



SLOVENSKI STANDARD
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**Železniške naprave - Zgornji ustroj proge - Zahteve za pritrdilne sisteme - 2. del:
Pritrdilni sistemi za betonske prage v tirni gredi**

Railway Applications - Track - Performance Requirements for Fastening Systems - Part
2: Fastening systems for concrete sleepers in ballast

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 en voie ballastée

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ICS:

93.100 Gradnja železnic Construction of railways

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

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prEN 13481-2

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English Version

Railway Applications - Track - Performance Requirements for Fastening Systems - Part 2: Fastening systems for concrete sleepers in ballast

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

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

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 256.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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European foreword

This document (prEN 13481-2:2021) has been prepared by Technical Committee CEN/TC 256 “Railway Applications”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 13481-2:2012+A1:2017.

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, see informative Annex ZA, which is an integral part of this document.

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Introduction

A series of tests is used to assess the suitability of fastening systems for use in railway track i.e. for type approval of complete fastening systems. This document only sets requirements considered relevant to ensure the safe, long term operation of the track system. The test methods are described in other associated standards.

The various Categories of rail fastenings used in this document are defined in EN 13481-1:2012.

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1 Scope

This document 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, kLFA, not less than 50 MN/m;
- fastening systems for rail sections included in EN 13674-1 (excluding 49E4) or EN 13674-4.

This document 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 document is to be used only for type approval of complete fastening systems.

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 13146-1:2019, *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 13146-4:2020, *Railway applications - Track - Test methods for fastening systems - Part 4: Effect of repeated loading*

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EN 13146-5:2012, *Railway applications — Track — Test methods for fastening systems — Part 5: Determination of electrical resistance*¹

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

EN 13146-7:2019, *Railway applications - Track - Test methods for fastening systems - Part 7: Determination of clamping force and uplift stiffness*

EN 13146-9:2020, *Railway applications - Track - Test methods for fastening systems - Part 9: Determination of stiffness*

EN 13146-10:2017, *Railway applications - Track - Test methods for fastening systems - Part 10: Proof load test for pull-out resistance*

EN 13230-1:2016, *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+A1:2017, *Railway applications - Track - Rail - Part 1: Vignole railway rails 46 kg/m and above*

EN 13674-4:2019, *Railway applications - Track - Rail - Part 4: Vignole railway rails from 27 kg/m to, but excluding 46 kg/m*

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3 Terms and definitions

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

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

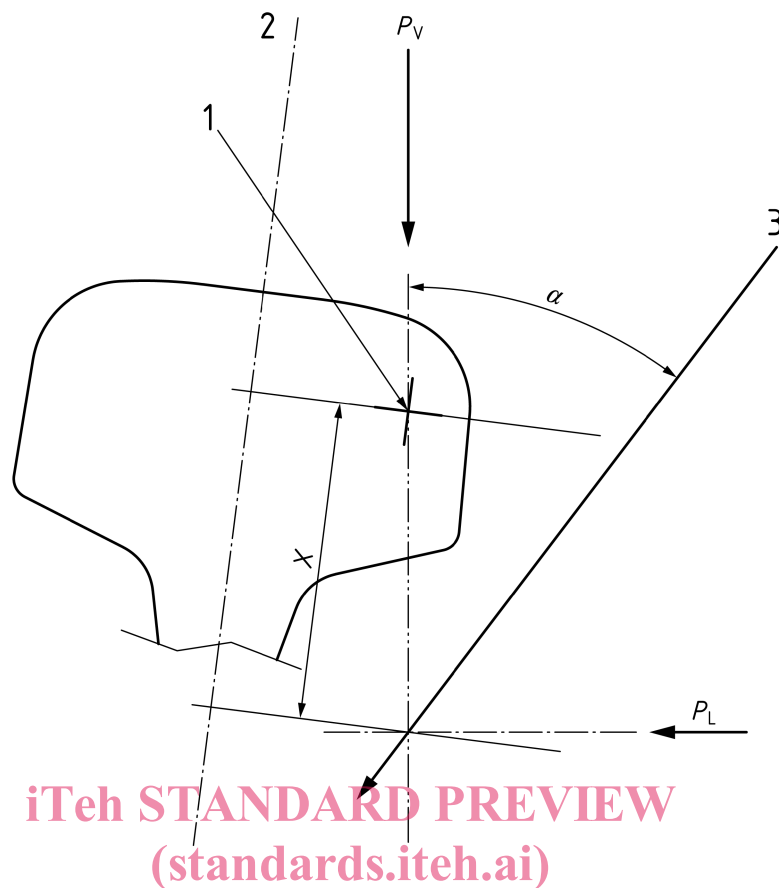
- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1**datum for applied test loads**

flat bottom surface of a conventional concrete sleeper used as a datum plane to define the orientation of the applied test loads

Note 1 to entry: For fastenings on sleepers which do not have a flat bottom surface, the orientation of the test loads is defined relative to “running surface of the rails” which is defined in EN 13848-1:2018. See Figure 1.

¹ Document impacted by EN 13146-5:2012/AC:2017

**Key**

- | | |
|---|---------------------------------|
| 1 | centre of gauge corner radius |
| 2 | centre line of the rail profile |
| 3 | line of load application |

Figure 1 — Load application position**3.2****purchaser**

operator, owner or user of the rail fastening system

3.3**supplier**

body responsible for the use of this European Standard

Note 1 to entry: Sometimes the manufacturer is also the supplier.

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4 Symbols

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

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 13146-1:2019), in kN
F_{SA1}	minimum force applied in measurement of static stiffness of assembly, in kN
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_{LFA}	low frequency dynamic stiffness of assembly, in MN/m
P_L	component of load parallel to the datum for applied test loads, in kN
P_V	component of load normal to the datum for applied test loads, in kN
X	distance between the line of application of P_L and the centre of the gauge corner radius of the rail head measured parallel to the centre line of the rail as shown in Figure 1, in mm
α	angle between the load line and a line normal to the datum for applied loads.

5 Requirements determined by laboratory testing

5.1 Specimens used for laboratory testing

The laboratory tests described in 5.2 to 5.7 shall be carried out using a concrete sleeper or a concrete block which has a rail seat inclination no greater than the inclination to be used on the sleeper for which the type of fastening will be used. If a concrete block is used it does not need to be pre-stressed.

NOTE On this basis a fastening tested successfully on a sleeper with 1:40 inclination does not need to be re-tested at 1:20 inclination. Similarly a fastening tested successfully on a reinforced concrete block does not need to be re-tested on a pre-stressed sleeper, etc.

If it is used for a fastening for a monobloc sleeper, the test described in 5.8 shall be carried out on a monobloc sleeper. If it is used for a fastening for a twin-block sleeper, the test described in 5.8 shall be carried out on a twin-block sleeper.

For the laboratory tests described in 5.9 and 5.10, the supplier shall carry out tests on concrete sleepers as for 5.2 to 5.7. However, the purchaser may request further tests to be carried out using other sleepers.

5.2 Longitudinal rail restraint

The requirement for longitudinal rail restraint is included to control rail creep and pull apart in the event of a broken rail. The longitudinal rail restraint shall be not less than 7,0 kN when measured by the procedure in EN 13146-1:2019 before any repeated load test is carried out. For fastenings to be used in

lines with trains operating at speeds above 250 km/h, the longitudinal rail restraint shall be not less than 9,0 kN when measured by the procedure in EN 13146-1:2019 before any repeated load test is carried out.

On structures such as long bridges, the longitudinal force transmitted between the track and the structure may be calculated by the method described in CEN/TR 17231:2018 and used in EN 1991-2:2003/AC:2010. The value of F_{\max} measured in accordance with EN 13146-1:2019 may be used in the calculation. In such cases, and subject to agreement between the purchaser and supplier, the requirement for longitudinal restraint may be amended.

5.3 Torsional resistance

Measurement of torsional resistance is included for use in assessing the risk of track buckling. When required by the purchaser, the torsional resistance shall be measured by the procedure in EN 13146-2:2012 and the result reported.

5.4 Clamping force and uplift stiffness

This shall be determined by the procedure in EN 13146-7:2019. The result shall be reported.

If the rail fastening system is to be used on long bridge structures calculations of track-bridge interaction effects at bridge deck ends, such as those required in EN 1991-2:2003², may require values of uplift stiffness of the fastening system. If such information is required it shall be determined using the method set out in EN 13146-7:2019.

This requirement is not applicable to web support fastening systems.

5.5 Vertical stiffness

The assembly stiffness shall be measured to inform the purchaser of an important mechanical property of the fastening system and to determine the parameters for the repeated loading test (see 5.6). The assembly static stiffness and assembly low frequency dynamic stiffness at 5Hz shall be measured in accordance with EN 13146-9:2020.

Stiffness testing of pads is not a requirement for type approval of the fastening but may be used to provide guidance for other tests e.g. quality control. If required, pads shall be tested in accordance with EN 13146-9:2020.

Loads are given in Table 2 for testing pads and for testing complete fastening assemblies.

Table 2 — Loads for measurement of stiffness

Fastening category	F_{SP1} and F_{LFP1} kN	$F_{SP\max}$ and $F_{LFP\max}$ kN	F_{SA1} and F_{LFA1} kN	$F_{SA\max}$ and $F_{LFA\max}$ kN
A	16	51	1	32
B	18	64	1	43
C	18	85	1	64
D	18	85	1	64
E	20	119	1	95

NOTE Guidance on the measurement of pad high frequency dynamic stiffness is given in EN 13146-9:2020, Annex B. For the measurement of assembly properties at acoustic frequency see EN 15461:2008+A1:2010.

² Document impacted by EN 1991-2:2003/AC:2010.