



SLOVENSKI STANDARD
SIST EN 13481-5:2022

01-september-2022

Nadomešča:

SIST EN 13481-5:2012+A1:2017

**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: EN 13481-5:2022

ICS:

93.100 Gradnja železnic Construction of railways

SIST EN 13481-5:2022 **en,fr,de**

EUROPEAN STANDARD

EN 13481-5

NORME EUROPÉENNE

EUROPÄISCHE NORM

July 2022

ICS 93.100

Supersedes EN 13481-5:2012+A1:2017

English Version

Railway applications - Track - Performance requirements for fastening systems - Part 5: Fastening systems for ballastless tracks

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

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

This European Standard was approved by CEN on 8 May 2022.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists 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.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents	Page
European foreword.....	3
Introduction	5
1 Scope.....	6
2 Normative references.....	6
3 Terms and definitions	7
4 Symbols.....	9
5 Requirements determined by laboratory testing	9
5.1 Specimens used for laboratory testing.....	9
5.2 Longitudinal rail restraint or longitudinal stiffness	10
5.2.1 General case	10
5.2.2 Special case for long structures	10
5.3 Clamping force and uplift stiffness	10
5.4 Vertical stiffness.....	11
5.5 Effect of repeated loading	11
5.6 Electrical resistance of the fastening system and slab track elements	12
5.7 Effect of exposure to severe environmental conditions (surface mounted rails only)	13
5.8 Anchoring fastening components.....	13
5.8.1 Cast-in or glued-in components in concrete supporting elements	13
5.8.2 Anchoring components on steel supporting elements.....	13
6 Other requirements	13
6.1 Dimensions.....	13
6.2 Effect of fastening system tolerances on track gauge	14
6.3 In-service testing.....	15
6.4 Attenuation of noise and vibration.....	15
7 Fitness for purpose.....	16
8 Marking, labelling and packaging.....	16
Annex A (informative) Vibration and noise.....	17
A.1 General.....	17
A.2 Symbols.....	17
A.3 Parameters for environmental vibration calculations.....	17
A.4 Calculating the vibration attenuation.....	18
A.5 Environmental noise.....	18
Bibliography.....	19

European foreword

This document (EN 13481-5:2022) 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 January 2023, and conflicting national standards shall be withdrawn at the latest by January 2023.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13481-5:2012+A1:2017.

The main changes compared to the previous edition are as follows:

- a) changes to the terminology to be consistent with the EN 16432 series of standards;
- b) inclusion of details of in-service testing, replacing the reference to EN 13146-8, which is to be withdrawn;
- c) slight reduction of test loads in repeated loading test for fastening category D;
- d) editorial changes to make clear which requirements are based on laboratory testing;
- e) removal of Annex ZA.

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 tracks*
- *Part 7: Fastening systems for switches and crossings, check rails, insulated rail joints and rail expansion devices*

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 Standardization Request given to CEN by the European Commission and the European Free Trade Association.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

EN 13481-5:2022 (E)

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 13481-5:2022](https://standards.iteh.ai/catalog/standards/sist/4cc34dec-efd9-4a51-911c-737a4bc75061/sist-en-13481-5-2022)

<https://standards.iteh.ai/catalog/standards/sist/4cc34dec-efd9-4a51-911c-737a4bc75061/sist-en-13481-5-2022>

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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 13481-5:2022](https://standards.iteh.ai/catalog/standards/sist/4cc34dec-efd9-4a51-911c-737a4bc75061/sist-en-13481-5-2022)

<https://standards.iteh.ai/catalog/standards/sist/4cc34dec-efd9-4a51-911c-737a4bc75061/sist-en-13481-5-2022>

EN 13481-5:2022 (E)

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 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 wood or polymer composite sleepers used in ballastless track, which are included in EN 13481-3.

This document is not applicable to 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” (under-sleeper pads) 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 13146-5:2012¹, *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 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*

EN 17319:2020, *Railway applications — Infrastructure — Performance requirements of rail fastening systems for tramways*

EN 17343:2020, *Railway applications — General terms and definitions*

3 Terms and definitions

For the purposes of this document, the following terms and definitions given in EN 13481-1:2012, EN 17343:2020 and the following apply.

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

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

3.1

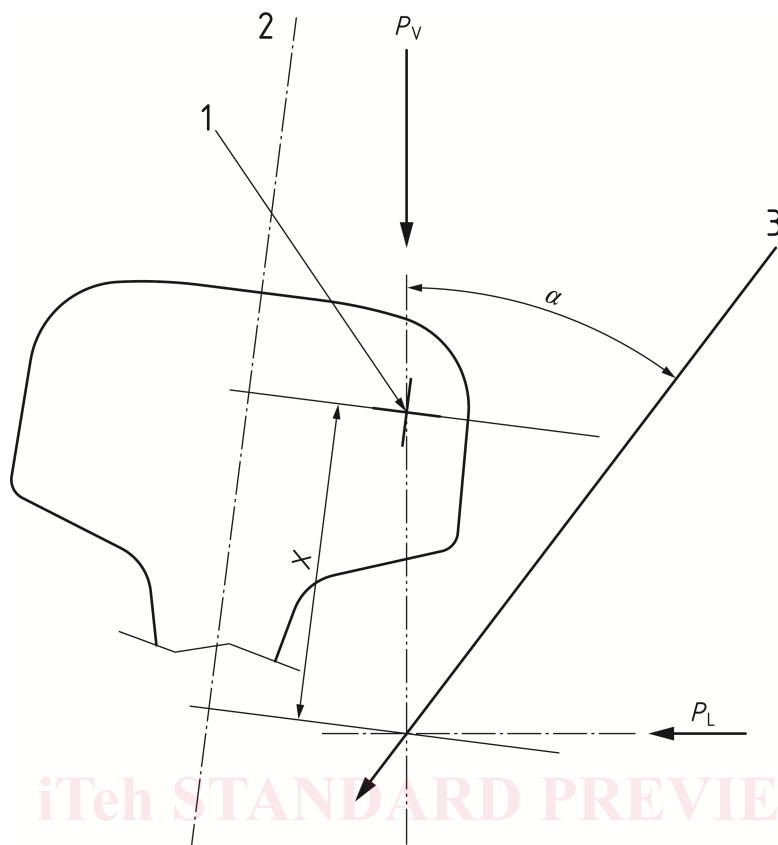
datum for applied test loads

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 13848-1:2019. See Figure 1.

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

EN 13481-5:2022 (E)

**Key**

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

SIST EN 13481-5:2022
<https://standards.iteh.ai/catalog/standards/sist/4cc34dec-efd9-4a51-911c-737a4bc75061/sist-en-13481-5-2022>
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;
F_{LFA1}	minimum force applied in measurement of low frequency dynamic stiffness of assembly, in kN;
F_{LFAmax}	reference force for measurement of low frequency dynamic stiffness of assembly, in kN;
F_{LFP1}	notional fastening clip force assumed for measurement of low frequency dynamic stiffness of pad, in kN;
F_{LFPmax}	reference force for measurement of low frequency dynamic stiffness of pad, in kN;
F_{max}	axial load at which gross slip occurs in the longitudinal rail restraint test 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_{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 5.5 and 5.7 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 test length of rail is the length which is supported on the pad. For embedded rail, the test length of rail is the length which is embedded. In these cases, for category A the test length should be $(0,8 \pm 0,01)$ m and for categories B to D the test length should be $(0,6 \pm 0,01)$ 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.

For example, a fastening tested successfully on a support with 1:40 inclination does not need to be re-tested at 1:20 inclination.