, use including setting, programming, and process changeover, operation, cleaning, fault finding, maintenance and de-commissioning of the machines.

NOTE Specific measures for exceptional circumstances are not dealt with in this document. They can be subject to negotiation between manufacturer and the machine operator.

The common hazards dealt with include the general hazards presented by the machines, also the hazards presented by the following specific machine functions:

- a) excavation;
- b) ballast tamping, ballast cleaning, ballast regulating, ballast consolidating;
- c) track construction, renewal, maintenance and repair;
- d) lifting;
- e) overhead contact line system renewal / maintenance;
- f) maintenance of the components of the infrastructure;
- g) inspection and measurement of the components of the infrastructure;
- h) working in tunnels;
- i) shunting;
- j) vegetation control;
- k) emergency rescue and recovery;

during commissioning, use, maintenance and servicing.

For a road-rail machine it is assumed that an EU road permissible host vehicle will offer an accepted safety level for its designed basic functions before conversion. Unless explicitly stated otherwise in a particular clause this specific aspect is not dealt with in this document.

This document does not deal with:

- 1) requirements with regard to the quality of work and the performance of the machine;
- 2) machines that utilize the contact line system for traction purposes;
- 3) specific requirements established by a railway Infrastructure Manager or Urban Rail Manager;
- 4) negotiations between the manufacturer and the machine operator for additional or alternative requirements;

- 5) requirements for use and travel of the machine on public highway;
- 6) hazards due to air pressure caused by the passing of high-speed trains at more than 190 km/h;
- 7) requirements which could be necessary in case of use in extreme conditions, such as extreme ambient temperatures (tropical or polar); see 5.30;
- 8) highly corrosive or contaminating environment, e.g. due to the presence of chemicals;
- 9) potentially explosive atmospheres.

Other special machines used on railway tracks are dealt with in other European Standards, see Annex E.

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.

EN 2:1992, *Classification of fires*

EN 3-7:2004+A1:2007, *Portable fire extinguishers — Part 7: Characteristics, performance requirements and test methods*

EN 280:2013+A1:2015, *Mobile elevating work platforms — Design calculations — Stability criteria — Construction - Safety - Examinations and tests*

EN 403:2004, *Respiratory protective devices for self-rescue — Filtering devices with hood for escape from fire — Requirements, testing, marking*

EN 474-1:2006+A6:2019, *Earth-moving machinery — Safety — Part 1: General requirements*

EN 547-1:1996+A1:2008, *Safety of machinery — Human body measurements — Part 1: Principles for determining the dimensions required for openings for whole body access into machinery*

EN 547-2:1996+A1:2008, *Safety of machinery — Human body measurements — Part 2: Principles for determining the dimensions required for access openings*

EN 547-3:1996+A1:2008, *Safety of machinery — Human body measurements — Part 3: Anthropometric data*

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

EN 614-2:2000+A1:2008, *Safety of machinery — Ergonomic design principles — Part 2: Interactions between the design of machinery and work tasks*

EN 618:2002+A1:2010, *Continuous handling equipment and systems — Safety and EMC requirements for equipment for mechanical handling of bulk materials except fixed belt conveyors*

EN 619:2002+A1:2010, *Continuous handling equipment and systems — Safety and EMC requirements for equipment for mechanical handling of unit loads*

EN 620:2002+A1:2010, *Continuous handling equipment and systems — Safety and EMC requirements for fixed belt conveyors for bulk materials*

- EN 842:1996+A1:2008, *Safety of machinery — Visual danger signals — General requirements, design and testing*
- EN 894-1:1997+A1:2008, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 1: General principles for human interactions with displays and control actuators*
- EN 894-2:1997+A1:2008, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 2: Displays*
- EN 894-3:2000+A1:2008, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 3: Control actuators*
- EN 981:1996+A1:2008, *Safety of machinery — System of auditory and visual danger and information signals*
- EN 1032:2003+A1:2008, *Mechanical vibration — Testing of mobile machinery in order to determine the vibration emission value*
- EN 1837:1999+A1:2009, *Safety of machinery — Integral lighting of machines*
- EN 12999:2011+A2:2018, *Cranes — Loader cranes*
- EN 13000:2010+A1:2014, *Cranes — Mobile cranes*
- EN 13135:2013+A1:2018, *Cranes — Safety — Design — Requirements for equipment*
- EN 14033-1:2017, *Railway applications — Track — Railbound construction and maintenance machines — Part 1: Technical requirements for running*
- EN 14033-2:2017, *Railway applications — Track — Railbound construction and maintenance machines — Part 2: Technical requirements for travelling and working*
- EN 14033-3:2017, *Railway applications — Track — Railbound construction and maintenance machines — Part 3: General safety requirements*
- EN 15153-2:2020, *Railway applications — External visible and audible warning devices — Part 2: Warning horns for heavy rail*
- EN 15746-1:2020, *Railway applications — Track — Road-rail machines and associated equipment — Part 1: Technical requirements for travelling and working*
- EN 15746-3:2020, *Railway applications — Track — Road-rail machines and associated equipment — Part 3: Technical requirements for running*
- EN 15877-1:2012+A1:2018, *Railway applications — Marking on railway vehicles — Part 1: Freight wagons*
- EN 16704-2-1:2016, *Railway applications — Track — Safety protection on the track during work — Part 2-1: Common solutions and technologies — Technical requirements for Track Warning Systems (TWS)*
- EN 28662-1:1992, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 1: General (ISO 8662-1:1988)*

EN 45545-2:2020, *Railway applications — Fire protection on railway vehicles — Part 2: Requirements for fire behaviour of materials and components*

EN 50153:2014,¹ *Railway applications — Rolling stock — Protective provisions relating to electrical hazards*

EN 60204-1:2018, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2016)*

EN 60204-32:2008, *Safety of machinery — Electrical equipment of machines — Part 32: Requirements for hoisting machines (IEC 60204-32:2008)*

EN 60529:1991,² *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN 61310-1:2008, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, acoustic and tactile signals (IEC 61310-1:2007)*

EN 61310-2:2008, *Safety of machinery — Indication, marking and actuation — Part 2: Requirements for marking (IEC 61310-2:2007)*

EN 61310-3:2008, *Safety of machinery — Indication, marking and actuation — Part 3: Requirements for the location and operation of actuators (IEC 61310-3:2007)*

EN 61496-1:2013, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests (IEC 61496-1:2012)*

EN 61508-3:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 3: Software requirements (IEC 61508-3:2010)*

EN 62262:2002, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code) (IEC 62262:2002)*

EN ISO 2860:2008, *Earth-moving machinery — Minimum access dimensions (ISO 2860:1992)*

EN ISO 2867:2011, *Earth-moving machinery — Access systems (ISO 2867:2011)*

EN ISO 3411:2007, *Earth-moving machinery — Physical dimensions of operators and minimum operator space envelope (ISO 3411:2007)*

EN ISO 3471:2008, *Earth-moving machinery — Roll-over protective structures — Laboratory tests and performance requirements (ISO 3471:2008)*

EN 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 3744:2010)*

¹ As impacted by EN 50153:2014/A1:2017.

² As impacted by EN 60529:1991/AC:2006-12, EN 60529:1991/A1:2000, EN 60529:1991/A2:2013 and EN 60529:1991/A2:2013/AC:2019-02.

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

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

EN ISO 4871:2009, *Acoustics — Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

EN ISO 5353:1998, *Earth-moving machinery, and tractors and machinery for agriculture and forestry — Seat index point (ISO 5353:1995)*

EN ISO 6682:2008, *Earth-moving machinery — Zones of comfort and reach for controls (ISO 6682:1986, including Amd 1:1989)*

EN ISO 6683:2008, *Earth-moving machinery — Seat belts and seat belt anchorages — Performance requirements and tests (ISO 6683:2005)*

EN ISO 7731:2008, *Ergonomics — Danger signals for public and work areas — Auditory danger signals (ISO 7731:2003)*

EN 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 11201:2010)*

EN ISO 11688-1:2009, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning (ISO/TR 11688-1:1995)*

EN ISO 12001:2009, *Acoustics — Noise emitted by machinery and equipment — Rules for the drafting and presentation of a noise test code (ISO 12001:1996)*

EN ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction (ISO 12100:2010)*

EN ISO 13732-1:2008, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces (ISO 13732-1:2006)*

EN ISO 13849-1:2015, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2015)*

EN ISO 13849-2:2012, *Safety of machinery — Safety-related parts of control systems — Part 2: Validation (ISO 13849-2:2012)*

EN ISO 13850:2015, *Safety of machinery — Emergency stop function — Principles for design (ISO 13850:2015)*

EN ISO 13854:2019, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body (ISO 13854:2017)*

EN ISO 13855:2010, *Safety of machinery — Positioning of safeguards with respect to the approach speeds of parts of the human body (ISO 13855:2010)*

EN ISO 13857:2019, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2019)*

- EN ISO 14118:2018, *Safety of machinery — Prevention of unexpected start-up (ISO 14118:2017)*
- EN ISO 14119:2013, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection (ISO 14119:2013)*
- EN ISO 14120:2015, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards (ISO 14120:2015)*
- EN ISO 14122-2:2016, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and walkways (ISO 14122-2:2016)*
- EN ISO 14122-3:2016, *Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, stepladders and guard-rails (ISO 14122-3:2016)*
- ISO 3795:1989, *Road vehicles, and tractors and machinery for agriculture and forestry — Determination of burning behaviour of interior materials*
- ISO 3864-1:2011, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety markings*
- ISO 3864-2:2016, *Graphical symbols — Safety colours and safety signs — Part 2: Design principles for product safety labels*
- ISO 3864-3:2012, *Graphical symbols — Safety colours and safety signs — Part 3: Design principles for graphical symbols for use in safety signs*
- ISO 3864-4:2011, *Graphical symbols — Safety colours and safety signs — Part 4: Colorimetric and photometric properties of safety sign materials*
- ISO 5006:2017, *Earth-moving machinery — Operator's field of view — Test method and performance criteria*
- ISO 6405-1:2017, *Earth-moving machinery — Symbols for operator controls and other displays — Part 1: Common symbols*
- ISO 7000:2019, *Graphical symbols for use on equipment — Registered symbols*
- ISO 10263-2:2009, *Earth-moving machinery — Operator enclosure environment — Part 2: Air filter element test method*
- ISO 10263-3:2009, *Earth-moving machinery — Operator enclosure environment — Part 3: Pressurization test method*
- ISO 10263-5:2009, *Earth-moving machinery — Operator enclosure environment — Part 5: Windscreen defrosting system test method*
- ISO 11112:1995,³ *Earth-moving machinery — Operator's seat — Dimensions and requirements*

³ As impacted by ISO 11112:1995/AMD 1:2001.

ISO 12117-2:2008,⁴ *Earth-moving machinery — Laboratory tests and performance requirements for protective structures of excavators — Part 2: Roll-over protective structures (ROPS) for excavators of over 6 t*

ISO 12508:1994, *Earth-moving machinery — Operator station and maintenance areas — Bluntness of edges*

ISO 15817:2012, *Earth-moving machinery — Safety requirements for remote operator control systems*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100:2010, EN 15746-1:2020 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 rail configuration

state of the machine when it is in place on the track ready to work or travel along the track

Note 1 to entry: Rail configuration does not include the transient state during getting on and off the track.

3.2 road configuration

state of the machine when it is on the ground, i.e. not on the track

Note 1 to entry: It does not imply that the machine is suitable for use on the public highway.

3.3 working place

driver's cab, working cabs, combined driver's and working cabs, operator's places situated outside cabs and places situated at control or maintenance locations

3.4 rated capacity indicator / limiter RCI/RCL

device which gives within specified tolerance limits, at least a continuous indication of the load being lifted and a continuous indication that the rated capacity is exceeded, and another continuous indication of the approach to the rated capacity and prevents the machine from movement into a worse condition as it reaches the overload condition, as described in this document

Note 1 to entry: For rated capacity, see EN 12077-2.

⁴ As impacted by ISO 12117-2:2008/A1:2016.