SLOVENSKI STANDARD
SIST EN 15839:2024

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Železniške naprave - Preskušanje in simuliranje voznih karakteristik pri prevzemu železniških vozil - Vozna varnost pri vzdolžni tlačni sili

Railway applications - Testing and simulation for the acceptance of running characteristics of railway vehicles - Running safety under longitudinal compressive force

Bahnanwendungen - Versuche und Simulationen für die Zulassung der fahrtechnischen Eigenschaften von Eisenbahnfahrzeugen - Fahrsicherheit unter Längsdruckkräften

Applications ferroviaires - Essais et simulations en vue de la validation du comportement dynamique des véhicules ferroviaires - Sécurité de circulation sous force longitudinale de compression

Ta slovenski standard je istoveten z: **EN 15839:2024**

ICS:

45.060.20	Železniški vagoni	Trailing stock

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English Version

Railway applications - Testing and simulation for the acceptance of running characteristics of railway vehicles - Running safety under longitudinal compressive force

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

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

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European foreword

This document (EN 15839:2024) 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of an identical text or by endorsement, at the latest by April 2025, and conflicting national standards shall be withdrawn at the latest by April 2025.

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.

This document supersedes EN 15839:2012+A1:2015.

This document includes the following significant technical changes with respect to EN 15839:2012+A1:2015:

— railbound construction and maintenance machines added in the scope, which explains why the term vehicle has mostly replaced the term wagon in this document;

— requirements for endurable longitudinal compressive force in EN 15839:2012+A1:2015 kept in the present document and mainly reported in 5.2 for conventional trains. New optional requirements in 5.3, informative Annex F and informative Annex G added for endurable longitudinal compressive force in high-capacity trains. The reason is to make the link between the present document and the methodology for assessment of high-capacity trains (described in IRS 40421);

— 5.4 and informative Annex H on assessment of endurable longitudinal compressive force for vehicles with centre couplers added;

— 5.5 about special vehicle layout and more particularly 5.5.2 “Permanently coupled units with a bar coupler” added;

— Clause 5 “Evaluation of the torsional coefficient of a car body c_t* and 6 “Condition for dispensation from tests or calculations regarding the safety against derailment on twisted track” removed as these sections are already in EN 14363:2016+A2:2022;

— Clause 7 (except 7.2) relocated in normative Annex B. Some precisions in normative Annex B added and 7.2 relocated in Annex C. Dispensation from the assessment of endurable longitudinal compressive force for wagon with 3 axle bogies and railbound construction and maintenance machines added. Dispensation from the assessment of endurable longitudinal compressive force for machines comes from EN 14033-1:2017;

— possibility to assess endurable longitudinal compression force with simulation added in 5.1 and informative Annex E.

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

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

Due to the operating conditions of braking or propelling, high longitudinal compressive force can occur between coupled freight vehicles. This force can be safety-related especially in S-shaped curves with small radii under some conditions depending also on the design of the vehicle and the coupling.

This document defines the acceptance process to be followed by vehicles that are operated in a way that high longitudinal compressive force can occur in the trains.

The establishment of this document was based on currently existing rules, practices, and procedures to define acceptance criteria ensuring running safety under the existing operating conditions. It provides a defined assessment method between vehicle design, track layout and braking operation. Investigations according to this document are not necessary if operating practice shows that running safety is achieved without them.

The following principles are applied:

a) the railway system requires comprehensive technical rules to ensure an acceptable interaction between vehicle and track;

b) due to the numerous national and international regulations, new railway vehicles are tested and homologated before putting them into service. In addition, existing acceptance are checked when operating conditions are extended;

c) in view of the significance of international traffic, the harmonization of existing regulations is required. In some cases, additional rules are required as well: an update of existing regulations is also needed due to the considerable progress achieved in the field of railway-specific methods for measuring, evaluation, and data processing;

d) it is of particular importance that the existing level of safety and reliability is not compromised even when changes in design and operating practices are demanded.

This document is derived in essential parts from UIC 530-2:2011, which is based on practical tests performed in ERRI-B12.

Variations from the conditions specified in this document are allowed as specified by Article 7 of Directive 2016/797/EU.

For national or multilateral operations, variations to the defined conditions can be authorized.

1 Scope

This document defines the assessment of endurable longitudinal compressive force (LCF) of a vehicle. The endurable longitudinal compressive force is a parameter depending on the vehicle design. It is used to estimate the risk of derailment of a vehicle as a result of being subjected to longitudinal compressive force, under operating conditions.

NOTE 1 As operating conditions can vary in several aspects (infrastructure, train configurations etc.), this document defines uniform assessments of endurable longitudinal compressive force per vehicle in specific operating conditions. The main assessment of endurable longitudinal compressive force for conventional trains is derived from UIC 530-2:2011, which is based on practical tests performed in ERRI-B12. Assessments of endurable longitudinal compressive force for high-capacity trains in this document are required by the methodology of IRS 40421. IRS 40421 assesses operational train parameters.

This document applies to the following types of vehicles:

— single wagons;

— permanently coupled units with standard ends between the vehicles;

— permanently coupled units with diagonal buffers and screw couplers between the vehicles;

— permanently coupled units with a bar coupler between the vehicles;

— articulated units with 2-axle bogies;

— wagons with 3-axle bogies;

— low-floor wagons with eight or more axles (e.g. rolling road wagon);

— vehicles with centre couplers;

— railbound construction and maintenance machines as defined in EN 14033-1:2017.

NOTE 2 This document defines the acceptance process to be followed by vehicles that are operated in a way that high longitudinal compressive force occur in the trains due to their operational environment (e.g. train composition, brake mode, track layout).

The following vehicles are not in the scope of this document:

— locomotives and passenger rolling stocks;

— vehicles that are only operated in passenger trains.

NOTE 3 Locomotives, passenger rolling stocks and vehicles operated in passenger trains only are not in the scope of this document as they either are subject to low longitudinal compressive force in operation or have sufficient endurable longitudinal compressive force due to their axle load.

Acceptance criteria and test conditions as well as conditions for simulation are defined in this document. Conditions for dispensation of the assessment of the endurable longitudinal compressive force are also defined in this document.

This document applies principally to vehicles which operate without restrictions on tracks with a gauge of 1 435 mm in Europe.

NOTE 4 The influence on railway systems using other gauges is not sufficiently understood to extend the scope of this document to gauges other than 1 435 mm.

NOTE 5 For wagons with centre couplers, a need for assessment of derailment risk due to Longitudinal Forces on other gauges (1 524 mm, 1 600 mm, 1 668 mm) has been expressed. The influence on railway systems using other gauges is not sufficiently understood. This document only introduces some notions to assess it independently from the gauge.

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 15551:2022, *Railway applications — Railway rolling stock — Buffers*

EN 15566:2022, *Railway applications — Railway Rolling stock — Draw gear and screw coupling*

EN 16235:2023, *Railway applications — Testing for the acceptance of running characteristics of railway vehicles - Freight wagons — Conditions for dispensation of freight wagons with defined characteristics from on-track tests according to EN 14363*

EN 17343:2023, *Railway applications — General terms and definitions*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 17343:2023, the symbols given in Annex A, and the following 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
torsional coefficient of vehicle body
relevant parameter for running safety under compressive forces and safety against derailment on twisted track

Note 1 to entry: Test conditions for deriving the torsional coefficient of a carbody are defined in EN 14363:2016+A2:2022.

3.2
safety against derailment on twisted track
safety of a vehicle against wheel climbing of a guiding wheel whilst negotiating a curved track with limit conditions of twist

Note 1 to entry: Test conditions are defined in EN 14363:2016+A2:2022.

3.3
longitudinal compressive force
longitudinal force which is applied on a vehicle through its interfaces with flanking vehicles

Note 1 to entry: The longitudinal compressive force depends on many parameters such as the composition of the train, the track layout, the driving manoeuvre, and dynamic parameters.

3.4
endurable longitudinal compressive force
longitudinal force which can be applied on a vehicle under defined conditions related to the flanking wagons and the track layout without exceeding limits specified for wheel lift, lateral axle box force, overlap of buffer plates and axle guard deformation

3.5
required endurable longitudinal compressive force
minimum endurable longitudinal compressive force required for a vehicle to be authorized for use in defined operating conditions

3.6
standard end
specific design of the coupling end of a vehicle equipped with side buffers and screw coupling systems

Note 1 to entry: Geometric location of buffers and draw gear is specified in EN 16839:2022. Characteristics of buffers are specified in EN 15551:2022, characteristics of screw coupling systems are specified in EN 15566:2022.

3.7
permanently coupled unit
unit consisting of several single vehicles which cannot be operated separately, each vehicle being fitted with its own running gear

3.8
articulated unit
unit consisting of several elements connected with joints between adjacent elements where the elements cannot be operated separately

3.9
conventional train
train including freight wagons and/or railbound construction and maintenance machines whose composition characteristics (length, mass, brake mode, maximum speed…) are admitted in international traffic

Note 1 to entry: IRS 40421 presents train compositions admitted in international traffic which are conventional trains.

3.10
high-capacity train
train including freight wagons and/or railbound construction and maintenance machines whose composition characteristics (length, mass, brake mode, maximum speed…) are not commonly admitted in international traffic or not admitted yet in any European country

3.11
centre coupler
central buffer end coupling that works automatically for coupling two units together, at least mechanically

Note 1 to entry: a standard on the Digital Automatic Coupler (DAC), which is a specific centre coupler for freight operations, is under preparation.

3.13
railbound construction and maintenance machine
on-track machines and infrastructure inspection machines

3.14
on-track machine
OTM
machine specially designed for construction and maintenance of the track and infrastructure as a self-propelling or as a hauled vehicle, when it is running on its own rail wheels

Note 1 to entry: Modes of the OTM are defined in EN 14033-1:2017.

Note 2 to entry: An OTM is designed to have characteristics necessary for the operation of track-based train detection systems.

[SOURCE: EN 17343:2023, 3.1.7.8.1.1]

3.15
infrastructure inspection machine
self-propelled or hauled machine running on its own rail wheels for inspecting and measuring the infrastructure

Note 1 to entry: Infrastructure inspection machines designed to be incorporated into passenger trains are not considered as railbound construction machines.

Note 2 to entry: An infrastructure inspection machine measuring the tracks only is alternatively referred to as a track recording machine (TRM).

[SOURCE: EN 17343:2023, 3.1.7.8.1.2]

4 Deviations from requirements

If deviating from some points of the requirements of this document for a particular assessment, these deviations shall be reported and explained. Then, the influence on the assessment of the vehicle in terms of the acceptance criteria shall be evaluated and recorded. The outcome of this study shall be considered as an integral part of the requirements of this document when applied to the assessment process of the vehicle, as long as evidence can be furnished that safety is at least the equivalent to that ensured by complying with these rules.

5 Proof of the endurable longitudinal compressive force

5.1 Assessment of endurable longitudinal compressive force

The endurable longitudinal compressive force shall be determined either:

a) by performing propelling tests on the vehicle according to the specification in normative Annex B;

b) by performing simulations according to informative Annex E.

It is not necessary to assess the endurable longitudinal compressive force of vehicles which are not operated in conventional trains or high-capacity trains and therefore are not subjected to high longitudinal compressive force.

5.2 Required endurable longitudinal compressive force for use in conventional trains

For an unlimited operation in conventional trains, the vehicle shall have endurable longitudinal compressive force higher than:

— 200 kN for vehicles or units equipped with single axle running gear;