



SLOVENSKI STANDARD
SIST EN 13481-2:2012+A1:2017
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**Železniške naprave - Zgornji ustroj - Zahteve za izdelavo pritrdilnih sistemov - 2.
del: Pritrdilni sistemi za betonske prage**

Railway applications - Track - Performance requirements for fastening systems - Part 2:
Fastening systems for concrete sleepers

Bahnanwendungen - Oberbau - Leistungsanforderungen für
Schienenbefestigungssysteme - Teil 2: Befestigungssysteme für Betonschwellen

Applications ferroviaires - Voie - Exigences de performance pour les systèmes de
fixation - Partie 2: Systèmes de fixation pour traverses en béton

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ICS:

93.100 Gradnja železnic Construction of railways

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EUROPEAN STANDARD
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Railway applications - Track - Performance requirements for fastening systems - Part 2: Fastening systems for concrete sleepers

Applications ferroviaires - Voie - Exigences de
performance pour les systèmes de fixation - Partie 2:
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Bahnanwendungen - Oberbau -
Leistungsanforderungen für
Schienenbefestigungssysteme - Teil 2:
Befestigungssysteme für Betonschwellen

This European Standard was approved by CEN on 27 April 2012 and includes Corrigendum 1 issued by CEN on 12 March 2014 and Amendment 1 approved by CEN on 5 June 2016.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 13481-2:2012+A1:2017) 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of an identical text or by endorsement, at the latest by July 2017, and conflicting national standards shall be withdrawn at the latest by July 2017.

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 includes Amendment 1 approved by CEN on 2016-06-05.

This document supersedes A1 EN 13481-2:2012 A1.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

The main changes in this revision of EN 13481-2:2002 are as follows:

- a) new categories of fastening systems have been introduced (Clause 2, Table 1);
- b) the ranges of test loads have been extended to cover the new categories of fastening system (5.4, Table 2 and 5.5, Table 3);
- c) advice on the attenuation of noise and vibration has been added in a new annex (Annex B).

This European Standard is one of the series EN 13481 "Railway applications – Track – Performance requirements for fastening systems" which consists of the following parts:

- Part 1: Definitions
- Part 2: Fastening systems for concrete sleepers
- Part 3: Fastening systems for wood sleepers
- Part 4: Fastening systems for steel sleepers
- Part 5: Fastening systems for slab track with rail on the surface or rail embedded in a channel
- Part 7: Special fastening systems for switches and crossings and check rails

NOTE Part 6 does not exist in this series.

These European Standards are supported by the test methods in the series EN 13146 "Railway applications – Track – Test methods for fastening systems".

For relationship with EU Directive 2008/57/EC, see informative Annex ZA, which is an integral part of this document.

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,

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Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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Introduction

A series of tests is used to assess the suitability of fastening systems for use in railway track.

In this European Standard a requirement for longitudinal rail restraint is included to control rail creep and pull apart in the event of a broken rail. Measurement of torsional resistance is included for use in assessing the risk of track buckling. Classes for attenuation of dynamic loading are included for use when it is necessary to protect sleepers from vehicle induced impacts. The laboratory test for the effect of repeated loading is specified to assess the potential long term performance of the fastening in track. The test for clamping force is only suitable for laboratory use.

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1 Scope

A1 This European Standard is applicable to fastening systems in Categories A–E as specified in EN 13481-1:2012, 3.1, for use on concrete sleepers in ballasted track with maximum axle loads, and minimum curve radii as shown in Table 1.

Table 1 — Fastening category criteria

Category	Maximum design axle load kN	Minimum curve radius m
A	130	40
B	180	80
C	260	150
D	260	400
E	350	150

NOTE The maximum axle load for Categories A and B does not apply to maintenance vehicles.

The requirements apply to:

- fastening systems which act on the foot and/or web of the rail including direct fastening systems and indirect fastening systems;
- fastening systems with dynamic stiffness, k_{LFA} , not less than 50 MN/m;
- fastening systems for rail sections included in EN 13674-1 (excluding 49E4) or EN 13674-4.

This standard is not applicable to fastening systems for other rail sections, rigid fastening systems or special fastening systems used at bolted joints or glued joints.

This standard should only be used for type approval of complete fastening systems. **A1**

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 13146-1:2012, *Railway applications — Track — Test methods for fastening systems — Part 1: Determination of longitudinal rail restraint*

EN 13146-2:2012, *Railway applications — Track — Test methods for fastening systems — Part 2: Determination of torsional resistance*

EN 13146-3:2012, *Railway applications — Track — Test methods for fastening systems — Part 3: Determination of attenuation of impact loads*

EN 13146-4:2012, *Railway applications — Track — Test methods for fastening systems — Part 4: Effect of repeated loading*

EN 13146-5:2012, *Railway applications — Track — Test methods for fastening systems — Part 5: Determination of electrical resistance*

EN 13146-6:2012, *Railway applications — Track — Test methods for fastening systems — Part 6: Effect of severe environmental conditions*

EN 13146-7:2012, *Railway applications — Track — Test methods for fastening systems — Part 7: Determination of clamping force*

EN 13146-8:2012, *Railway applications — Track — Test methods for fastening systems — Part 8: In service testing*

EN 13146-9:2009+A1:2011, *Railway applications — Track — Test methods for fastening systems — Part 9: Determination of stiffness*

A1

EN 13146-10, *Railway applications — Track — Test methods for fastening systems — Part 10: Proof load test for pull-out resistance*

A1

EN 13230-1, *Railway applications — Track — Concrete sleepers and bearers — Part 1: General requirements*

EN 13481-1:2012, *Railway applications — Track — Performance requirements for fastening systems - Part 1: Definitions*

EN 13674-1:2011, *Railway applications — Track — Rail — Part 1: Vignole railway rails 46 kg/m and above*

EN 13674-4, *Railway applications — Track — Rail — Part 4: Vignole railway rails from 27 kg/m to, but excluding 46 kg/m*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 13481-1:2012 apply.

4 Symbols

For the purposes of this document, the following symbols apply.

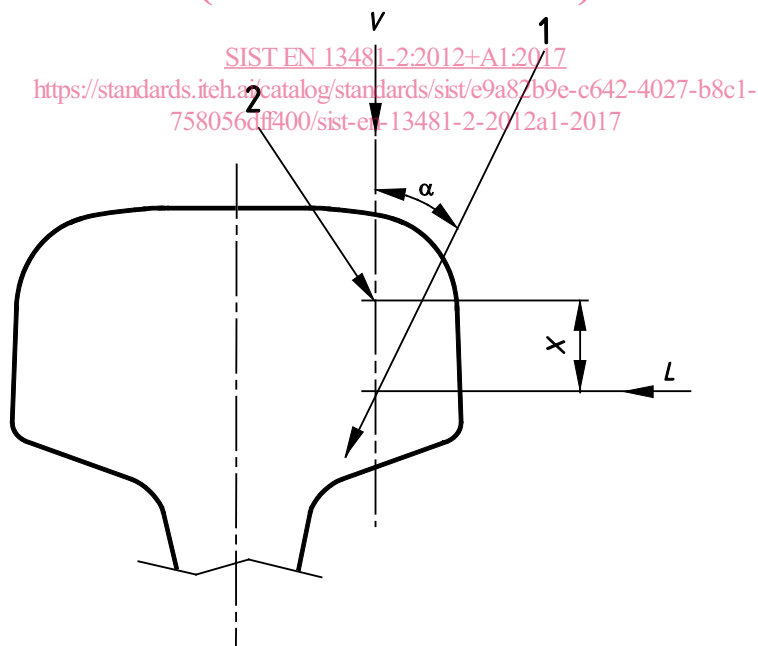
F_{HFAmax}	static preload applied in measurement of high frequency stiffness, in kN
F_{LFA1}	minimum force applied in measurement of dynamic low frequency stiffness of assembly, in kN
F_{LFAmax}	reference force for measurement of dynamic low frequency stiffness of assembly, in kN
F_{LFP1}	notional fastening clip force assumed for measurement of dynamic low frequency stiffness of pad, in kN
F_{LFPmax}	reference force for measurement of dynamic low frequency stiffness of pad, in kN
F_{max}	axial load at which gross slip occurs in the longitudinal rail restraint test (EN 13146-1:2012), in kN
F_{SA1}	minimum force applied in measurement of static stiffness of assembly, in kN

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F_{SAmax}	force applied to assembly in measurement of static stiffness of assembly, in kN
F_{SP1}	notional fastening clip force assumed for measurement of static stiffness of pad, in kN
F_{SPmax}	force applied to pad in measurement of static stiffness of pad, in kN
k_{HFAD}	transfer stiffness in measurement of high frequency stiffness of assembly, in N/m
k_{LFAD}	low frequency dynamic stiffness of assembly, in MN/m
L	lateral component of force transmitted by the wheel to the rail head as shown in Figure 1, in kN
P_L	component of load parallel to the running surface of the rails, in kN
P_V	component of load normal to the running surface of the rails, in kN
V	vertical component of load transmitted by the wheels to the running surface at the rail head as shown in Figure 1, in kN
X	distance between the line of application of P_L and the centre of the gauge corner radius of the rail head as shown in Figure 1, in mm
α	angle between the load line and a line normal to the running surface of the rails as shown in Figure 1, in °

NOTE $\frac{L}{V} = \frac{P_L}{P_V} = \tan \alpha$

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**Key**

- 1 line of load application
- 2 centre of gauge corner radius

Figure 1 — Load application position

5 Requirements

5.1 Longitudinal rail restraint

The longitudinal rail restraint shall be not less than 7 kN when measured by the procedure in EN 13146-1. For use in category D fastening systems (> 250 km/h), the longitudinal rail restraint shall be not less than 9 kN.

On structures such as long bridges, the longitudinal force transmitted between the track and the structure may be calculated by the method in EN 1991-2. The value of F_{\max} measured in accordance with EN 13146-1 may be used in the calculation. In such cases, and subject to agreement between the purchaser and manufacturer, the minimum requirement for longitudinal restraint may be reduced.

5.2 Torsional resistance

When required by the purchaser, the torsional resistance shall be measured by the procedure in EN 13146-2 and the result reported.

5.3 Attenuation of impact loads

For fastening systems described as having medium or high attenuation of dynamic loads this shall be measured by the procedure in EN 13146-3 using the type of sleeper (mono-block or two block) on which the fastening is to be used. The result shall comply with the following limits:

— medium attenuation $\geq 15\%$ to $\leq 30\%$;

— high attenuation $> 30\%$.

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5.4 Pad and assembly stiffness

As required by EN 13146-4, the assembly static stiffness and assembly low frequency dynamic stiffness shall be measured in accordance with EN 13146-9. Measurement of the rail pad static stiffness is required at the purchaser's discretion in accordance with EN 13146-8. If the purchaser requires either of the following, it shall be measured in accordance with EN 13146-9:

— pad low frequency dynamic stiffness;

— assembly high frequency dynamic stiffness.

Test loads are given in Table 2.

NOTE Guidance on the measurement of pad high frequency dynamic stiffness is given in EN 13146-9:2009+A1:2011, Annex A. For the measurement of assembly properties at acoustic frequency see EN 15461.