SLOVENSKI STANDARD
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Železniške naprave - Zgornji ustroj - Preskušanje pritrdilnih sistemov - 1. del: Ugotavljanje vzdolžnega odpora

Railway applications - Track - Test methods for fastening systems - Part 1: Determination of longitudinal rail restraint

Bahnanwendungen - Oberbau - Prüfverfahren für Schienenbefestigungssysteme - Teil 1: Ermittlung des Durchschubwiderstandes in Längsrichtung

Applications ferroviaires - Voie - Méthodes d'essai pour les systèmes de fixation - Partie 1 : Détermination de la résistance longitudinale au glissement

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ICS:

93.100	Gradnja železnic	Construction of railways

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English Version

Railway applications - Track - Test methods for fastening systems - Part 1: Determination of longitudinal rail restraint

Applications ferroviaires - Voie - Méthodes d'essai pour les systèmes de fixation - Partie 1 : Détermination de la résistance longitudinale au glissement

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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

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Contents

Page

European foreword

This document (prEN 13146-1:2017) 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 13146-1:2012+A1:2014.

In this European Standard, the test procedure has been adapted to be applicable to embedded rail as well as surface mounted rail. For embedded rail with an adhesive fastening system the test result is expressed as longitudinal stiffness.

This European Standard is one of the series EN 13146 “Railway applications – Track – Test methods for fastening systems” which consists of the following parts:

— Part 1: Determination of longitudinal rail restraint;

— Part 2: Determination of torsional resistance;

— Part 3: Determination of attenuation of impact loads;

— Part 4: Effect of repeated loading;

— Part 5: Determination of electrical resistance;

— Part 6: Effect of severe environmental conditions;

— Part 7: Determination of clamping force;

— Part 8: In service testing;

— Part 9: Determination of stiffness;

— Part 10: Proof load test for pull-out resistance.

These support the requirements in the series EN 13481 “Railway applications – Track – Performance requirements for fastening systems”.

Introduction

For fastening systems that hold the rail mechanically (whether at discrete intervals or continuously) the test procedure measures the longitudinal rail restraint. For an embedded rail with an adhesive fastening system the test procedure measures the longitudinal stiffness.

1 Scope

This European Standard specifies the laboratory test procedure to determine:

a) the maximum longitudinal force that can be applied to a rail, secured to a sleeper, bearer or element of slab track by a rail fastening assembly, without non-elastic displacement of the rail occurring, or the longitudinal stiffness at a specified longitudinal displacement of a specimen of embedded rail with an adhesive fastening system, and, for any type of fastening,

b) the shear displacement and slip data required for track-bridge interaction calculations.

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 13146-9, *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 ISO 7500-1:2015, *Metallic materials – Verification of static uniaxial testing machines – Part 1: Tension/compression testing machines – Verification and calibration of the force-measuring system (ISO 7500-1:2015)*

EN ISO 9513:2012, *Metallic materials – Calibration of extensometers used in uniaxial testing (ISO 9513:2012)*

3 Terms, definitions and symbols

3.1 Terms and definitions

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

3.2 Symbols

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

D_1	maximum longitudinal displacement of rail during each cycle of loading, in mm;
D_2	residual longitudinal displacement of rail after removal of load, in mm;
D_3	elastic longitudinal displacement of rail prior to slip, in mm;
D_r	maximum longitudinal displacement of embedded rail with adhesive fastening system, in mm;
F	maximum axial load on the rail without non-elastic displacement occurring, in kN;
F_{max}	axial load at which gross slip occurs, in kN;
k_L	longitudinal stiffness of embedded rail with adhesive fastening system, in kN/mm per m;
L_T	sample length of embedded rail, in m.

4 Principle

A longitudinal load is applied by pulling a rail fixed to a sleeper, bearer or element of slab track by one or two rail fastening assemblies or by an embedded rail fastening system whilst the support is restrained. Movement of the rail relative to the support is recorded and the load removed when the rail slips or the specified longitudinal displacement occurs.

Longitudinal rail restraint or longitudinal stiffness are obtained from a plot of load versus displacement.

5 Apparatus

5.1 Rail

A short length of rail of the section for which the fastening system under test has been designed. The rail shall be unlaminated and neither have loose rust on the surface nor be polished on the foot by repeated testing.

For surface mounted rail, the length of rail used for testing shall be approximately 0,5 m. For embedded rail, the rail is part of the test specimen and its length is specified in 6.1.

5.2 Actuator

Actuator capable of applying a tensile force of at least 40 kN to the longitudinal axis of the rail as shown in Figure 1.

5.3 Displacement measuring instruments

5.3.1 Contacting displacement measuring instruments

If contacting displacement measuring instruments are used they shall comply with EN ISO 9513:2012, Table 2, class 2.

5.3.2 Non-contacting displacement measuring instruments

If non-contacting displacement measuring instruments are used they shall be calibrated to ensure that they are capable of measuring the longitudinal displacement of the rail within ± 0,02 mm.

5.4 Force measuring instruments

Instruments conforming to EN ISO 7500-1:2015, class 1 over the required range of force.

5.5 Verification of calibration

The calibration of actuators and measuring instruments shall be verified using equipment having certified traceability to European or International Standards using the International System of Units (SI).

6 Test specimens

6.1 Rail support

A sleeper, half sleeper, bearer or element of slab track, incorporating embedded rail where appropriate, complete with cast-in fastening components or holes, and rail seats, as made without modification for this test.

For fastening systems incorporating continuous support of surface mounted rail, the test shall be performed using a length of pad equal in length to the design spacing of the fastening along the rail. The piece of rail used for the test shall be at least as long as the piece of pad.

For surface mounted fastening systems which have low frequency dynamic stiffness ≤ 50 MN/m, when tested in accordance with EN 13146-9, it may be necessary to carry out the test over two rail seats to provide greater stability.

For mechanically fastened embedded rail, the length of rail shall be the typical spacing of fastenings.

For adhesively fastened embedded rail, the length of the rail shall be 0,5 m to 0,85 m.

6.2 Fastening

The complete fastening assembly includes all components and baseplate, where appropriate.

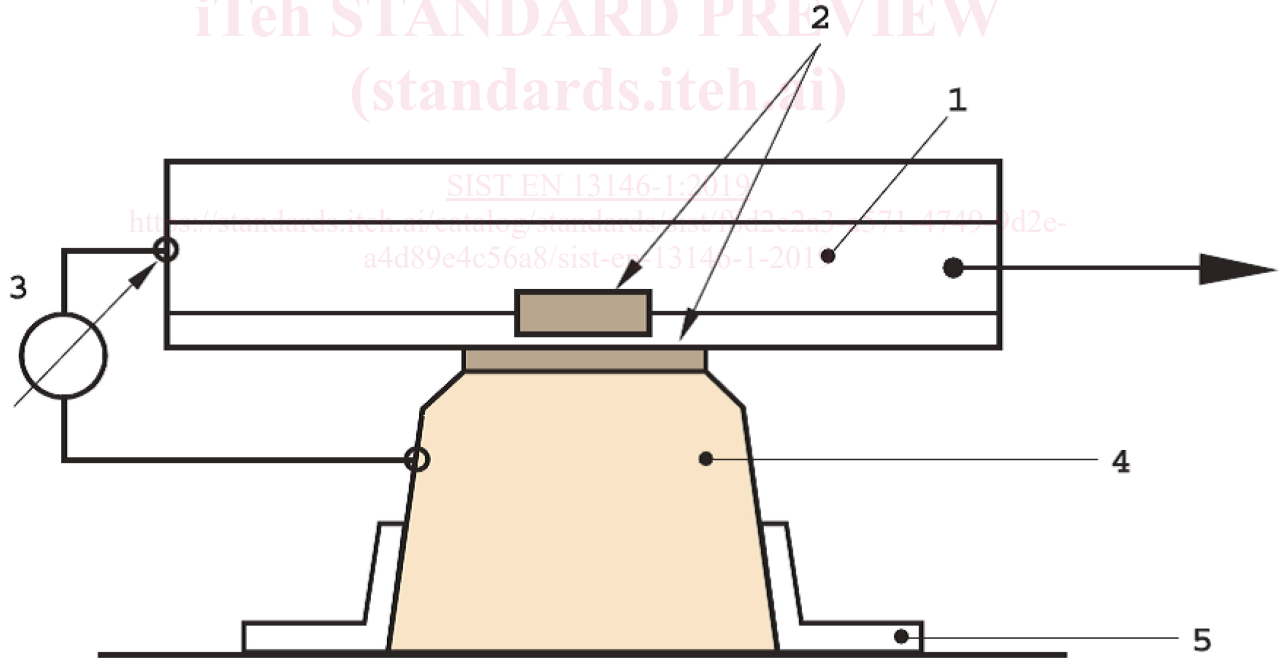
7 Procedure

7.1 Test temperature

The test shall be carried out in a room or enclosure maintained at (23 ± 5) °C. All components used in the test shall be kept at this temperature for no less than 4 h prior to the commencement of the test.

7.2 Preparation for test

If not already in place, fix the short length of rail to one or two rail seats as necessary using the fastening components as assembled in track. Place the rail support on a rigid base and restrict any movement parallel to the rail as shown in Figure 1.



Key

1 rail as described in 5.1
2 fastening assembly including rail pad
3 load-displacement measuring and recording instruments
4 rail support as described in 6.1
5 rigid support and restraint to prevent rotation of the rail support

NOTE For fastenings which hold the rail foot, the force application should be at the rail foot and for fastenings which hold the rail web the force should be applied at the rail centroid.

Figure 1 — Test arrangement

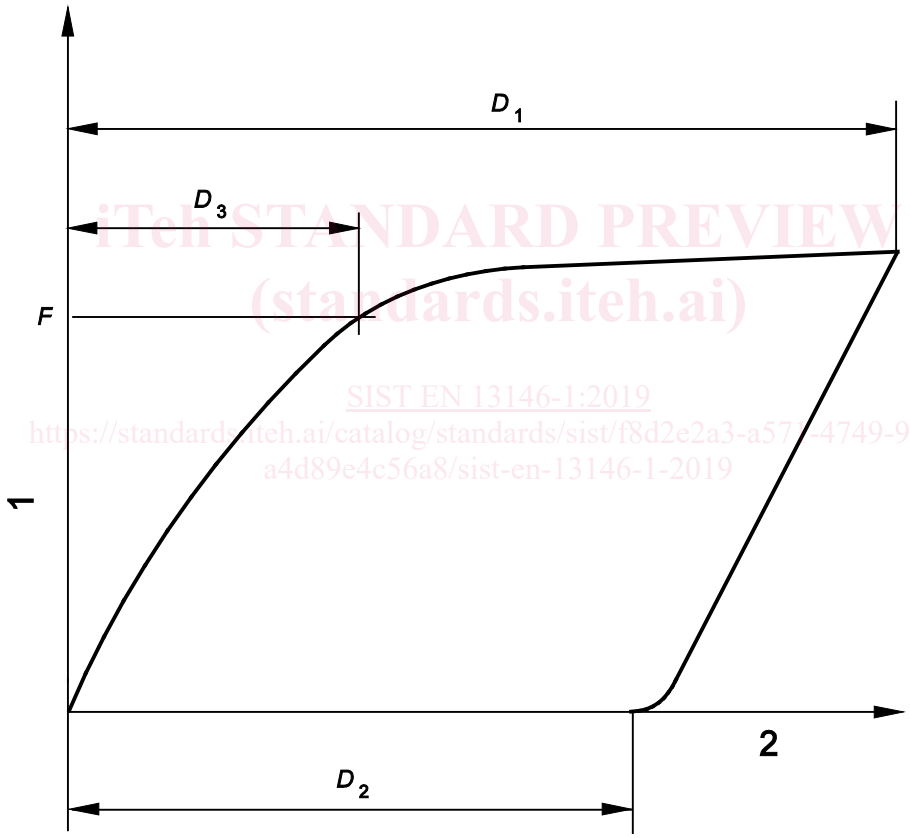
7.3 Loading

7.3.1 Longitudinal rail restraint

Apply a tensile load at a constant rate of (10 ± 5) kN/min to one end of the rail. From the start of this loading cycle, automatically measure the load and longitudinal displacement of the rail relative to the sleeper.

When the rail slips in the fastening assembly or if the load is more than four times the performance requirement, rapidly reduce the load to zero and continue measuring the rail displacement for two minutes. Without removing or adjusting the fastening assembly in any way repeat the above cycle a further three times with three minute intervals in the unloaded condition between each cycle. Plot the applied load against rail displacement for each cycle as shown in Figure 2. If the rail displacement is jerky, plot a median, smooth curve.

If D_2 ≤ 0,5 mm and the force does not exceed four times the performance requirement, the loading cycle is invalid and shall be repeated.



Key

1 longitudinal force (kN)

2 displacement (mm)

Figure 2 — Load-displacement diagram for one loading cycle