DRAFT INTERNATIONAL STANDARD
ISO/DIS 22074-2

ISO/TC **269**/SC **1** Secretariat: **AFNOR**

Voting begins on: **2019-08-09** Voting terminates on: **2019-11-01**

Railway infrastructure — Rail fastening systems —

Part 2:
Test method for longitudinal rail restraint

Infrastructure ferroviaire — Systèmes de fixation du rail —

Partie 2: Méthode d'essai pour la détermination de résistance longitudinale au glissement

ICS: 45.080

This document is circulated as received from the committee secretariat.

Reference number
ISO/DIS 22074-2:2019(E)

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC *Railway applications*, Subcommittee SC 1, *Infrastructure*.

A list of all parts in the ISO 22074 series can be found on the ISO website.

Railway infrastructure — Rail fastening systems —

Part 2:
Test method for longitudinal rail restraint

1 Scope

This 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.

ISO 22074-1, *Railway Infrastructure – Rail fastening systems – Part 1: Terms and definitions*

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)*

ISO 9513:2012, *Metallic materials — Calibration of extensometer systems used in uniaxial testing*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 22074-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

4 Symbols and abbreviated terms

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.

5 Principle

A longitudinal load is applied by pulling or pushing 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.

6 Apparatus

6.1 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.

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.

6.2 Actuator

For testing a single rail fastening system, an actuator capable of applying a force of at least 25 kN to the longitudinal axis of the rail as shown in Figure 1.

For testing two rail fastenings simultaneously, or for testing embedded rails, a higher actuator capacity may be required.

6.3 Displacement measuring instruments

6.3.1 Contacting displacement measuring instruments

If contacting displacement measuring instruments are used they shall comply with ISO 9513:2012, Table 2, class 2 and shall be capable of measuring the longitudinal displacement of the rail within ± 0,02 mm.

6.3.2 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.

6.4 Force measuring instruments

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

6.5 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).

7 Test specimens

7.1 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 surface mounted fastening systems which have low frequency dynamic stiffness ≤ 50 MN/m, when tested in accordance with ISO 22074-8, it may be necessary to carry out the test over two rail seats to provide greater tilting stability. (See 7.3.1)

For surface mounted fastening systems incorporating continuous support, 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 embedded rail, the length of embedment shall be the typical spacing of fastenings for the relevant fastening category and the piece of rail used for the test shall be at least as long as the embedment.

7.2 Fastening

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

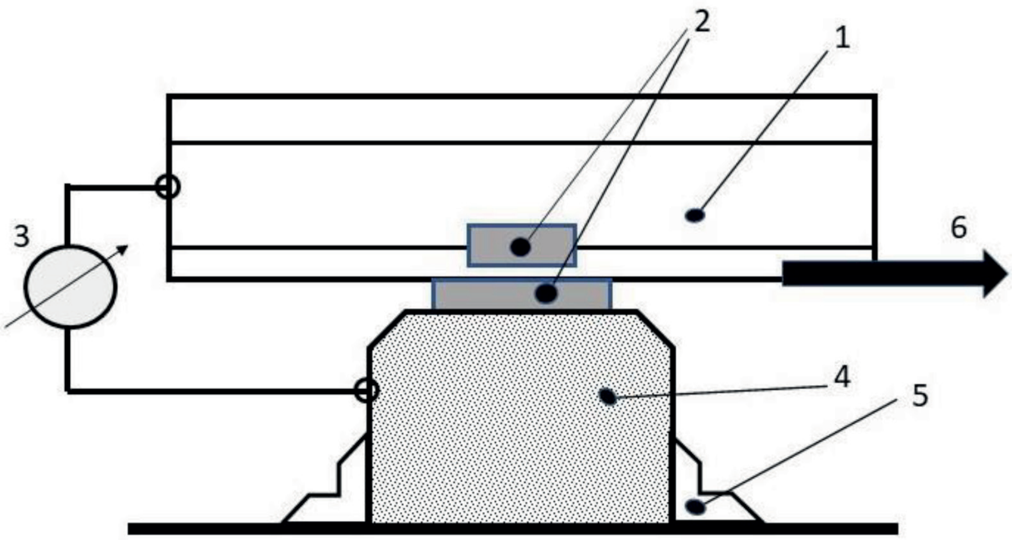
8 Procedure

8.1 Test temperature

The test shall be carried out in a room or enclosure maintained at (25 ± 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.

8.2 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
6 applied force (pulling or pushing)

Figure 1 — Test arrangement

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.

8.3 Loading

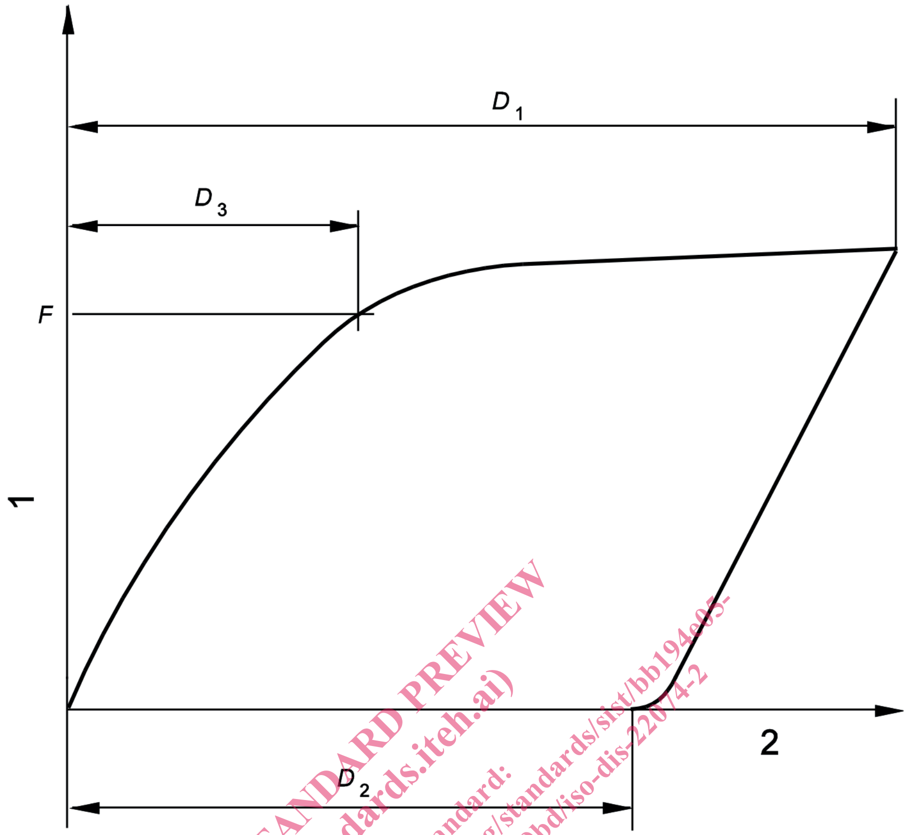
8.3.1 Longitudinal rail restraint

Apply a force, increasing at a constant rate of (10 ± 1) 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.

The force may be applied either to pull or to push the rail relative to the support. The rail should not tilt as the load is applied. It should move only in a direction parallel to its longitudinal axis.

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 $D_2 \leq 0,5$ 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

8.3.2 Longitudinal stiffness

For embedded rails with an adhesive fastening system, follow the loading and measuring procedure in 7.3.1 and continue until D_3 reaches the required value, D_r. Then rapidly reduce the load to zero and continue measuring the rail displacement for two minutes. Repeat the loading a further three times with three minute intervals in the unloaded condition between each cycle.

8.3.3 Parameters for Track-Bridge Interaction calculations

If data are required for track-structure interaction calculations such as those for long bridges, the load should be applied for a fifth time, but on this occasion the load should be increased until there is gross slip of the rail through the fastening system. Then plot a curve of applied load against rail displacement and record the load applied, F_{slip} (kN) at which the rail slides continuously through the fastening.

For low restraint fastening systems, the sustained load, F_{slip}, may be less than the maximum load achieved just before slip occurs.

This procedure is not applicable to adhesively fastened embedded rails.