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**Železniške naprave - Zgornji ustroj - Zahteve za izdelavo pritrdilnih sistemov - 4.
del: Pritrdilni sistemi za jeklene prage**

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

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

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

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Gradnja železnic

Construction of railways

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

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May 2012

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English Version

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

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 European Standard was approved by CEN on 27 April 2012.

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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.

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Foreword

This document (EN 13481-4:2012) 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of an identical text or by endorsement, at the latest by November 2012, and conflicting national standards shall be withdrawn at the latest by November 2012.

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

This document supersedes EN 13481-4:2002.

The main changes in this revision of EN 13481-3:2002 are as follows:

- a) the ranges of test loads have been extended to cover the new categories of fastening systems (5.3, Table 2 and 5.4, Table 3);
- b) advice on attenuation of noise and vibration has been added (Annex B).

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 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).

According to the CEN/CENELEC Internal Regulations, the national standards organizations 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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

A series of tests is used to assess the suitability of fastening systems for use in railway track.

In this European Standard 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. The laboratory test for the effect of repeated loading is specified to assess the potential long term performance of the fastening in track. The test for clamping force is only suitable for laboratory use.

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1 Scope

This European Standard is applicable to fastening systems, in categories A – C and 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
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 the rail sections in EN 13674-1 (excluding 49E4) and EN 13674-4+A1.

This standard is not applicable to fastening systems for other rail sections, rigid fastening systems or special fastening systems used at bolted joints or glued joints.

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

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 13146-1:2012, *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 13146-4:2012, *Railway applications – Track – Test methods for fastening systems – Part 4: Effect of repeated loading*

EN 13146-5:2012, *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*

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EN 13146-7:2012, *Railway applications – Track – Test methods for fastening systems – Part 7: Determination of clamping force*

EN 13146-8:2012, *Railway applications – Track – Test methods for fastening systems – Part 8: In service testing*

EN 13146-9:2009+A1:2011, *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, *Railway applications – Track – Rail – Part 1: Vignole railway rails 46 kg/m and above*

EN 13674-4+A1, *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 terms and definitions given in EN 13481-1:2012 apply.

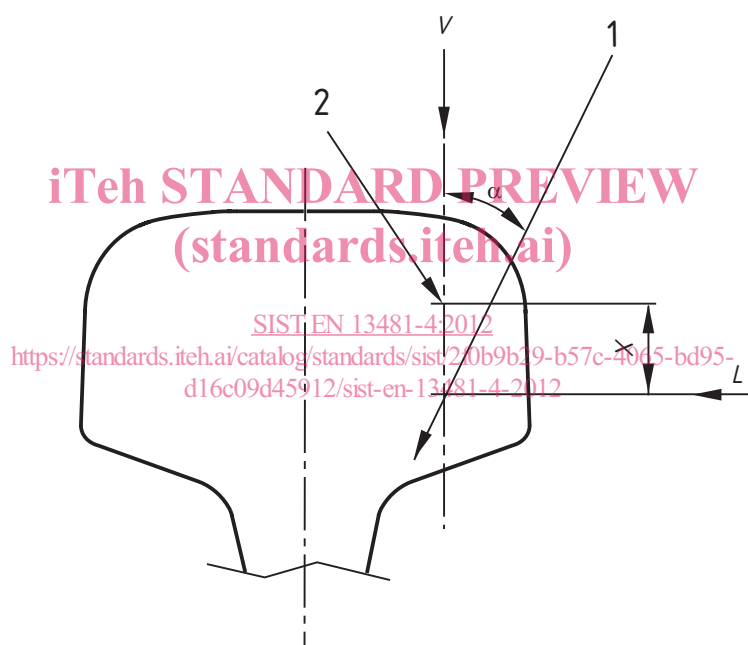
4 Symbols

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 13146-1:2012), 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;
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 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 load transmitted by the wheel to the running surface at 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;
- α angle between the load line and a line normal to the running surface of the rails as shown in Figure 1, in $^\circ$.

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



Key

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

Figure 1 — Load application position

5 Requirements

5.1 Longitudinal rail restraint

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