



# SLOVENSKI STANDARD

## oSIST prEN 13481-5:2010

01-oktober-2010

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**Železniške naprave - Zgornji ustroj - Zahteve za izdelavo pritrdilnih sistemov - 5. del: Pritrdilni sistemi za tir s tirnico na površini plošče ali s tirnico, vgrajeno v ploščo**

Railway applications - Track - Performance requirements for fastening systems - Part 5: Fastening systems for slab track with rail on the surface or rail embedded in a channel

Bahnanwendungen - Oberbau - Leistungsanforderungen für Schienenbefestigungssysteme - Teil 5: Befestigungssysteme für feste Fahrbahn mit aufgesetzten oder in Kanälen eingebetteten Schienen

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

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

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**ICS:**

93.100      Gradnja železnic      Construction of railways

**oSIST prEN 13481-5:2010**      **en,de**



EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**DRAFT**  
**prEN 13481-5**

June 2010

ICS 93.100

Will supersede EN 13481-5:2002

English Version

**Railway applications - Track - Performance requirements for  
fastening systems - Part 5: Fastening systems for slab track with  
rail on the surface or rail embedded in a channel**

Bahnanwendungen - Oberbau - Leistungsanforderungen für  
Schienenbefestigungssysteme - Teil 5:  
Befestigungssysteme für feste Fahrbahn mit aufgesetzten  
oder in Kanälen eingebetteten Schienen

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

**Management Centre: Avenue Marnix 17, B-1000 Brussels**

<b>Contents</b>		<b>Page</b>
<b>Foreword</b>		<b>3</b>
<b>Introduction</b>		<b>4</b>
<b>1</b>	<b>Scope</b>	<b>5</b>
<b>2</b>	<b>Normative references</b>	<b>5</b>
<b>3</b>	<b>Terms and definitions</b>	<b>6</b>
<b>4</b>	<b>Symbols</b>	<b>6</b>
<b>5</b>	<b>Requirements</b>	<b>7</b>
<b>5.1</b>	<b>Longitudinal rail restraint</b>	<b>7</b>
<b>5.2</b>	<b>Assembly and pad stiffness</b>	<b>8</b>
<b>5.3</b>	<b>Effect of repeated loading</b>	<b>8</b>
<b>5.4</b>	<b>Electrical resistance of the fastening system and slab track elements</b>	<b>9</b>
<b>5.5</b>	<b>Effect of exposure to severe environmental conditions</b>	<b>9</b>
<b>5.6</b>	<b>Dimensions</b>	<b>9</b>
<b>5.7</b>	<b>Effect of fastening system tolerances on track gauge</b>	<b>10</b>
<b>5.8</b>	<b>Cast-in fastening components</b>	<b>11</b>
<b>5.9</b>	<b>In-service testing</b>	<b>11</b>
<b>5.10</b>	<b>Attenuation of noise and vibration</b>	<b>11</b>
<b>6</b>	<b>Test specimens</b>	<b>11</b>
<b>7</b>	<b>Fitness for purpose</b>	<b>11</b>
<b>8</b>	<b>Marking, labelling and packaging</b>	<b>11</b>
<b>Annex A</b> (informative)	<b>Vibration and noise</b>	<b>13</b>
<b>A.1</b>	<b>Introduction</b>	<b>13</b>
<b>A.2</b>	<b>Symbols</b>	<b>13</b>
<b>A.3</b>	<b>Parameters for environmental vibration calculations</b>	<b>13</b>
<b>A.4</b>	<b>Calculating the vibration attenuation</b>	<b>13</b>
<b>A.5</b>	<b>Environmental noise</b>	<b>14</b>
<b>Annex ZA</b> (informative)	<b>Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC</b>	<b>15</b>
<b>Bibliography</b>		<b>17</b>

## Foreword

This document (prEN 13481-5:2010) 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 13481-5:2002.

This document has been prepared under a mandate given to CEN/CENELEC/ETSI by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 2008/57/EC.

For relationship with EU Directive 2008/57/EC, see informative Annex ZA, which is an integral part of this document.

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 with rail on the surface or rail embedded in a channel*
- *Part 7: Special fastening systems for switches and crossings and check rails*

NOTE Part 6 does not exist in this series.

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

**prEN 13481-5:2010 (E)****Introduction**

A requirement for longitudinal rail restraint is included to control rail creep and pull apart in the event of a broken rail. The relationship between longitudinal rail restraint and the overall design of the track slab requires consideration.

No satisfactory test is available to determine the attenuation of impact loads on slab track. The relative performance may be assessed by the procedure in prEN 13146-3:2009 with the fastening system on a concrete sleeper.

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

For systems in which the rail is continuously supported, test procedures are modified to take account of the change from discrete support.

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

SIST EN 13481-5:2012

<https://standards.iteh.ai/catalog/standards/sist/55d38724-480c-45f7-839a-27634b66dc64/sist-en-13481-5-2012>

## 1 Scope

This European Standard is applicable to fastening systems, in categories A – E (prEN 13481-1:2010, 3.1), for attaching rails to the uppermost surface of concrete or asphalt slabs and for embedded rails in non-ballasted tracks, with maximum axle loads and minimum curve radii in accordance with Table 1.

**Table 1 — Fastening category criteria**

Category	Maximum design axle load	Minimum curve radius
	kN	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 the following:

- a) fastening systems which act on the foot and/or web of the rail including direct fastening systems and systems which incorporate a baseplate;
- b) fastening systems which incorporate concrete elements which each have not more than one supporting element per rail, including booted concrete blocks and sleepers complete with boots;
- c) adhesive and mechanical fastening systems for embedded rail excluding rail cast into road pavements.

In the case of (b) the concrete element is considered to be part of the fastening system. If the system includes concrete elements which each have more than one supporting location per rail, those concrete elements are considered to be part of the slab and not part of the fastening system.

This standard is only applicable to fastening systems for rail sections in EN 13674-1 and EN 13674-4 (except 49E4); it is not applicable to special fastening systems for use at bolted joints.

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

## 2 Normative references

The following referenced documents are indispensable for the application 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.

prEN 13146-1:2009, *Railway applications – Track – Test methods for fastening systems – Part 1: Determination of longitudinal restraint*

prEN 13146-4:2009, *Railway applications – Track – Test methods for fastening systems – Part 4: Effect of repeated loading*

**prEN 13481-5:2010 (E)**

prEN 13146-5:2009, *Railway applications – Track – Test methods for fastening systems – Part 5: Determination of electrical resistance*

prEN 13146-6:2009, *Railway applications – Track – Test methods for fastening systems – Part 6: Effect of exposure to severe environmental conditions*

prEN 13146-8:2009, *Railway applications – Track – Test methods for fastening systems – Part 8: In-service testing*

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

prEN 13481-1:2010, *Railway applications – Track – Performance requirements for fastening systems – Part 1: Definitions*

prEN 13481-2:2010, *Railway applications – Track – Performance requirements for fastening systems – Part 2: Fastening systems for concrete sleepers*

EN 13674-1, *Railway applications – Track – Rail – Part 1: Vignole railway rails 46 kg/m and above*

EN 13674-4, *Railway applications – Track – Rail – Part 4: Vignole railway rails from 27 kg/m to, but not including 46 kg/m*

**3 Terms and definitions**

For the purposes of this standard the definitions in prEN 13481-1:2010 apply.

**4 Symbols**

For the purposes of this European Standard the following symbols apply.

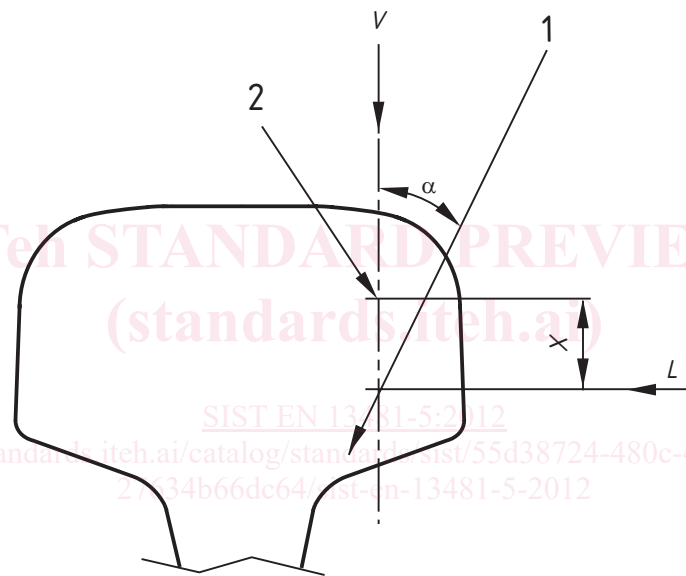
$F_{\text{HFmax}}$	reference force for measurement of dynamic high frequency stiffness of assembly, in kN;
$F_{\text{LFA}}$	minimum force applied in measurement of dynamic low frequency stiffness of assembly, in kN;
$F_{\text{LFmax}}$	reference force for measurement of dynamic low frequency stiffness of assembly, in kN;
$F_{\text{LFP}}$	notional fastening clip force assumed for measurement of dynamic low frequency stiffness of pad, in kN;
$F_{\text{LFPmax}}$	reference force for measurement of dynamic low frequency stiffness of pad, in kN;
$F_{\text{max}}$	axial load at which gross slip occurs in the longitudinal rail restraint test (prEN 13481-1:2010), in kN;
$F_{\text{Smax}}$	force applied to assembly in measurement of static stiffness of assembly, in kN;
$F_{\text{SP1}}$	notional fastening clip force assumed for measurement of static stiffness of pad, in kN;
$F_{\text{SPmax}}$	force applied to pad in measurement of static stiffness of pad, in kN;
$K_{\text{L}}$	longitudinal stiffness in accordance with prEN 13146-1:2009, in MN/m;
$k_{\text{HFAD}}$	transfer stiffness in measurement of high frequency stiffness of assembly, in N/m;
$k_{\text{LFA}}$	low frequency dynamic stiffness of assembly, in MN/m
$L$	lateral component of force transmitted by the wheel to the rail head as shown in Figure 1, in kN;
$L_{\text{T}}$	Sample length of embedded rail, in m;



- $P_L$  component of load parallel to the running surface of the rails, in kN;  
 $P_V$  component of load normal to the running surface of the rails, 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  $P_L$  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 running surface of the rails, in degrees.

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



- 1 line of load application  
 2 centre of gauge corner radius

**Figure 1 — Load application position**

## 5 Requirements

### 5.1 Longitudinal rail restraint

For discrete fastening systems the longitudinal rail restraint shall be not less than 7 kN when measured by the procedure in prEN 13146-1:2009. For use in category D tracks (> 250 km/h) the longitudinal rail restraint shall be not less than 9 kN.

For embedded rail with an adhesive fastening system the longitudinal stiffness  $K_L$  shall be measured in accordance with prEN 13146-1:2009 between (0 – 7) mm relative displacement 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 in EN 1991-2. The value of  $F_{max}$  measured in accordance

## prEN 13481-5:2010 (E)

with prEN 13146-1:2009 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.

## 5.2 Assembly and pad stiffness

As required by prEN 13146-4:2009 the assembly static stiffness and assembly low frequency dynamic stiffness shall be measured in accordance with EN 13146-9. Measurement of the rail pad static stiffness is required at the purchaser's discretion in accordance with prEN 13146-8:2009. If the purchaser requires any of the following it shall be measured in accordance with EN 13146-9:

- pad low frequency dynamic stiffness;
- assembly high frequency dynamic stiffness.

Test loads are given in Table 2.

NOTE Guidance on the measurement of pad high frequency stiffness is given in EN 13146-9:2009, Annex A. For the measurement of assembly properties at acoustic frequency see EN 15461.

**Table 2 — Loads for measurement of stiffness**

Fastening category	$F_{SP1}$ and $F_{LFP}$	$F_{SPmax}$ and $F_{LFPmax}$	$F_{LFA}$	$F_{SAmax}$ and $F_{LFAmax}$
	kN	kN	kN	kN
A	16	51	1	32
B	18	64	1	43
C	18	85	1	64
D	18	85	1	64

NOTE For embedded rail the stiffness shall be expressed per unit length.

## 5.3 Effect of repeated loading

This shall be determined by the procedure in prEN 13146-4:2009. In the case of twin block, booted concrete sleepers the whole sleeper shall be subject to test using the procedure for two rail seats.

The test loads and positions shall be as shown in Table 3.

The following measurements shall be performed before and after repeated loading. The change in performance shall not exceed the values shown below. For fastening systems which support the web of the rail and adhesive fastening systems for embedded rail, the change in clamping force does not apply.

- Longitudinal rail restraint                      change  $\leq 20\%$ ; or  
Longitudinal stiffness                            change  $\leq 20\%$ ;
- Vertical static stiffness                            change  $\leq 25\%$ ;
- Clamping force                                      change  $\leq 20\%$ .

Compliance with Category C implies compliance with Categories C and D

Compliance with Category B implies compliance with Categories A and B