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English Version

Railway applications - Investigations on vehicles to quantify track loading in curve radii below 250 m

Applications ferroviaires - Investigations sur les véhicules pour quantifier la sollicitation de la voie dans les courbes de rayon inférieur à 250 m

Bahnanwendungen - Untersuchungen an Fahrzeugen zur Quantifizierung der Fahrwegbeanspruchung in Bogenradien unter 250 m

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European foreword

This document (CEN/TS 17843:2022) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

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Introduction

EN 14363 defines necessary tests for assessing running behaviour for vehicle homologation. In the acceptance process the range of curve radii tested during on-track testing is defined with $R_{\min} = 250$ m. A vehicle accepted according to the requirements of this document is able to be operated on all standard gauge tracks complying with EN 13803 [1], which means with $R_{\min} = 150$ m. Beyond that, operation is also permitted even in smaller curve radii. It is state of the art that the minimum curve radius a vehicle is able to negotiate is validated by tests as described in EN 50215:2009, 9.9.2 [2]. These tests cover verification of adequate clearances for operation of the vehicle under specified limited cases (curvature, cant, etc.) in all load conditions and failure modes of the suspension. Running safety in curve radii below 250 m is covered by these tests as well as the proof of safety against derailment in twisted track according to EN 14363:2016+A1:2018, 6.1 (see A.1).

Regardless of the topic 'curve radius' it is stated in the EN 14363 that "experience over many years has demonstrated that vehicles complying with this document can be operated safely on infrastructure with conditions more severe than the target test conditions, if the current general operating rules are applied." General operating rules, including parameters like cant deficiency or axle load, have an influence on the physical effects that are intended to be controlled by this specification.

Most European infrastructure managers operate vehicles accepted according to EN 14363 without requesting additional on-track testing with curve radii lower than 250 m. Despite this, they have been running safely and reliably for many decades.

Depending on experience from some infrastructure managers, facing damages on tracks with curve radii smaller than 250 m after introduction of new rolling stock and modifications of operating conditions national rules were developed to control this field of operation, for example in Austria [5], the Czech Republic (applying also [5]) and Switzerland [4]. The requirements of these national rules differ in detail and make bilateral acceptance unfeasible.

Therefore, this specification has been developed.

NOTE The experience of many countries over many decades shows that for safe operation with an acceptable level of track loading on the whole network it is sufficient to assess vehicles according to EN 14363. It is not the intention of this specification to initiate new national rules in these fields.

1 Scope

This document covers the following aspects:

- Definition of a common method to assess track loading of a heavy rail vehicle for lines of 1 435 mm track gauge in curve radii below 250 m (test zone 5), which is not part of the acceptance testing according to EN 14363. This method is restricted to vehicles with maximum vertical wheelset forces up to 225 kN. It includes consideration of:
 - on-track measurements with instrumented wheelsets;
 - on-track measurements with local measurement sites;
 - simulation including description of requirements for use;
 - recalculation of EN 14363 results including description of requirements for use;
 - simple parameter check (dispensation from assessment of track loading).
- Description of available knowledge of running behaviour of existing vehicles.
- Description of observed track wear and damage related to traffic mix, track loading results of vehicles and axle loads related to track design.

The decision which railway line requires these tests is not part of this specification.

This specification can support national regulations in this field but does not affect directly existing national regulations such as [4] and [5].

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 14363:2016+A1:2018, *Railway applications - Testing and Simulation for the acceptance of running characteristics of railway vehicles - Running Behaviour and stationary tests*

EN 15663, *Railway applications — Vehicle reference masses*

3 Terms and definitions

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

3.1

test zone 5

combination of test conditions regarding speed, cant deficiency and curve radius for curve radii lower than 250 m for which the assessment of the running behaviour is required according to national rules

Note 1 to entry: The relevant lines for which test zone 5 testing is required are specified for Switzerland in [4] and for Austria in [5]. In Czech Republic the application of [5] is required for the whole network.