



SLOVENSKI STANDARD
SIST EN 13146-4:2004

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Železniške aplikacije - Stežnice - Postopki preskušanja za sisteme pritrditve - Del 4: Vpliv ponovljenega obremenjevanja

Railway applications - Track - Test methods for fastening systems - Part 4: Effect of repeated loading

Bahnanwendungen - Oberbau - Prüfverfahren für Schienenbefestigungssysteme - Teil 4: Dauerschwingversuch

Applications ferroviaires - Voie - Méthodes d'essai pour les systèmes de fixation - Partie 4: Effets produits par des charges répétitives

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Ta slovenski standard je istoveten z: EN 13146-4:2002

ICS:

93.100 Gradnja železnic Construction of railways

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 13146-4

November 2002

ICS 93.100

English version

Railway applications - Track - Test methods for fastening systems - Part 4: Effect of repeated loading

Applications ferroviaires - Voie - Méthodes d'essai pour les systèmes de fixation - Partie 4: Effets produits par des charges répétitives

Bahnanwendungen - Oberbau - Prüfverfahren für Schienenbefestigungssysteme - Teil 4: Dauerschwingversuch

This European Standard was approved by CEN on 2 October 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.

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

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

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Foreword

This document (EN 13146-4:2002) 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 May 2003, and conflicting national standards shall be withdrawn at the latest by May 2003.

This document has been prepared under mandates (M/024¹, M/275²) given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s). No existing European Standard is superseded.

This European Standard is one of the series EN 13146 as listed below :

— *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*

These support the requirements in the series EN 13481 Railway applications — Track — Performance requirements for fastening systems — Parts 1 to 7.

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.

EN 13146-4:2002 (E)**1 Scope**

This Part of this European Standard specifies a laboratory test procedure for applying repeated displacement cycles representative of the displacements caused by traffic on railway track. It is used for assessing the long term performance of direct fastening systems.

This test procedure applies to a complete fastening assembly.

2 Normative references

This European Standard incorporates by dated or undated reference, 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 publication referred to applies (including amendments).

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

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

EN 13481-1:2002, *Railway applications — Track — Performance requirements for fastening systems — Part 1: Definitions.*

EN 13481-2, *Railway applications — Track — Performance requirements for fastening systems — Part 2: Fastening systems for concrete sleepers.*

EN 13481-3, *Railway applications — Track — Performance requirements for fastening systems — Part 3: Fastening systems for wood sleepers.*

EN 13481-4, *Railway applications — Track — Performance requirements for fastening systems — Part 4: Fastening systems for steel sleepers.*

EN 13481-5, *Railway applications — Track — Performance requirements for fastening systems — Part 5: Fastening systems for slab track.*

ENV 13481-6, *Railway applications — Track — Performance requirements for fastening systems — Part 6: Special fastening systems for attenuation of vibration.*
prEN 13481-7, *Railway applications - Track - Performance requirements for fastening systems - Part 7: Special fastening systems for switches and crossing and check rails.*

3 Terms and definitions, symbols and abbreviations**3.1 Terms and definitions**

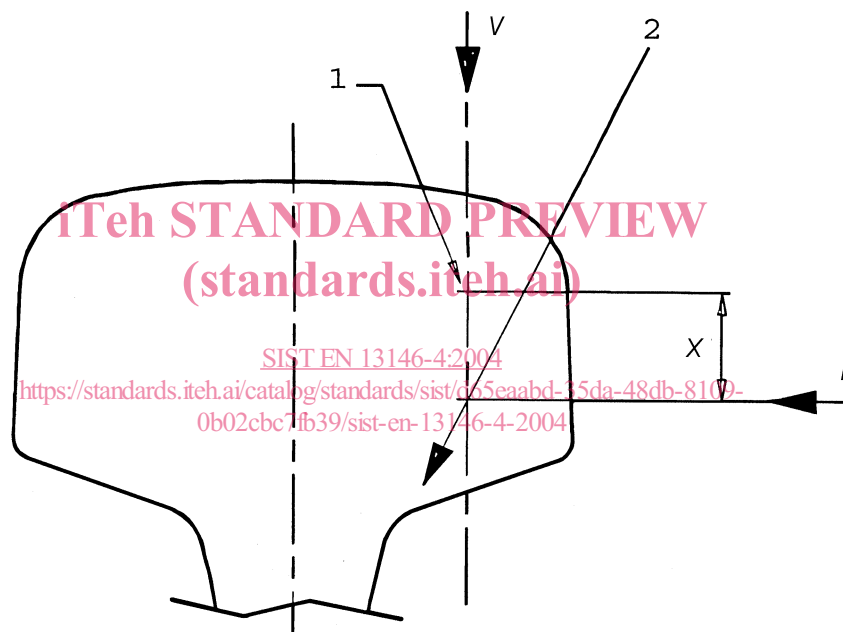
For the purposes of this European Standard, the terms and definitions given in EN 13481-1:2002 apply.

3.2 Symbols and abbreviations

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

α angle between the load line and a line normal to the base of the sleeper, in degrees;

d	mean vertical displacement of rail during determination of vertical stiffness, in mm;
F	maximum axial longitudinal load on the rail without non-elastic displacement occurring, in kN;
k	vertical stiffness of fastening assembly measured between 5 kN and 80 kN, in MN/m;
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;
$L/V =$	$P_L/P_V = \tan \alpha$;
R	radius of curvature of the track, in m;
X	position of the line of application of P_L below the centre of curvature of the gauge corner of the rail head as shown in Figure 1, in mm;



Key

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

NOTE The angle of load application is shown in Figure 3.

Figure 1 — Position of load application

4 Principle

A constant amplitude, cyclic force is applied by a single actuator at a predetermined load line and position on the rail head. The load, position and line of application to be used are determined from the vertical stiffness of the fastening assembly, axle loads and curve conditions of the track for which the fastening assembly is being tested. Curve conditions include radius and cant deficiency.

Performance is determined by the change in clamping force, longitudinal rail restraint, vertical stiffness and rail position, and visual inspection of the components during test.

EN 13146-4:2002 (E)

5 Apparatus

5.1 Rail

Short lengths of rail (approximately 0,5 m per rail seat), of the section for which the fastening assembly under test is designed. The rail shall be unlaminated and have no loose rust on the surface nor be polished on the foot by repeated testing.

The head of the rail may be modified to accommodate the load application head. In this case the dimension X , as shown in Figure 1, refers to the design rail section for the fastening assembly.

NOTE The rail should also be suitable for the determination of longitudinal rail restraint.

5.2 Actuator

Actuator capable of generating a load of up to 150 kN in a cyclic manner at a frequency of (4 ± 1) Hz.

NOTE For simultaneous loading of two and four rail seats the required capacity will be correspondingly greater.

5.3 Load application head

A head in contact with the rail which is capable of transmitting the applied load to a rail at the required position relative to the rail head.

5.4 Displacement measuring instruments

Instruments capable of measuring the displacement of the rail, relative to the sleeper, within $\pm 0,01$ mm.

5.5 Load measuring instruments

Instruments capable of measuring the applied load within $\pm 0,3$ kN.

5.6 Verification of calibration

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

6 Test specimens

6.1 Sleeper or other rail support

A sleeper, half sleeper, concrete block or other rail support with cast-in fastening components or holes, and rail seats, as made without modification for this test. It is recommended that two sleepers or half sleepers are used if the cast-in fastening components or holes are non-symmetrical about the longitudinal centre line of the sleeper.

6.2 Fastening

All fastening components as used in track.

7 Procedure for one rail seat

7.1 General

The following procedure is for the test when a rail is fixed to one end of the sleeper or half sleeper. When two rails are used the procedure in clause 8 shall be used.

The sequence of tests shall be 7.3, 7.4, 7.5, 7.6, 7.5, 7.4, 7.3 performed on test specimens assembled in accordance with 7.2.1 or 7.2.2. At no time during the test sequence shall any part of the fastening assembly be adjusted, retightened or modified.

7.2 Preparation for test

7.2.1 In line fastening

If the fastenings are in line fix a short length of rail to one rail seat using the fastening components as assembled in track.

7.2.2 Offset fastening

If the fastenings are non-symmetrical fix a short length of rail to one rail seat on each of two adjacent sleepers or half sleepers as shown in Figure 2.

7.3 Clamping force

Determine the clamping force of the assembly using the procedure in EN 13146-7.

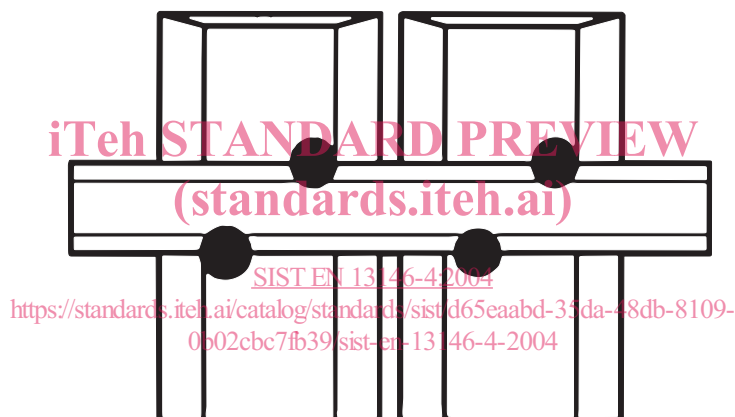


Figure 2 — Arrangement of test sleepers for offset fastenings

7.4 Longitudinal rail restraint

Determine the longitudinal rail restraint using the procedure in EN 13146-1. If the test is on two adjacent rail seats as described in 7.2.2 the result shall be expressed as :

— longitudinal rail restraint (F) = (measured value)/2 kN.

The tensile load applied to the rail before and after the repeated load test shall be in the same direction.

7.5 Vertical stiffness

Support the test specimen on a rigid horizontal surface. Apply a vertical load of 85 kN, at a rate of (50 ± 5) kN/min to the centre line of the rail head, perpendicular to the rail seat, above the longitudinal centre line of the sleeper or half sleeper.

If the specimen includes two adjacent rail seats in accordance with 7.2.2, the load shall be 170 kN applied at a rate of (100 ± 10) kN/min. This is applied through a load frame so that it is distributed equally between the two rail seats.

Apply the load five times. On the sixth loading, record the vertical displacement of the rail using four transducers, with a measuring tolerance of $\pm 0,1$ mm, relative to the four corners of the rail seat.