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Railway applications - Track - Railbound construction and maintenance machines - Part 3: General safety requirements

Bahnanwendungen - Oberbau - Schienengebundene Bau- und Instandhaltungsmaschinen - Teil 3: Allgemeine Sicherheitsanforderungen

Applications ferroviaires - Voie - Machines de construction et de maintenance empruntant exclusivement les voies ferrées - Partie 3 : Prescriptions générales pour la sécurité

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Foreword

This document (EN 14033-3:2009) 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of an identical text or by endorsement, at the latest by June 2010, and conflicting national standards shall be withdrawn at the latest by June 2010.

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 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 Directives.

For relationship with EU Directives, see informative Annexes ZA and ZB, which are integral parts of this document.

EN 14033, *Railway applications — Track — Railbound construction and maintenance machines*, consists of the following parts:

— *Part 1: Technical requirements for running*

— *Part 2: Technical requirements for working*

— *Part 3: General safety requirements*

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, 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 United Kingdom.

Introduction

This document is a type C standard as stated in EN ISO 12100-1:2003.

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.

1 Scope

1.1 General

This European Standard specifies the significant hazards, hazardous situations and events, common to rail bound machines and arising due to the adaptation for their use on railways. These machines are intended for construction, maintenance and inspection of track, structures, infrastructure and fixed electric traction equipment, when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer, see Clause 4.

This European Standard applies to railbound machines and other vehicles - referred to as machines - working exclusively on the railway (utilising friction adhesion between the rail and rail wheels) but including machines that in working position are partly supported on the ballast or the formation and used for construction, maintenance and inspection of track, structures, infrastructure and fixed electric traction equipment. This European Standard applies to machines that are intended to operate signalling and control systems. Other similar machines are dealt with in other European Standards, see Annex D.

This European Standard specifies the common hazards, in normal circumstances, during running, assembly and installation, commissioning, use (including setting, programming, and process changeover), operation, cleaning, fault finding, maintenance and de-commissioning of the machines. Additional safety measures can be required by exceptional circumstances, such as extreme ambient temperatures (less than – 20 °C or greater than + 40 °C), highly corrosive or contaminating environment; e.g. due to the presence of chemicals, and potentially explosive atmospheres. Air pressure caused by the passing of high-speed trains at more than 190 km/h is also not dealt with.

NOTE 1 Specific measures for exceptional circumstances are not dealt with in this European Standard. The specific measures for exceptional circumstances introduced by a railway infrastructure manager and requirements introduced by the manufacturer and/or machine operator as referred to in the scope are not dealt with in this European Standard. When such additional measures are necessary, they should be agreed between the manufacturer and the machine operator. The manufacturer will be responsible for compliance with the Directive(s) concerned independent of this European Standard for additional hazards created by any additional or alternative requirements.

NOTE 2 This European Standard deals only with the additional hazards from the adaptation of a machine for its use on rail. Other standards specific to the particular machine as far as available will need to be used in addition to this European Standard to give the complete requirements.

The common hazards specified include the general hazards presented by the machines, and also the hazards presented by the following specific machine functions, common to two or more machine types:

— ballast excavation, ballast cleaning, ballast regulating, ballast consolidating;

— tamping;

— track renewal;

— craning;

— maintenance of the components of the infrastructure;

during commissioning, use, maintenance and servicing.

This European Standard does not deal comprehensively with specific machine functions other than the common functions listed in the previous paragraph, or with all possible hazards presented by complete machines or by the combination of functions.

NOTE 3 For such specific functions or hazards, the use of specific European Standards is recommended.

This European Standard does not deal with:

— requirements with regard to the quality of work and the performance of the machine;

— machines that utilise the catenary for traction purposes;

— specific requirements introduced by a railway infrastructure manager;

— additional or alternative requirements introduced by the manufacturer and/or operator.

1.2 Validity of this European Standard

This European Standard applies to all machines, which are ordered after one year from the publication date of this European Standard.

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.

EN 2, *Classification of fires*

EN 3 (all parts), *Portable fire extinguishers*

EN 280, *Mobile elevating work platforms — Design calculations — Stability criteria — Construction — Safety — Examinations and tests*

EN 349, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body*

EN 474-1:2006+A1:2009, *Earth-moving machinery — Safety — Part 1: General requirements*

EN 547-1, *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, *Safety of machinery — Human body measurements — Part 2: Principles for determining the dimensions required for access openings*

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

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

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

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

EN 619, *Continuous handling equipment and systems — Safety and EMC requirements for equipment for mechanical handling of unit loads*

EN 620, *Continuous handling equipment and systems — Safety and EMC requirements for fixed belt conveyors for bulk materials*

EN 842, *Safety of machinery — Visual danger signals — General requirements, design and testing*

EN 894-1, *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, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 2: Displays*

EN 894-3, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 3: Control actuators*

EN 953, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

EN 981, *Safety of machinery — System of auditory and visual danger and information signals*

EN 982, *Safety of machinery — Safety requirements for fluid power systems and their components — Hydraulics*

EN 983, *Safety of machinery — Safety requirements for fluid power systems and their components — Pneumatics*

EN 999, *Safety of machinery — The positioning of protective equipment in respect of approach speeds of parts of the human body*

EN 1032, *Mechanical vibration — Testing of mobile machinery in order to determine the vibration emission value*

EN 1037:1995, *Safety of machinery — Prevention of unexpected start-up*

EN 1088, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection*

EN 1837, *Safety of machinery — Integral lighting of machines*

EN 12096:1997, *Mechanical vibration — Declaration and verification of vibration emission values*

EN 13135-1:2003, *Cranes — Safety — Design — Requirements for equipment — Part 1: Electrotechnical equipment*

EN 13135-2:2004, *Cranes — Equipment — Part 2: Non-electrotechnical equipment*

prEN 14033-1:2008, *Railway applications — Track — Railbound construction and maintenance machines — Part 1: Technical requirements for running*

EN 14033-2:2008, *Railway applications — Track — Railbound construction and maintenance machines — Part 2: Technical requirements for working*

EN 28662-1, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 1: General (ISO 8662-1:1988)*

EN 60204-1:2006, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2005, modified)*

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

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

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

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

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

EN 61496-1, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests (IEC 61496-1:2004, modified)*

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

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

EN ISO 2867:2008, *Earth-moving machinery — Access systems (ISO 2867:2006, including Cor 1:2008)*

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

EN ISO 3744:2009, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering method in an essentially free field over a reflecting plane (ISO 3744:1994)*

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

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

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

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

EN ISO 11201:2009, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Engineering method in an essentially free field over a reflecting plane (ISO 11201:1995, including Cor 1:1997)*

EN ISO 11688-1, *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 12100-1:2003, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology (ISO 12100-1:2003)*

EN ISO 12100-2:2003, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles (ISO 12100-2:2003)*

EN ISO 13732-1, *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, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2006)*

EN ISO 13850, *Safety of machinery — Emergency stop — Principles for design (ISO 13850:2006)*

EN ISO 13857, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2008)*

EN ISO 14122-2, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and walkways (ISO 14122-2:2001)*

EN ISO 14122-3:2001, *Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, stepladders and guard-rails (ISO 14122-3:2001)*

ISO 3795, *Road vehicles, and tractors and machinery for agriculture and forestry — Determination of burning behaviour of interior materials*

ISO 3864-1, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs in workplaces and public areas*

ISO 5006:2006, *Earth-moving machinery — Operator's field of view — Test method and performance criteria*

ISO 7000, *Graphical symbols for use on equipment — Index and synopsis*

ISO 10263-2, *Earth-moving machinery — Operator enclosure environment — Part 2: Air filter element test method*

ISO 10263-3, *Earth-moving machinery — Operator enclosure environment — Part 3: Pressurization test method*

ISO 10263-5, *Earth-moving machinery — Operator enclosure environment — Part 5: Windscreen defrosting system test method*

ISO 11112:1995, *Earth-moving machinery — Operator's seat — Dimensions and requirements*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100-1:2003 and the following apply.

3.1
working place
working cabs, combined working and driving cabs, operators places situated outside cabs and places situated at control or maintenance locations

4 List of significant hazards

Table A.1 shows all the significant hazards, hazardous situations and events, as far as they are dealt with in this European Standard, identified by risk assessment as significant for this type of machinery and which require action to eliminate or reduce the risk.

5 General safety requirements and/or protective measures

5.1 General

Machines shall comply with the safety requirements and/or protective measures in accordance with Clauses 5 and 6. In addition, the machine shall be designed according to the principles of EN ISO 12100-2 for relevant but not significant hazards, which are not dealt with by this European Standard.

For hazards which are to be reduced by application of type B standards the manufacturer should carry out a specific risk assessment to establish the requirements of those standards which are to be applied. This specific risk assessment is part of the general risk assessment of the machine.

This European Standard refers to the following type B standards:

EN 349, EN 547-1, EN 547-2, EN 547-3, EN 614-1, EN 614-2, EN 842, EN 894-1, EN 894-2, EN 894-3, EN 953, EN 981, EN 982, EN 983, EN 999, EN 1032, EN 1037, EN 1088, EN 1837, EN 60204-1, EN 61310-1, EN 61310-2, EN 61310-3, EN 61496-1, EN ISO 4871, EN ISO 7731, EN ISO 11688-1, EN ISO 12001, EN ISO 13732-1, EN ISO 13849-1, EN ISO 13850, EN ISO 13857, EN ISO 14122-2 and EN ISO 14122-3.

Taking into account that the standard is only formulating general/common requirements for the equipment in the scope the manufacturer will have to carry out a complete risk assessment for identifying the specific hazards of its machine and the corresponding measures (including the measures additional to those of Clauses 5 and 6 that may be required).

5.2 Access to working places

5.2.1 Working cabs and combined working and driving cabs

The arrangement of working cabs and combined working and driving cabs shall comply with EN 14033-2:2008, 5.4.1 and 5.4.2.

The access to working cabs and combined working and driving cabs shall comply with prEN 14033-1:2008, 14.2 and EN 14033-2:2008, 5.5.

Driving cabs shall comply with the requirements of EN 14033-2:2008, 5.4 and 5.5.

Doors for working cabs shall either comply with prEN 14033-1:2008, 14.2.3 or where this is not possible for technical reasons the minimum dimensions of the access to working cabs shall comply with the requirements of EN ISO 2867:2008, Clause 11, Figure 4 and Table 4.

5.2.2 Working places, places for control and maintenance outside of cabs

The arrangement of working places, places for control and frequent maintenance outside of cabs shall comply with EN 14033-2:2008, 5.4.1 and 5.4.2.

The access to working places, places for control and frequent maintenance outside of cabs shall either comply with prEN 14033-1:2008, 14.2 and EN 14033-2:2008, 5.5 or where this is not possible for technical reasons they shall comply with EN ISO 2867:2008, Clauses 6 to 10.

5.2.3 Walkways on the machine

The walkways on the machine shall have a minimum width of 500 mm and a headroom of a minimum 2 000 mm. Floors shall as far as technically possible not present a tripping hazard and their coverings shall be in conformance with the requirements of EN ISO 14122-2.

Guard rails shall comply with the requirements of EN ISO 14122-3:2001, Clause 7 and 8.2.

5.3 Ergonomics

Machines shall be designed according to the principles of EN 614-1 and EN 614-2. Where for specific working places this is technically not completely possibly the machines shall be designed as far as possible with the purpose of approaching these principles.

5.4 Requirements for working cabs

5.4.1 Minimum dimensions in working cabs

Except under the conditions of the following paragraph the minimum space available to the operator shall be as specified in EN ISO 3411.

For working cabs with limited headroom measured from the seat index point to the roof, as specified in EN ISO 5353 caused by technical requirements, e.g. working cabs for laying of sleepers or ballast chains underneath of the frame of the machine as well as cabs of portal cranes, the minimum space envelope height (dimension R_1 as specified in EN ISO 3411:2007, Figure 4) may be reduced to 920 mm.

The minimum space and location of the controls at the operator's station shall meet the requirements as specified in EN ISO 6682.

5.4.2 Working cab floors

The floor of working cabs shall be constructed in conformance with the requirements of EN ISO 14122-2.

5.4.3 Storage for instruction handbook

A space intended for the safekeeping of the instruction handbook shall be provided in at least one of the work cabs.

5.4.4 Emergency exit

An alternative exit (emergency exit) shall be provided according to the requirements of EN 474-1:2006+A1:2009, 5.3.2.4.

5.4.5 Climatic conditions

Working cabs and combined working and driving cabs shall protect the operator against foreseeable adverse climatic conditions.

Working cabs and combined working and driving cabs shall be heat insulated and shall be equipped with an adjustable heating and ventilation system according to the requirements of EN 474-1:2006+A1:2009, 5.3.2.6.

If the heating system is insufficient to defrost windows, working cabs and combined working and driving cabs shall be equipped with a system for defrosting the windows used for the observation of work tools. Where systems for defrosting of windows are fitted they shall be tested in accordance with the requirements of ISO 10263-5.

NOTE The area of the windscreen to be defrosted is determined by the manufacturer according to the requirements of 5.10 and 5.11.

The doors, windows, pipes and cable ducting, traps and valves shall protect against rain, exhaust gases and wind.