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Railway infrastructure — Rail fastening systems —

Part 7: Test method for clamping force and uplift stiffness

Infrastructure ferroviaire — Systèmes de fixation du rail —

Partie 7: Méthode d'essai pour la détermination de l'effort d'application au patin du rail et la rigidité au soulèvement

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Foreword

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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).

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For an explanation of 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 269, *Railway applications*, Subcommittee SC 1, *Infrastructure*.

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Railway infrastructure — Rail fastening systems —

Part 7: Test method for clamping force and uplift stiffness

1 Scope

This document specifies the laboratory test procedure for determining the clamping force exerted by the fastening system on the foot of the rail by measuring the force to separate the rail foot from its immediate support. When required, the procedure is also used to determine the uplift stiffness of the fastening system.

It is applicable to systems with and without baseplates on all types of sleepers, bearers or elements of ballastless track. The test does not determine the security of the fastening components fixed into the sleeper or other fastening system support.

This test procedure applies to a complete fastening assembly. It is not applicable to fastening systems for embedded rail or other fastening systems which do not act on the foot of the rail.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7500-1:2018, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system*

ISO 22074-1, *Railway infrastructure — Rail fastening systems — Part 1: Vocabulary*

3 Terms and definitions

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

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

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

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

4 Symbols

Symbol	Description	Unit
d	for direct fastening systems – vertical displacement of the rail relative to the sleeper for indirect fastening systems – vertical displacement of the rail relative to the baseplate	mm
d_{lim}	limiting uplift displacement beyond which the fastening is very stiff (effectively rigid)	mm
m_s	mass of sleeper or part sleeper and fastening components fixed to it, used in the test	kg
m_f	mass of loading frame supported by the sleeper	kg
P	vertical load applied to the rail	kN

P_c	initial estimate of clamping force	kN
P_{lim}	vertical load required to reach limiting uplift displacement, d_{lim}	kN
P_0	vertical load at zero rail displacement which just counteracts the clamping force	kN
P_1	vertical load at zero displacement which, combined with the weight of the sleeper, just counteracts the clamping force	kN

5 Principle

The clamping force for a complete rail fastening assembly is determined by measuring the force necessary to separate the rail from the surface on which it is supported.

6 Apparatus

6.1 Rail, of short length, of the section for which the fastening assembly under test is designed.

6.2 Loading device, to apply a vertical load to the rail (reference method) or sleeper (alternative method) at a controlled rate of approximately 10 kN/min.

NOTE Throughout this document the orientation of the applied force, described as "vertical", "upward" or "downward" is in line with the vertical axis of the rail.

6.3 Measuring and recording instruments, measuring the vertical displacement of the rail support (baseplate or sleeper) relative to the rail with an accuracy of ±0,1 mm and instruments conforming to ISO 7500-1:2018, Class 1, which measure the applied force. The recording instruments shall be capable of plotting load-displacement diagrams.

The calibration of actuators and measuring instruments shall be verified periodically with equipment conforming to relevant local or international standards.

6.4 Steel shims, with dimensions 25 mm × 25 mm × 0,25 mm, with maximum thickness 0,30 mm.

7 Test specimens

7.1 Rail support

A portion of a sleeper, bearer or a concrete block whose centroid is approximately at the centre line of the rail seat or baseplate support area. This is described as a sleeper in the test procedure.

7.2 Fastening

All fastening components, as used in track, including baseplates where incorporated.

8 Test procedure (reference method)

8.1 Preparation for test

Fix the rail to the sleeper, with the baseplate if part of the assembly, using the fastening components assembled as in track. If the test is to be conducted on an indirect fastening system, the clamps may be fixed over the baseplate provided that movement of the rail relative to the baseplate is not constrained.

