SLOVENSKI STANDARD
oSIST prEN 13481-5:2021

01-marec-2021

Železniške naprave - Zgornji ustroj proge - Zahteve za izdelavo pritrdilnih sistemov - 5. del: Pritrdilni sistemi za progo z utrjenimi tirnicami

Railway Applications - Track - Performance requirements for fastening systems - Part 5: Fastening systems for ballastless track

Bahnanwendungen - Oberbau - Leistungsanforderungen für Schienenbefestigungssysteme - Teil 5: Befestigungssysteme für feste Fahrbahn

Applications ferroviaires - Voie - Exigences de performance pour les systèmes de fixation - Partie 5 : Systèmes de fixations pour voies sans ballast

Ta slovenski standard je istoveten z: **prEN 13481-5**

ICS:

93.100	Gradnja železnic	Construction of railways

oSIST prEN 13481-5:2021 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 13481-5

January 2021

ICS 93.100

Will supersede EN 13481-5:2012+A1:2017

English Version

Railway Applications - Track - Performance requirements for fastening systems - Part 5: Fastening systems for ballastless track

Applications ferroviaires - Voie - Exigences de performance pour les systèmes de fixation - Partie 5: Systèmes de fixations des voies sans ballast ou voies avec rails enrobés

Bahnanwendungen - Oberbau - Leistungsanforderungen für Schienenbefestigungssysteme - Teil 5: Befestigungssysteme für feste Fahrbahn

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.

This draft European Standard was established by CEN in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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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 13481-5:2021) 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 13481-5:2012+A1:2017.

The main changes in this revision of EN 13481-5:2012+A1:2017 are as follows:

a) Changes to the terminology to be consistent with the EN 16432 series of standards

b) The inclusion of details of in service testing, replacing the reference to EN 13146-8, which is to be withdrawn

c) 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 concrete 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.

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 standard are defined in EN 13481-1:2012.

1 Scope

This document is applicable to fastening systems, in categories A –D as specified in EN 13481-1:2012, 3.1 for attaching rails to the uppermost surface of concrete or steel elements in ballastless tracks, including tracks on open deck bridges, and for embedded rails in ballastless tracks, for respective 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
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
- fastening systems for use on wood or polymer composite sleepers used in ballastless track, performance requirements for which are included in EN 13481-3
- rigid fastening systems

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. In track forms in which there are rail seat blocks or sleepers mounted in “boots” the concrete element and its resilient support are considered to be parts of the elastic fastening system. If the track form includes floating slabs, (i.e. resiliently supported concrete elements with more than one fastening per rail) those concrete elements and their resilient supports are considered to be parts of the ballastless track and not of the fastening system.

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

EN 13146-5:2012,[1] *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 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*

[1] Document impacted by AC:2007.

3 Terms and definitions

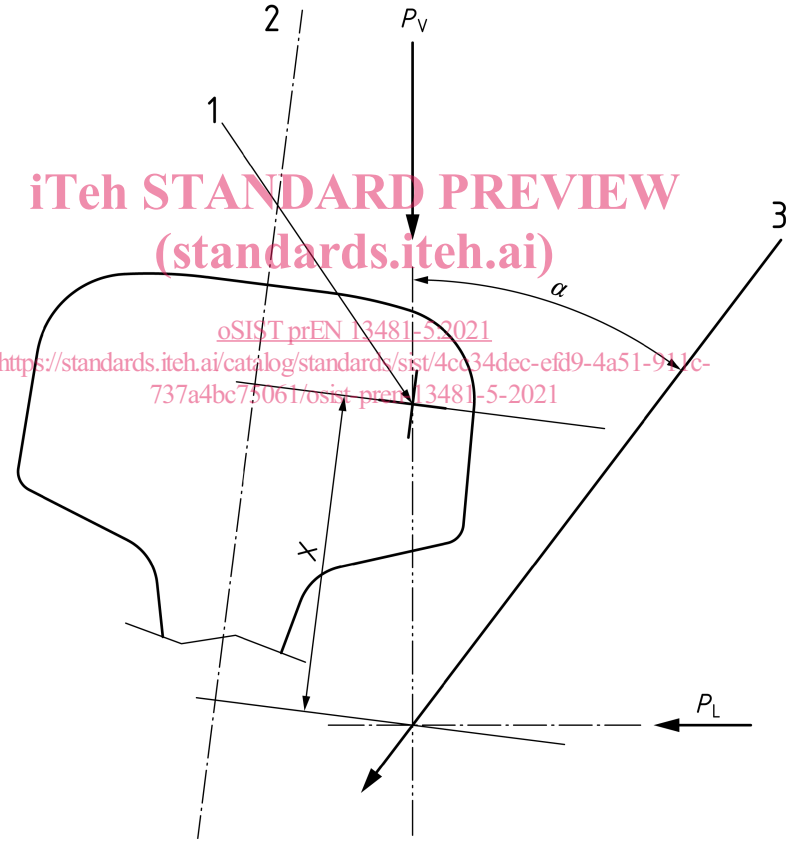
For the purposes of this document, the following terms and definitions and the terms and definitions given in EN 13481-1:2012 apply.

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 datum plane to define the orientation of the applied test loads

Note 1 to entry: For fastenings on supports 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.



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.

4 Symbols

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

D_r	maximum longitudinal displacement of rail prior to slip, in mm (EN 13146-1:2019)
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}	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_L	longitudinal stiffness in accordance with EN 13146-1:2019), in MN/m;
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;
L_T	Sample length of embedded rail, in m;
P_L	component of load parallel to the datum, in kN;
P_V	component of load normal to the datum, 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 the datum as shown in Figure 1, in °.

5 Requirements determined by laboratory testing

5.1 Specimens used for laboratory testing

The laboratory tests described in 5.2 to 5.4 and 5.6 shall be carried out using a supporting element e,g, a reinforced concrete block to represent concrete ballastless track or a steel plate to represent a steel bridge structure.

For continuously supported rail, the length of rail used for category A should be (0,8 ± 0,01) m. The test lengths for categories B to D should be (0,6 ± 0,01) m.

The supporting element shall have a rail seat inclination no greater than the inclination to be used on the application for which the type of fastening will be used.

NOTE: On this basis a fastening tested successfully on a support with 1:40 inclination does not need to be re-tested at 1:20 inclination.

For the laboratory test described in 5.5 two fastenings shall be assembled on a section of concrete track or steel structure with a length equivalent to the intended fastener spacing as described in EN 13146-5:2012.

For the laboratory test described in 5.7 a fastening system shall be assembled on a concrete block or steel element as described in EN 13146-10:2017.

5.2 Longitudinal rail restraint or longitudinal stiffness

The requirement for longitudinal rail restraint is included to control rail creep and pull apart in the event of a broken rail.

For discrete fastening systems, 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.

For embedded rail with an adhesive fastening system, the longitudinal stiffness k_L shall be measured in accordance with EN 13146-1:2019, between 0 mm and 7 mm (i.e. $D_r = 7$) relative displacement per equivalent length of support without visible damage.

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 manufacturer, the minimum requirement for longitudinal restraint may be reduced.

5.3 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 1991-2:2003/AC:2010, 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.