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Railway Applications — Acoustics — Determination of the dynamic stiffness of elastic track components related to noise and vibration: Rail pads and rail fastening assemblies

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The UK participation in its preparation was entrusted to Technical Committee EH/1/2, Transport noise.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Railway Applications - Acoustics - Determination of the dynamic stiffness of elastic track components related to noise and vibration: Rail pads and rail fastening assemblies

Applications ferroviaires - Acoustique - Détermination de la raideur dynamique des composants élastiques de la voie pour le bruit et les vibrations: Semelles sous rail et systèmes de fixation du rail

Bahnanwendungen - Akustik - Bestimmung der dynamischen Steifigkeit von elastischen Komponenten im Oberbau in Bezug auf Schall und Schwingungen: Zwischenlagen und Schienenbefestigungssysteme

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European foreword

This document (EN 17495:2022) 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of an identical text or by endorsement, at the latest by February 2023, and conflicting national standards shall be withdrawn at the latest by February 2023.

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Introduction

Airborne rolling noise and structure-borne noise that propagates through the ground and rolling stock, are excited during rolling wheel-rail interaction by the *acoustic roughness* (see EN 15610) of the wheel and rail surfaces. For this reason, models for railway noise and vibration use a measure of track-support stiffness determined at amplitudes of vibration caused by acoustic roughness and under the load of a train and/or the rail fastening system.

This document sets out requirements for a laboratory measurement of the dynamic stiffness of rail pads and rail fastening assemblies relevant to noise and vibration models.

The purpose is to provide data for assessment and specification of the acoustic performance of track components.

An alternative technique to determine input data for rolling noise models is to measure track decay rates according to EN 15461 (see also Bibliography [1]).

NOTE In contrast to the test methods elaborated in this document, other methods exist that can deliver values for dynamic stiffness and loss factor of elastic components and fastening assemblies. They are not thought to attain the quality and comparability required for standardization and they are not within the scope or content of this document. For more information on these methods, see Bibliography [2 – 6].

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1 Scope

This document specifies laboratory test procedures to determine a high-frequency dynamic stiffness, "acoustic stiffness", of resilient components of rail fastening assemblies.

This document is applicable to complete rail fastening assemblies and to pad components of fastening systems including both discrete and continuous fastening systems.

It is applicable to the measurement of the dynamic transfer stiffness under a prescribed pre-load and the associated hysteretic damping loss factor.

It provides measurement methods and pre-load, excitation and frequency range conditions for application to ground borne and structure borne noise as well as for rolling noise.

It is not applicable to the measurement of the stiffness of pads and fastening assemblies under static or low-frequency dynamic loading used for track mechanics.

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.

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

EN 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 7500-1:2018)*

EN ISO 10846-1, *Acoustics and vibration - Laboratory measurement of vibro-acoustic transfer properties of resilient elements - Part 1: Principles and guidelines (ISO 10846-1)*

EN ISO 10846-2, *Acoustics and vibration - Laboratory measurement of vibro-acoustic transfer properties of resilient elements - Part 2: Direct method for determination of the dynamic stiffness of resilient supports for translatory motion (ISO 10846-2)*

EN ISO 10846-3, *Acoustics and vibration - Laboratory measurement of vibro-acoustic transfer properties of resilient elements - Part 3: Indirect method for determination of the dynamic stiffness of resilient supports for translatory motion (ISO 10846-3)*

ISO 7626-1:2011, *Mechanical vibration and shock — Experimental determination of mechanical mobility — Part 1: Basic terms and definitions, and transducer specifications*

ISO 16063-21, *Methods for the calibration of vibration and shock transducers — Part 21: Vibration calibration by comparison to a reference transducer*

ISO 21948, *Coated abrasives — Plain sheets*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 13481-1 and EN ISO 10846-1 and the following apply.

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

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

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

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