SLOVENSKI STANDARD
SIST EN 14033-2:2008

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Železniške naprave - Zgornji ustroj - Težka tirna mehanizacija za gradnjo in vzdrževanje - 2. del: Tehnične zahteve za delovanje

Railway applications - Track - Railbound construction and maintenance machines - Part 2: Technical requirements for working

Bahnanwendungen - Oberbau - Schienengebundene Bau- und Instandhaltungsmaschinen - Teil 2: Technische Anforderungen an den Arbeitseinsatz

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Applications ferroviaires - Voie - Machines de construction et de maintenance empruntant exclusivement les voies ferrées - Partie 2: Prescriptions techniques pour le travail

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EUROPEAN STANDARD

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Foreword

This document (EN 14033-2:2008) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

This document shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2008 and conflicting national standards shall be withdrawn at the latest by October 2008.

Special National Conditions are given in Annex A.

This series of standards 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.

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Introduction

This European Standard (EN) was prepared to meet the basic requirements of EU Directives to facilitate an open market for goods and services.

Railway machines used for construction and maintenance form the object of this European Standard.

This European Standard deals with railway specific risks of the machines, as specified in 1.1, when working on railway infrastructures.

For safety requirements in relation to the Machinery Directive, see prEN 14033-3.

For deviations or special national conditions, see Annex A.

The risks which exist in all mechanical, electrical, hydraulic, pneumatic and other components of machines and which are dealt with in the relevant European Standards are not within the scope of this European Standard. If necessary, references are made to appropriate standards of this type.

If the provisions of this type C standard are different from those which are stated in type A or B standards, the provision of this type C standard take precedence.

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1 Scope

1.1 General

This European Standard defines the specific technical railway requirements for working with machines and other vehicles used for construction, maintenance and inspection of track, structures, track formation and fixed electric traction equipment as specified in EN 14033-1.

This European Standard applies to all railbound machines and other vehicles - referred to as machines - working exclusively on the railway (utilising adhesion between the rail and rail wheels) 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 M.

Additional requirements can apply for working on infrastructures with narrow gauge or broad gauge lines, lines of tramways, railways utilising other than adhesion between the rail and rail wheels and underground infrastructures.

This European Standard is applicable to 1 435 mm nominal track gauge. Some requirements may be applicable for working on infrastructures with nominal narrow track gauge or nominal broad track gauge lines, lines of tramways, railways utilising other than adhesion between the rail and rail wheels and underground infrastructures.

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This European Standard covers the safety requirements for the railway specific problems for working on different infrastructures. The application of these requirements is the object of a verification procedure, which does not form part of this European Standard, but an Annex J is included for information. In all cases an authorisation to work is required to access the infrastructure.

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This European Standard is also applicable for machines that in working position are partly supported on the ballast or the formation.

This European Standard does not apply to

— the requirements with regard to the quality of work, including the related measuring methods, and the performance of the machine;[1)]

— the specific requirements established by each railway infrastructure manager for the use of machines which will be the subject of negotiation between the manufacturer and the infrastructure manager.

This European Standard does not deal with the following additional requirements:

— working methods;

— operation in severe working conditions requiring special measures (e.g. work in tunnels or in cuttings, extreme environmental conditions such as freezer applications, high temperatures, corrosive environment, tropical environment, contaminating environments, strong magnetic fields);

— operation subject to special rules (e.g. potentially explosive atmospheres);

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1) Parameters for the measurement of track quality are dealt with in prEN 13848-3:2007.

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— hazards due to errors in software;

— hazards occurring when used to handle suspended loads which may swing freely;

— hazards due to wind pressure greater than normal e.g. pressures caused by the passing of trains at speed in excess of 190 km/h.

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

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

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EN 791, *Drill rigs — Safety*

EN 12077-2:1998, *Cranes safety — Requirements for health and safety — Part 2: Limiting and indicating devices*

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EN 12999, *Cranes — Loader cranes*

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

prEN 14033-3:2007, *Railway applications — Track — Railbound construction and maintenance machines — Part 3: General safety requirements*

EN 14363:2005, *Railway applications — Testing for the acceptance of running characteristics of railway vehicles — Testing of running behaviour and stationary tests*

EN 50122-1, *Railway applications — Fixed installations — Part 1: Protective provisions relating to electrical safety and earthing*

EN 50153:2002, *Railway applications — Rolling stock — Protective provisions relating to electrical hazards*

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

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

ISO 4305, *Mobile cranes — Determination of stability*

ISO 4310, *Cranes — Test code and procedures*

UIC 505-1:2006, *Railway transport stock — Rolling stock construction gauge*

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UIC 505-4:1977, *Effects of the application of the kinematic gauges defined in the 505 series of leaflets on the positioning of structures in relation to the tracks and of the tracks in relation to each other*

UIC 644:1980, *Warning devices used on tractive units employed on international services*

UIC 702:2003, *Static loading diagrams to be taken into consideration for the design of rail carrying structures on lines used by international services*

3 Terms and definitions

3.1 General terms and definitions

The terms listed in the relevant railway specific documents and in particular those in the UIC leaflets apply to this European Standard.

Terms and definitions that are used in European and International Standards that are referred to in this European Standard also apply.

3.2 Additional terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.2.1
working configuration
machine is said to be in working configuration as soon as any part of the machine is moved from its travelling position as specified in EN 14033-1:2008, 5.2

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3.2.2
working place
working places are working cabs, combined working and driving cabs, operators places situated outside cabs and places situated at control or maintenance locations

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3.2.3
working limit contour
limit in which a machine can work without interfering with the kinematic envelope of vehicles on adjacent tracks

3.2.4
operating track
track corresponding to the criteria of the infrastructure manager on which vehicles may run under normal signalling arrangements (with or without a speed limit)

3.2.5
working track
track that is being maintained for which the geometrical parameters may reach the limiting values as specified in Annex F and for which special operational restrictions may apply

3.2.6
authorised body
body appointed by the infrastructure manager

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3.2.7
working agreement
working agreement is a procedure that enables a machine to work on one railway infrastructure

NOTE This procedure consists of two parts:

a) the proof of conformity with the safety requirements, as specified in prEN 14033-3 (EC declaration of conformity), given by the manufacturer;

b) the authorisation to work that is given at the end of the working agreement. It is also permissible to give a preliminary authorisation to work if some requirements are not yet fulfilled or have yet to be proved that they are fulfilled.

3.2.8
authorisation to work
given by the infrastructure manager it permits a machine to work on the railway infrastructure in accordance with the specific requirements of the latter (method of work, quality, output)

3.2.9
type testing
see EN 14033-1

3.2.10
type conformance testing
see EN 14033-1

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4 Field of use of machines

Machines shall in accordance with their proper use either:

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— be designed to work on all tracks within the geometric limits as specified in Annex F

or

— work on tracks within the geometric limits of the operating track only and shall then display at each operating position the warning plate as shown in Annex C.

5 Specific railway requirements and/or measures

5.1 Interaction with the Infrastructure

5.1.1 General

The wheels, supports and working tools shall not generate harmful stresses in the infrastructure components, e.g. rail, fastenings, sleepers, ballast, structures and formation.

Futhermore it is necessary to take into consideration the maximum rail load, the permissible bending of the rail, the transverse forces on the sleeper fastenings, the surface pressure on the ballast as well as the load carrying ability of the formation and structures.

The parameters to consider for the calculations are listed in Annex K.

If the machine contains devices for levelling and lining of the track the maximum forces generated by these devices shall be stated in the technical documentation, see Annex E, and in the instruction handbook.

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5.1.2 Stress induced into the rails

Any tool shall not generate stresses in the rail higher than the following values given in Table 1 expressed as a percentage of the minimum ultimate tensile strength of the rail.

The calculations shall be based on a 60E1 rail section with a maximum tensile strength of 880 N/mm^2 and a 49E1 rail section with a maximum tensile strength of 680 N/mm^2. The manufacturer shall state the limitations of use for both these rail types.

The limits a) and b) in Table 1 can be exceeded in machines specifically designed for straightening or bending rails.

Table 1 — Stress limit in the rails

bending stress	measure points	ultimate tensile strength of the rail %
a) Maximum permissible tensile bending stress	middle of the head and middle of the foot of the rail	45
	at the corner of the head of the rail	50
	at the foot of the rail	60
b) Maximum permissible compressive bending stress	head and foot of the rail	65

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The values above allow for safety in particular conditions, e.g. heavy rail use, joints with big gaps, non standard sleeper spacing, residual stresses in the rails.

5.1.3 Auxiliary wheels, auxiliary guides and working parts

The wheels and guides referred to in this clause are for the support and guidance of assemblies associated with the operation of the machine and not for running.

The construction and positioning of any auxiliary wheels and/or guides shall provide satisfactory guidance on rails and shall not cause damage to the rail or any associated part of the railway infrastructure.

The devices for the vertical and lateral positioning of the rails not placed on sleepers, e.g. guiding rollers, rail hooks, shall be designed in order to prevent dangerous movements of rail in case of fracture of the rails or fishplates.

Any additional supporting elements necessary to ensure stability or assist the work process shall also comply with the above requirements.

5.1.4 Maximum wheel loads

5.1.4.1 General

The wheels referred to in this clause are the wheels used for the running of the machine as specified in EN 14033-1.

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5.1.4.2 Machines without wheel load control devices

In working configuration the maximum wheel loads Q_{max} of the main wheels or auxiliary wheels in relation to the diameter of the wheel and the rail material are given in Table 2.

The calculation of the vertical loads applied to the wheels shall take into account all the factors that can produce variations, i.e.:

— due to the machine:

  — eccentricity of the centre of gravity;

  — torsional flexibility;

  — hysteresis of the suspension;

  — eccentric load;

  — application of an eccentric force;

— due to the track:

  — maximum cant;

  — maximum twist.

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Table 2 — Maximum wheel load with the machine in working configuration for machines that lift a load without wheel load control devices

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d mm	Q_{max} kN	
	Rail [a] with σ_B = 880 N/mm^2	Rail [b] with σ_B = 680 N/mm^2
∅ ≥ 920	222	136
920 > ∅ ≥ 840	222	136
840 > ∅ ≥ 760	201	120
760 > ∅ ≥ 680	179	107
680 > ∅ ≥ 630	167	99
630 > ∅ ≥ 550	146	89
550 > ∅ ≥ 470	124	74
470 > ∅ ≥ 390	103	62
390 > ∅ ≥ 330	87	52

σ_B = maximum tensile stress of rail material
d = worn diameter limit
∅ = wheel diameter
[a] Corresponds e.g. to rails UIC 60, S 54, S49 (880 N/mm^2).
[b] Corresponds e.g. to rails, rails S 49 (680 N/mm^2).

If, in working mode, the maximum static wheel load exceeds the values for rails with σ_b = 680N/mm^2, it shall be stated in the documentation, see Annex E, and in the instruction handbook.

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5.1.4.3 Machines that do not lift a load or lift a load with wheel load control devices

The maximum wheel loads Q_{max} for machines, notably railway cranes, for which the loads on the wheel are controlled by means of a device, e.g. device for limiting of overturning moment, which prevents the maximum value of the wheel load being exceeded, are given in Table 3.

Reductions of the maximum load shall be applied when the working conditions are imprecise or difficult to determine, such as:

— lifting of the load from underneath;

— indeterminate break out forces;

— overload due to unequal distribution of the load within the lifting tackle;

— oblique lifting of the load;

— dynamic movements of the load, e.g. swinging or vertical movements of the load.

Table 3 — Maximum wheel load with the machine in working configuration with wheel load control devices

d mm	**Q_{max}** kN	
	Rail [a] with σ_B = 880 N/mm^2	Rail [b] with σ_B = 680 N/mm^2
∅ ≥ 920	243	170
920 > ∅ ≥ 840	243	170
840 > ∅ ≥ 760	243	154
760 > ∅ ≥ 680	230	138
680 > ∅ ≥ 630	213	127
630 > ∅ ≥ 550	186	111
550 > ∅ ≥ 470	159	95
470 > ∅ ≥ 390	132	79
390 > ∅ ≥ 330	112	67

d = worn diameter limit

∅ = wheel diameter

σ_B = maximum tensile stress of rail material

[a] Corresponds e.g. to rails UIC 60, S 54, S49 (880 N/mm^2).

[b] Corresponds e.g. to rails, rails S 49 (680 N/mm^2).

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If, in working mode, the maximum static wheel load exceeds the values for rails with σ_b = 680 N/mm^2 given in Table 3 it shall be stated in the documentation, see Annex E, and in the instruction handbook.

5.1.5 Loads applied to the ballast

The surface pressure applied to the ballast shall not exceed 0,3 MN/m^2.

In the case of a tracked machine the surface pressure shall be calculated as specified in EN 791.