



**SLOVENSKI STANDARD**  
**SIST EN 13481-2:2004**  
**01-marec-2004**

---

**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

**iTeh STANDARD PREVIEW**

Applications ferroviaires - Voie (Prescriptions de performance pour les systemes de  
fixation - Partie 2: Systemes de fixation des traverses en béton

[SIST EN 13481-2:2004](https://standards.iteh.ai/catalog/standards/sist/da8bb9f7-a6a8-47c4-85be-18518c66fd56/sist-en-13481-2-2004)

**Ta slovenski standard je istoveten z: EN 13481-2:2002**

---

**ICS:**

93.100

**SIST EN 13481-2:2004**

**en**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN 13481-2:2004

<https://standards.iteh.ai/catalog/standards/sist/da8bb9f7-a6a8-47c4-85be-185f8eb0fd56/sist-en-13481-2-2004>

ICS 93.100

English version

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

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

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

This European Standard was approved by CEN on 6 March 2002.

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 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

<https://standards.iteh.ai/catalog/standards/sist/da8bb9f7-a6a8-47c4-85be-185f8eb0fd56/sist-en-13481-2-2004>



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

Management Centre: rue de Stassart, 36 B-1050 Brussels

## Contents

	page
Foreword.....	3
Introduction .....	4
1 Scope .....	4
2 Normative references .....	4
3 Terms and definitions.....	5
4 Symbols .....	5
5 Requirements .....	6
5.1 Longitudinal rail restraint.....	6
5.2 Torsional resistance .....	6
5.3 Attenuation of impact loads.....	6
5.4 Effect of repeated loading.....	7
5.5 Electrical resistance of fastening system and sleeper .....	8
5.6 Effect of exposure to severe environmental conditions.....	8
5.7 Dimensions.....	8
5.8 Effect of fastening system tolerances on track gauge .....	9
5.9 Clamping force.....	10
5.10 Cast-in fastening components .....	10
5.11 In-service testing .....	10
6 Test specimens .....	10
7 Classification.....	10
8 Fitness for purpose .....	10
9 Marking, labelling and packaging .....	10
Annex A (normative) Vertical load test for cast-in fastening components .....	11
A.1 Test procedure .....	11
A.2 Test report .....	12
Annex B (normative) Determination of dynamic stiffness of rail pads.....	13
B.1 General.....	13
B.2 Terms and definitions.....	13
B.3 Symbols .....	13
B.4 Principle .....	13
B.5 Apparatus .....	13
B.5.1 Controlled temperature test area .....	13
B.5.2 Steel plate .....	13
B.5.3 Abrasive cloth .....	13
B.5.4 Actuator .....	14
B.5.5 Displacement measuring instruments.....	14
B.5.6 Force measuring instruments .....	14
B.5.7 Recording equipment .....	14
B.6 Procedure .....	14
B.7 Test report .....	14
Annex ZA (informative) Clauses of this European Standard addressing essential requirements or other provisions of EU Directives .....	15
Bibliography .....	17

## Foreword

This document EN 13481-2:2002 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 December 2002, and conflicting national standards shall be withdrawn at the latest by December 2002.

This document has been prepared under Mandates (M/024<sup>1</sup>, M/275<sup>2</sup>) given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directives.

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this document.

No existing European Standard is superseded.

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;
- Part 6: Special fastening systems for attenuation of vibration;
- Part 7: Special fastening systems for switches and crossings and check rails.

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

The annexes A and B are normative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

---

1) Railway Equipment

2) Standardization in the field of Railway Equipment on the Interoperability of the Trans-European High-Speed Rail System

## Introduction

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.

A class of high attenuation of dynamic loading is included for use when it is necessary to protect sleepers from vehicle induced impacts.

The laboratory test for the effect of repeated loading is the means of assessing potential long-term performance of the fastening in track.

The test for clamping force is only suitable for laboratory use.

## 1 Scope

This European Standard is applicable to fastening systems for use on concrete sleepers in ballasted track as follows:

- main lines having a radius of curvature greater than 150 m and subject to a maximum design axle load of 260 kN;
- light rail systems having a radius of curvature greater than 80 m and subject to a maximum design axle load of 130 kN.

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

<https://standards.iteh.ai/catalog/standards/sist/da8bb9f7-a6a8-47c4-85be-185f8eb0fd56/sist-en-13481-2-2004>

The requirements apply to:

- direct fastening systems and systems which incorporate a baseplate;
- fastening systems for the rail sections in prEN 13674-1 and prEN 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.

This standard is for type approval of a complete fastening assembly only.

## 2 Normative references

This European Standard incorporates by dated or undated references, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publications referred to applies (including amendments).

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

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

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

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

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

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

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

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

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

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

prEN 13674-1, *Railway applications — Track — Rail — Part 1: Flat bottom symmetrical railway rails 46 kg/m and above.*

prEN 13674-4<sup>3)</sup>, *Railway applications — Track — Rail — Part 4: Flat bottom symmetrical railway rails from 27 to 46 kg/m.*

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

SIST EN 13481-2:2004

### 3 Terms and definitions

<https://standards.iteh.ai/catalog/standards/sist/da8bb9f7-a6a8-47c4-85be-185f8eb0fd56/sist-en-13481-2-2004>

For the purposes of this European Standard the terms and definitions in EN 13481-1 apply.

### 4 Symbols

$L$  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 base of the sleeper, in kN;

$P_V$  component of load normal to the base of the sleeper, in kN;

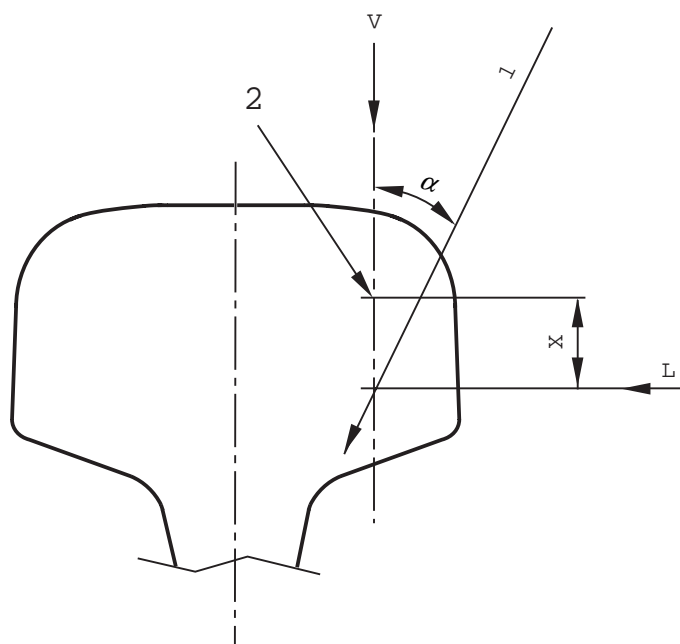
$V$  vertical component of force transmitted by the wheel to the rail head as shown in Figure 1, in kN;

$X$  distance between the line of application of  $L$  and the centre of the gauge corner radius of the rail head as shown in Figure 1, in mm;

$\alpha$  angle between the load line and a line normal to the base of the sleeper, in degrees.

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

3) In preparation.



**Key**

- 1 Line of load application
- 2 Centre of gauge corner radius

**iTeh STANDARD PREVIEW**  
(standards.iteh.ai)

**Figure 1 — Load application position**  
SIST EN 13481-2:2004

<https://standards.iteh.ai/catalog/standards/sist/da8bb9f7-a6a8-47c4-85be-185f8eb0fd56/sist-en-13481-2-2004>

**5 Requirements**

**5.1 Longitudinal rail restraint**

The longitudinal rail restraint shall be not less than 7 kN when measured by the procedure in prEN 13146-1. For use in high speed tracks ( $\geq 250$  km/h) the longitudinal rail restraint shall be not less than 9 kN.

When necessitated by the design of the supporting structure, and subject to agreement between the purchaser and manufacturer, the minimum requirement for longitudinal restraint may be reduced.

**5.2 Torsional resistance**

The torsional resistance shall be measured by the procedure in prEN 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 prEN 13146-3 using the type of sleeper (monoblock or two block) on which the fastening is to be used. The result shall comply with the following limits:

- medium attenuation  $\geq 15\% \leq 30\%$ ;
- high attenuation  $> 30\%$ .



#### 5.4 Effect of repeated loading

This shall be determined by the procedure in prEN 13146-4. Test loads for the track types specified in Table 1 shall be in accordance with Table 2. The value of  $P_V/\cos\alpha$  shall be obtained from Table 2 for the assembly design under test. The values in Table 2 have been derived for the track classes shown in Table 1.

**Table 1 — Reference values for testing the effect of repeated loading**

Type of track	Main line	Light rail
Rail section	60 E1	40 E1
Axle load <sup>1)</sup> in kN	225	100
Curve radius in m	> 400 (soft pads) <sup>2)</sup> > 150 ≤ 400 (med/hard pads)	> 80 (all pads)
<p><sup>1)</sup> The axle loads in this table are reference values only.</p> <p><sup>2)</sup> The dynamic stiffness of pads is stated for test purposes only. It should not be taken as a recommendation for the dynamic stiffness of pads to be used in track.</p>		

Pads shall be classified as follows when the dynamic stiffness is measured in accordance with annex B.

- Soft - dynamic stiffness < 100 MN/m;
- Medium - dynamic stiffness  $\geq 100$  MN/m < 200 MN/m;
- Hard - dynamic stiffness  $\geq 200$  MN/m.