SLOVENSKI STANDARD
SIST EN 16432-4:2026

01-julij-2026

Železniške naprave - Progovni sistemi z utrjenimi tirnicami - 4. del: Posebni progovni sistemi z utrjenimi tirnicami za dušenje vibracij

Railway applications - Ballastless track systems - Part 4: Special ballastless track systems for attenuation of vibration

Bahnanwendungen - Feste Fahrbahn-Systeme - Teil 4: Spezielle Feste Fahrbahn-Systeme zur Vibrationsdämpfung

Applications ferroviaires - Systèmes de voie sans ballast - Partie 4: Système spécial de voie sans ballast pour l'atténuation des vibrations

Ta slovenski standard je istoveten z: **EN 16432-4:2026**

ICS:

17.160	Vibracije, meritve udarcev in vibracij	Vibrations, shock and vibration measurements
45.080	Tračnice in železniški deli	Rails and railway components
93.100	Gradnja železnic	Construction of railways

SIST EN 16432-4:2026 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 16432-4

May 2026

ICS 45.080; 93.100

English Version

Railway applications - Ballastless track systems - Part 4: Special ballastless track systems for attenuation of vibration

Applications ferroviaires - Systèmes de voie sans ballast - Partie 4: Système spécial de voie sans ballast pour l'atténuation des vibrations

Bahnanwendungen - Feste Fahrbahnsysteme - Teil 4: Spezielle Feste Fahrbahnsysteme zur Vibrationsdämpfung

This European Standard was approved by CEN on 13 April 2026.

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 CEN-CENELEC 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and United Kingdom.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN 16432-4:2026 E

Contents

European foreword 3
Introduction 4
1 Scope 5
2 Normative references 5
3 Terms and definitions 5
4 Abbreviations 7
5 Design approach 8
6 System design 9
6.1 Establishing the interface between acoustic design and track design 9
6.2 Design implications arising from the integration of resilient elements 10
6.3 Control of vibrations using the rail fastening system alone 11
6.4 Mass spring system (MSS) 12
6.4.1 General 12
6.4.2 System classification according to length 13
6.4.3 Joints 15
6.4.4 Transitions 17
6.4.5 Lateral and longitudinal resilient elements 17
6.5 MSS for switches and crossings 22
6.6 Drainage 22
6.7 Design requirements for maintenance and durability 22
7 Acceptance 23
7.1 Acceptance of design 23
7.2 Acceptance of components 23
7.3 Acceptance of works 24
7.3.1 General 24
7.3.2 Stage 1 – Before installation 24
7.3.3 Stage 2 – Installation of resilient elements 24
7.3.4 Stage 3 – Installed mitigation performance 25
7.3.5 Stage 4 – Operational performance 25
Annex A (informative) Typical workflow from design to installation of special ballastless track systems for attenuation of vibration 26
Annex B (informative) Simplified assessment of structural dynamics implications 28
Bibliography 32

European foreword

This document (EN 16432-4:2026) 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 November 2026, and conflicting national standards shall be withdrawn at the latest by November 2026.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Introduction

Ballastless track systems can be affected by acoustic requirements for the protection of the environment against noise and vibration.

This document covers the integration of additional acoustic requirements in the ballastless track system design.

This part of the EN 16432 series is used in conjunction with the following parts:

— Part 1: General requirements;

— Part 2: System design, subsystems and components;

— Part 3: Acceptance.

1 Scope

This document specifies how to integrate the particular aspects of ballastless track systems for attenuation of vibration into the system and subsystem design and component configuration according to EN 16432-2:2017.

The general system and subsystem design requirements are assigned from EN 16432-1:2017.

Additional noise and vibration requirements can be project specific and are not provided by this document. Acoustic requirements are considered as input for the track design from the acoustic design. The acoustic design and the track design affect each other and may require an iterative overall design process.

The range of applicability covers all kind of rail systems including Urban Rail systems.

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 1991 (all parts), *Eurocode 1 — Actions on structures*

EN 1992 (all parts), *Eurocode 2 — Design of concrete structures*

EN 16432-1:2017, *Railway applications - Ballastless track systems - Part 1: General requirements*

EN 16432-2:2017, *Railway applications - Ballastless track systems - Part 2: System design, subsystems and components*

EN 16432-3:2021, *Railway applications - Ballastless track systems - Part 3: Acceptance*

EN 17495:2022, *Railway Applications - Acoustics - Determination of the dynamic stiffness of elastic track components related to noise and vibration: Rail pads and rail fastening assemblies*

EN 17682, *Railway applications - Infrastructure - Resilient element for floating slab system*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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/

3.1
mass spring system
ballastless track system using a specific mass in combination with its designed support stiffness

3.2
longitudinal resilient element
resilient element according to Figure 1 for MSS in order to constrain the longitudinal movement of the mass

Note 1 to entry: It is installed perpendicular to the track axis.

3.3
lateral resilient element
resilient element placed according to Figure 1 for MSS in order to constrain the lateral movement of the mass

Note 1 to entry: It is installed parallel to the track axis.

3.4
vertical resilient element
resilient element placed according to Figure 1 for MSS in order to provide the required support stiffness

3.5
full surface resilient element
full surface support (mat) between mass and its substructure to provide the required support stiffness

3.6
strip resilient element
linear support between mass and its substructure to provide the required support stiffness

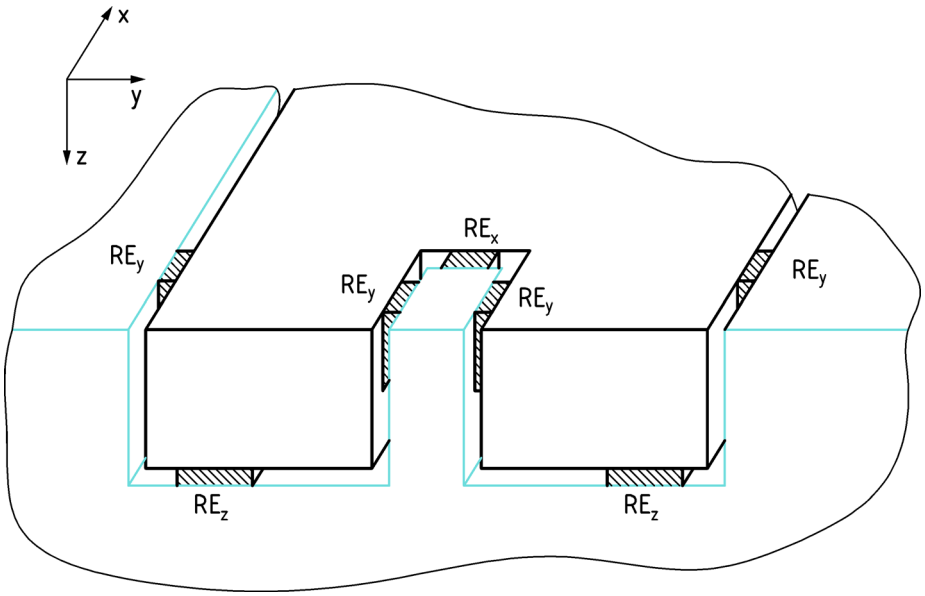
3.7
discrete resilient element
point support between mass and its substructure to provide the required support stiffness

3.8
dynamic stiffness
force or stress per unit deflection measured under an uniaxial force which acts periodically at a given frequency of 5 Hz to 20 Hz between specific force or stress levels

Note 1 to entry: This value is determined mainly for calculation of dynamic deformation of tracks.

3.9
acoustic stiffness
dynamic stiffness of a resilient track support element that is measured under a static preload and at small amplitudes of displacement or velocity applied in the frequency range relevant to noise or vibration perception

3.10
insertion loss
relative reduction [dB] of vibration in the transmission path as a function of frequency resulting from the implementation of a subsystem



Key

X	longitudinal direction
Y	lateral direction
Z	vertical direction
RE_x	longitudinal resilient element
RE_y	lateral resilient element
RE_z	vertical resilient element

Figure 1 — Orientation of resilient elements (for example: arranged as discrete resilient elements)

4 Abbreviations

For the purposes of this document, the abbreviations in Table 1 apply.

Table 1 — Abbreviations

Abbreviation	Abbreviated term
CRCP	Continuously Reinforced Concrete Pavement
FEM	Finite Element Method
GB N&V	Ground Borne Noise and Vibration
JPCP	Jointed Plain Concrete Pavement
JRCP	Jointed Reinforced Concrete Pavement
MSS	Mass Spring System
MWCC	Main Works Civil Contractor
S&C	Switches and Crossings