SLOVENSKI STANDARD
SIST EN 13146-4:2012+A1:2015

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Železniške naprave - Zgornji ustroj - Preskušanje pritrdilnih sistemov - 4. del: Učinek ponavljajoče se obremenitve

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

Ta slovenski standard je istoveten z: **EN 13146-4:2012+A1:2014**

ICS:

93.100	Gradnja železnic	Construction of railways

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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

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This European Standard was approved by CEN on 26 November 2011 and includes Amendment 1 approved by CEN on 25 September 2014.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (EN 13146-4:2012+A1:2014) 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of an identical text or by endorsement, at the latest by May 2015, and conflicting national standards shall be withdrawn at the latest by May 2015.

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 A1 EN 13146-4:2002 A1.

This document includes Amendment 1 approved by CEN on 2014-09-25.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

In this revision of EN 13146-4:2002 the procedure has been modified for application to embedded rail.

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.*

These support the requirements in the series EN 13481 "*Railway applications — Track — Performance requirements for fastening systems*".

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, Former Yugoslav Republic of Macedonia, 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.

1 Scope

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.

The procedure is applicable to surface mounted rail on sleepers, bearers and slab track, and embedded rail.

This test procedure applies to a complete fastening assembly.

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.

〚A1〛 EN 13146-1:2012+A1:2014 〚A1〛, *Railway applications — Track — Test methods for fastening systems — Part 1: Determination of longitudinal rail restraint*

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

EN 13146-9:2009, *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 13481-2:2012, *Railway applications — Track — Performance requirements for fastening systems — Part 2: Fastening systems for concrete sleepers*

EN 13481-3:2012, *Railway applications — Track — Performance requirements for fastening systems — Part 3: Fastening systems for wood sleepers*

EN 13481-4:2012, *Railway applications — Track — Performance requirements for fastening systems — Part 4: Fastening systems for steel sleepers*

EN 13481-5:2012, *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*

EN 13481-7:2012, *Railway applications — Track — Performance requirements for fastening systems — Part 7: Special fastening systems for switches and crossings and check rails*

EN ISO 7500-1:2004, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Verification and calibration of the force-measuring system (ISO 7500-1:2004)*

EN ISO 9513:2002, *Metallic materials — Calibration of extensometers used in uniaxial testing (ISO 9513:1999)*

3 Terms and definitions, symbols and abbreviations

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 and abbreviations

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

α angle between the load line and a line normal to the running surface of the rails, in degrees;

F maximum axial longitudinal load on the rail without non-elastic displacement occurring, in kN;

F_{SAmax} force applied to assembly in measurement of static stiffness of assembly, in kN;

L lateral component of force transmitted by the wheel to the rail head as shown in Figure 1, in kN;

P_L component of force parallel to the running surface of the rails in kN;

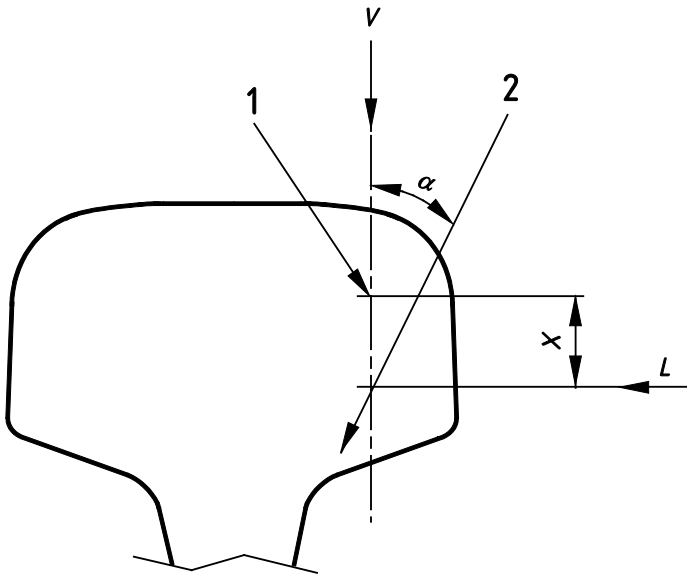
P_V component of force normal to the running surface of the rails, in kN;

V vertical component of load transmitted by the wheels to the running surface at the rail head as shown in Figure 1, in kN;

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.

NOTE 1 $\frac{L}{V} = \frac{P_L}{P_V} = \tan \alpha$

NOTE 2 Running surface is defined in EN 13481-1:2012.



Key

1 centre of gauge corner radius

2 line of load application

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.

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.

5 Apparatus

5.1 Rail

Short lengths of rail (approximately 0,5 m per rail seat or longer if required), of the section for which the fastening assembly under test is designed. The rail shall be unlaminated and have neither 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 except when testing fastenings which support the web of the rail. In this case, the dimension *X*, as shown in Figure 1, refers to the design rail section for the fastening assembly.

〚A1〛 For embedded rail, the rail is part of the test specimen and its length is specified in 6.1. 〚A1〛

5.2 Actuator

Actuator capable of applying a force 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 force to a rail at the required position relative to the rail head.

5.4 Displacement measuring instruments

Instruments conforming to EN ISO 9513:2002, Table 2, Class 2. The instruments shall be capable of measuring displacement of the rail, relative to the support, within ± 0,01 mm. Non-contact instruments may be used providing a procedure for verifying their calibration is used and recorded.

NOTE Non-contact instruments are outside the scope of EN ISO 9513.

5.5 Force measuring instruments

Instruments conforming to EN ISO 7500-1:2004 and EN ISO 7500-1:2004/AC:2009, Class 1 and over the required range of force.

5.6 Verification of calibration

The calibration of actuators shall be verified periodically in accordance with EN ISO 7500-1 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.

For surface mounted rail on slab track, the fastening system shall be mounted in the centre of the top of a reinforced concrete block. The length of the block, normal to the rail, shall be ≥ 500 mm and the width ≥ 300 mm. If, for stability, it is necessary to test two rail seats, the width of the block shall be ≥ 2 × the design fastening spacing in the track. The depth of the block shall be the depth of the slab or (200 ± 10) mm, whichever is the smaller.

For surface mounted fastening systems on slab track, with continuous support of the 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 and the size of the concrete block shall be sufficient to provide support to the full length of the piece of pad.

[A1› For embedded rail the channel containing the rail shall be contained in a concrete block similar to that for surface mounted rail on sleepers, bearers and slab track.

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. ‹A1]

6.2 Fastening

All fastening components as used in track and assembled in accordance with the manufacturer’s instructions.

7 Procedure for one rail

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.