



SLOVENSKI STANDARD
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**Železniške naprave - Zgornji ustroj proge - Zahteve za pritrdilne sisteme - 4. del:
Pritrdilni sistemi za jeklene prage v tirni gredi**

Railway applications - Track - Performance requirements for fastening systems - Part 4:
Fastening systems for steel sleepers in ballast

Bahnanwendungen - Oberbau - Leistungsanforderungen für
Schienenbefestigungssysteme - Teil 4: Befestigungssysteme für Stahlschwellen

Applications ferroviaires - Voie - Exigences de performance pour les systèmes de
fixation - Partie 4 : Systèmes de fixation pour traverses en acier

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ICS:

93.100 Gradnja železnic Construction of railways

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EUROPEAN STANDARD
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English Version

Railway applications - Track - Performance requirements for fastening systems - Part 4: Fastening systems for steel sleepers in ballast

Applications ferroviaires - Voie - Exigences de
performance pour les systèmes de fixation - Partie 4:
Systèmes de fixation pour traverses en acier

Bahnanwendungen - Oberbau -
Leistungsanforderungen für
Schienenbefestigungssysteme - Teil 4:
Befestigungssysteme für Stahlschwellen

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 13481-4:2021) 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 13481-4:2012.

The main changes in this revision of EN 13481-2:2012 are as follows:

- a) The inclusion of details of in service testing, replacing the reference to EN13146-8, which is to be withdrawn.
- b) Changes to the loading conditions for Category B fastenings.
- c) The inclusion of details of in service testing, replacing the reference to EN 13146-8, which is to be withdrawn.
- d) Editorial changes to make clear which requirements are based on laboratory testing.

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 in ballast*
- *Part 3: Fastening systems for wood and polymeric composite sleepers*
- *Part 4: Fastening systems for steel sleepers*
- *Part 5: Fastening systems for ballastless track*
- *Part 7: Fastening systems for switches and crossings, check rails, rail expansion devices and insulated rail joints.*

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*”.

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.

prEN 13481-4:2021 (E)**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 systems. The test methods are described on other associated standards. The test methods are described in other associated standards.

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

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<https://standards.iteh.ai/catalog/standards/sist/aea2f162-72d9-4e8f-a7a4-2acae15d2d2d/osist-pren-13481-4-2021>

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 rectilinear steel sleepers in ballasted track with maximum axle loads and minimum curve radii in accordance with 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 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, special fastening systems used at bolted joints or glued joints or special low clamping force fastenings used to mitigate track-bridge interaction effects.

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

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EN 13146-5:2012¹, *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 13146-7:2019, *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 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*

3 Terms and definitions

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

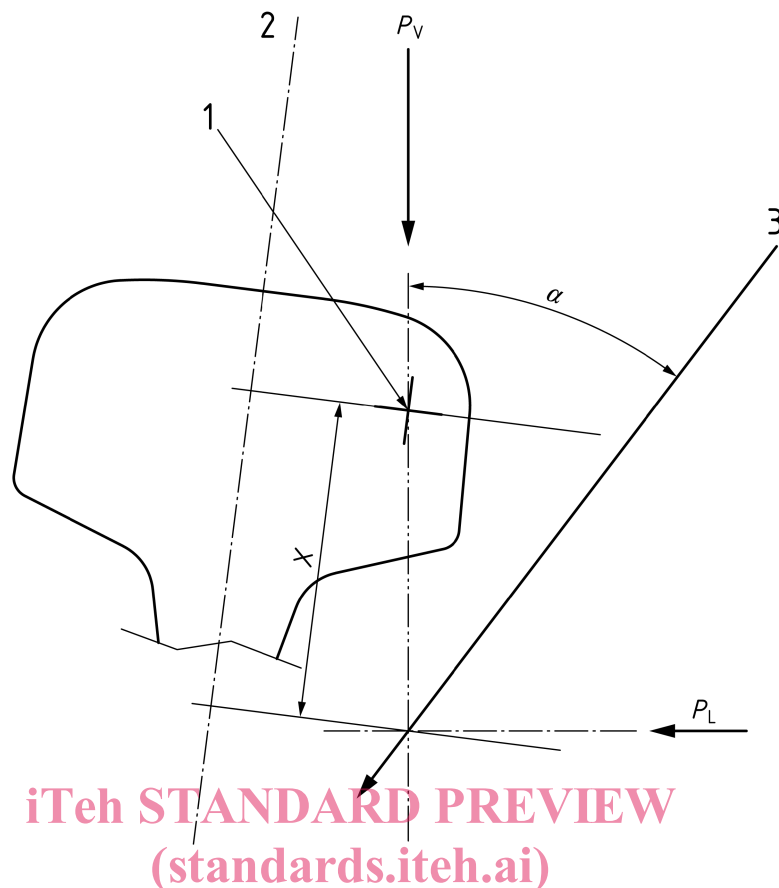
ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- 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 reference 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 AC:2007.

**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.

prEN 13481-4:2021 (E)**4 Symbols**

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

F_{HFAmax}	static preload applied in measurement of high frequency stiffness of assembly, 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 13146-1:2019), in kN;
F_{SA1}	notional fastening clip force assumed for 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_{HFAD}	transfer stiffness in measurement of high frequency stiffness of assembly, in N/m;
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 as shown in Figure 1 in mm;
α	angle between the load line and a line normal to the datum for applied test loads as shown in Figure 1.

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 steel sleeper which has a rail seat inclination no greater than the inclination to be used on the sleeper for which the type of fastening is to be used and a thickness of steel directly under the fastening and in the rail seat area which is no greater than the thickness of steel on the sleeper for which the type of fastening is to be used.

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. A fastening tested successfully on a sleeper 10 mm thick at the rail seat does not need to be re-tested on a sleeper 12 mm thick.

5.2 Longitudinal rail restraint

The longitudinal rail restraint shall be not less than 7 kN when measured by the procedure in EN 13146-1:2019.

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 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 minimum requirement for longitudinal restraint may be reduced.

5.3 Torsional resistance

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

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

This requirement is not applicable to web support fastening systems.

5.5 Pad and assembly stiffness

As required by EN 13146-4:2020, the assembly static stiffness and assembly low frequency dynamic stiffness shall be measured in accordance with EN 13146-9:2020. If there is no elastic pad in the fastening assembly (i.e no rail pad or baseplate pad) it is not necessary to measure the stiffness. In such a case, for all of the following tests it shall be assumed that the static and low frequency dynamic assembly stiffnesses is more than 300 MN/m.

Test loads are given in Table 2.

Table 2 — Loads for measurement of stiffness

Fastening category	F_{SP1} and F_{LFP1} kN	F_{SPmax} and F_{LFPmax} kN	F_{SA1} and F_{LFA} kN	F_{SAmax} and F_{LFAmax} 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.

5.6 Effect of repeated loading

A repeated load test shall be carried out in accordance with EN 13146-4:2020, the test configuration being that shown in EN 13146-4:2020, 7.4 and Figure 5. The steel sleeper, or pair of sleepers, shall be supported on elastomeric soffit pads as described in Annex A.

If electrical resistance measurements are to be made (see 5.8), the edges of the rail pad shall not be removed to facilitate the clamping force test. The clamping force test procedure for assemblies not incorporating a rail pad (EN 13146-7:2019, 7.3) shall be used with the pad in position.

The test loads and positions in Table 3 shall be used. Background information and a general justification for the test load conditions may be found in CEN/TR 17320:2019.