SLOVENSKI STANDARD
oSIST prEN 16235:2022

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Železniške naprave - Preskušanje voznih karakteristik pri prevzemu železniških vozil - Tovorni vagoni - Pogoji za opustitev preskusne vožnje, opisane v standardu EN 14363, za tovorne vagone z določenimi karakteristikami

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

Bahnanwendungen - Prüfung für die fahrtechnische Zulassung von Eisenbahnfahrzeugen - Güterwagen - Bedingungen für Güterwagen mit definierten Eigenschaften zur Befreiung von Streckenfahrversuchen nach EN 14363

Applications ferroviaires - Essais en vue de l'homologation du comportement dynamique des véhicules ferroviaires - Wagons - Conditions pour la dispense des wagons avec caractéristiques définies concernant les essais en ligne selon l'EN 14363

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 256.

If this draft becomes a European Standard, 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.

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

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Contents

Page

European foreword

This document (prEN 16235:2022) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 16235:2013.

In comparison with the previous edition EN 16235:2013, the following technical modifications have been made:

— Scope adapted to the terminology given in EN 17343 and extended to non-powered special vehicles with operating conditions of freight trains;

— normative references updated;

— references to withdrawn EN 15687 replaced by references to EN 14363 in the whole document;

— in Table 12 and Table 15 the parameter “mass of the wagon” was replaced by a requirement for “axle load” in tare condition;

— modification of the test procedure for a new standardized running gear: requirements for the length of the tested wagons were deleted and replaced by an application range for the wagons based on the lengths of the tested wagons (Table 1 deleted);

— clarification that the use of simulations according to EN 14363 can replace physical testing;

— clarification that the minimum and maximum axle load specified for the application range are the limits for the load conditions for the operation and not necessarily for the design of the wagon;

— Annex ZA deleted.

Introduction

EN 14363 defines the requirements for railway vehicles with respect to running behaviour. The approval process in accordance with EN 14363, including the dispensation defined in this document, is illustrated in normative Annex B, Figure B.1 (flow chart).

It is recognized that experience has demonstrated that running gear fitted to wagons that operate safely can also be fitted to other wagons which are within certain design limits. These other wagons will also operate safely without the need to undergo on-track testing. This experience is based on the characteristics of track design, track maintenance and vehicle maintenance in the European network since 1998. This document defines the process to determine the conditions under which such dispensation from testing can be given for a vehicle defined by the running gear and its relevant parameters together with the associated parameter limits of wagon bodies.

Vehicles for the transport of freight on the railway have historically been subject to standardization. Very early common items like wheels, buffers, draw gear, etc. were developed as standardized components to fulfil safety requirements, for achieving ease of repair and maintenance for international traffic and low cost. Freight wagons have a wide range of applications and consequently the parameters will vary. In the UIC work for the standardization and interchange of freight wagons certain processes for acceptance with respect to running characteristics evolved and these were formalized in UIC 432 and UIC 572 among others. The principles of this document are similar to the intention of these two leaflets.

NOTE Vehicles accepted through the UIC process were also accepted for RIV (Regolamento Internazionale Veicoli) service, i.e. international interchange between the RIV railways. This was replaced by the General Contract of Use for Wagons (GCU) agreement on 1st July 2006. Following the Directive 2008/57/EC the Conventional Rail Technical Specification for Interoperability for Freight Wagons (CR TSI WAG) was elaborated, which contains interoperability requirements for freight wagons.

The following principles apply to the use of this document:

1) the railway system requires comprehensive technical rules in order to ensure an acceptable interaction of vehicle and track;

2) new railway vehicles are approved (in the UIC 432 the term homologated is used) before being placed into service in accordance with numerous national and international regulations. In addition, existing approval is checked when operating conditions are extended. The approval is based on test results, calculations and/or comparisons with existing vehicles in order to achieve a safety level according to the recognized standards and regulations;

3) 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 does not prevent the use of the principles laid down applying to other types of rolling stock.

1 Scope

This document defines the process to determine the conditions under which dispensation from on-track testing according to EN 14363 can be given to freight wagons. In its application this document specifies the means by which dispensation from on-track tests is possible.

This document is subordinate to EN 14363.

The dispensation conditions described in this document apply to all freight wagons and non-powered special vehicles with operating conditions of freight trains, which are operated on the heavy rail network with standard gauge (1 435 mm).

NOTE 1 The various rail-inclinations used in Europe (1:20, 1:40 and 1:30) are covered by the conditions for dispensation.

This document is not limited to any type of freight vehicle; however, freight wagons with defined parameters and equipped with certain running gear types, which have been previously accepted, are considered to have a continuing dispensation from on-track testing. The parameters of these freight wagons and running gear are detailed within this document.

NOTE 2 The test procedures described in this document (and in EN 14363) can be applied also to applications with other track gauges e.g. 1 524 mm or 1 668 mm. The limit values could be different. If established running gear are existing in such restricted networks the related ranges of running gear and vehicle parameters for dispensation from on-track tests might be specified together with the operational parameters (speed, can't deficiency, maximum axle load) based on previous tests and operating experiences. These limit values and parameters will be specified on national level.

This document only contains requirements for characteristics related to requirements for on-track tests specified in EN 14363.

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 13715, *Railway applications — Wheelsets and bogies — Wheels — Tread profile*

EN 14363, *Railway applications — Testing and Simulation for the acceptance of running characteristics of railway vehicles — Running Behaviour and stationary tests*

EN 15313, *Railway applications — In-service wheelset operation requirements — In-service and off-vehicle wheelset maintenance*

EN 15551, *Railway applications — Railway rolling stock — Buffers*

EN 15566, *Railway applications — Railway rolling stock — Draw gear and screw coupling*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

NOTE Other terms and definition can be found in EN 14363 and EN 13749.

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
'declaration of conformity' with this document
declaration that contains all necessary information for the description of a proven vehicle configuration

3.2
standardised running gear
running gear, bogie or single axle suspension system, which ensures compliance with the requirements related to on-track tests as specified in EN 14363 for a vehicle that has vehicle body parameters in a defined range

3.3
established running gear
running gear previously approved by UIC for which compliance with Clause 6 of this document is in place of the 'declaration of conformity' with this document

3.4
homologation file
file that contains the relevant parameters and their permitted modification range that represents the values of the standardised running gear when assessed according to the requirements of Clause 5 of this document

3.5
bogies of Y25 family
bogies that are defined by:

— a torsional elastic frame, consisting of two side beams with or without head beam;

— spring suspension with two sets of helical suspension spring (a set may also consist of one spring) per axle box;

— a lateral and vertical dry friction damping depending on part of the vertical load supported by the axle box;

— a wheelset guiding with a maximum allowed nominal lateral displacement of ± 10 mm

and called for example Y21, Y23, Y25, Y27, Y31, Y33 or Y37

3.6
2-axle steering axle bogie family
steering axle bogie family that is defined by:

— a stiff frame, consisting of two side beams with a head beam;

— a leaf spring mounted in links guiding the axle;

— a nominal longitudinal clearance of the axle guiding of ± 6 mm;

— a nominal lateral clearance of the axle guiding of ± 23 mm;

and called for example DB 65, LHB 82, WU 83, Talbot U

3.7
3-axle steering axle bogie family
steering axle bogie family that is defined by:

— a stiff frame, consisting of two side beams with a head beam;

— a leaf spring mounted in links guiding the axle;

— a nominal longitudinal clearance of the axle guiding of ± 10 mm;

— a nominal lateral clearance of the axle guiding of ± 25 mm;

and called for example DB 711 to DB 715

3.8
mass distribution coefficient
description of the distribution of mass of the vehicle around the vertical axis given by:

$$\Phi = \frac{\sqrt{\frac{I^*_{zz}}{m^*}}}{2a^*} = \frac{i^*_{zz}}{2a^*}$$

where

I^*_{zz} is the moment of inertia of the vehicle body relative to the vertical axis through the centre of gravity of the vehicle body;

i^*_{zz} is the radius of inertia of the vehicle body relative to the vertical axis through the centre of gravity of the vehicle body;

m^* is the mass of the vehicle body;

$2a^*$ is the distance between running gear centres

3.9
coefficient of height of centre of gravity
coefficient which is used to control maximum height of centre of gravity depending on margin of wheel force on outer rail in curves during on-track testing:

$$\chi = Q_0 \left[1 + 2{,}3\ h_{cg} \frac{I_{adm}}{(2b_A)^2} \right]$$

where

Q_0 is the static wheel load;

h_{cg} is the height of the centre of gravity of the vehicle relative to the centre of the wheelset;

I_{adm} is the admissible cant deficiency;

$2b_A$ is the lateral distance between the contact points of the wheels (approximately 1 500 mm for standard gauge)

3.10
factor for track loading parameters
lowest ratio between limit values and estimated values for maximum and quasi-static wheel load:

$$\lambda' = \min\left(\frac{x_{\lim}}{X(PA)_{\max}}; \frac{y_{\lim}}{Y(PA)_{\max}}; \ldots\right)$$

where

$x_{\lim}, y_{\lim}$ are the limit values of the assessment quantities of EN 14363;

$X(PA)_{\max}$, $Y(PA)_{\max}$ are the estimated values of assessment quantities evaluated from on-track tests performed for the assessment quantities Q_{qst} and $Q_{\max}$ for normal measuring method (only applicable for vehicles with static axle loads higher than 225 kN up to 250 kN)

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.

5 Acceptance process to achieve a standardized running gear status

5.1 General

Standardized running gear according to this document shall be certified. For this purpose on-track tests according to EN 14363 shall be carried out with two different vehicles. If both vehicles pass the tests described in 5.2, the running gear shall be certified as standardized running gear in a 'declaration of conformity' with this document that contains:

— a description of the standardized running gear; the relevant parameters and their proven range as specified in 5.3 and 5.4;

— the range of applicable parameters of the vehicle body as specified in 5.5;

— the applicable operating conditions.

Vehicles with parameters within the range defined in the 'declaration of conformity' and equipped with a standardized running gear have dispensation from on-track testing according to EN 14363.

The established running gear defined in Clause 6 of this document shall be regarded as fulfilling the requirements of this chapter and the parameters specified in Clause 6 shall be regarded as equivalent to the 'declaration of conformity'.

This procedure applies only to the on-track tests as required in the relevant clauses of EN 14363. It does not give approval for safety against derailment on twisted track (5.1) and under longitudinal compressive forces in S-shaped curves (5.2).

5.2 Test requirements

5.2.1 Extent of tests

On-track tests shall be carried out according to the complete procedure specified in EN 14363.

The tests shall be performed for the same intended operating conditions (V_{adm} and I_{adm}) with two wagons with different body parameters:

— one wagon of short running gear distance;

— one wagon of long running gear distance.

To achieve a wide range of accepted running gear distances for two axle wagons, it is recommended to test one wagon with $2a^* \leq 7$ m and one wagon with $2a^* \geq 9$ m. For bogie wagons it is recommended to test one wagon with $2a^* \leq 7$ m and one wagon with $2a^* \geq 13$ m.

The torsional coefficient of vehicle bodies shall be between $0{,}5 \cdot 10^{10}$ kNmm²/rad and $8 \cdot 10^{10}$ kNmm²/rad for each tested wagon.

For the purposes of assessment of running behaviour in loaded condition, a typical loading condition shall be tested.

NOTE 1 It is not necessary to test the worst position of centre of gravity (as it is in most cases impossible to have a density of the load, filling the whole loading gauge, that would lead to the maximum axle load).

In addition, 2 axle wagons for speeds ≥ 100 km/h shall be tested in loaded condition also in sections of test zone 2 with clearances given by a gauge ≥ 1 450 mm in combination with wheelsets having distances between active faces at the minimum operation limit.

If the design parameters and the operation parameters require the application of the normal measuring method, it is nevertheless acceptable to perform such tests with one of the vehicles based on measurements of lateral acceleration. In that case, it shall be demonstrated that a relationship exists between accelerations and the sum of the guiding forces on the vehicle tested according to the normal measuring method and a related limit value shall be established.

NOTE 2 This requirement is an extension of the application of the simplified measuring method, using information gathered with vehicle tested according to the normal measuring method.

Physical testing according to EN 14363 can be replaced by simulation if EN 14363 allows for that.

5.2.2 Certification

The compliance of new types of bogies or running gear with the requirements of this document shall be documented in the 'declaration of conformity' with this document. This declaration shall include:

— an unequivocal and unique name for the running gear;

— range of parameters of the running gear (see 5.3);

— detailed technical description of the interface between vehicle body and running gear (see 5.4);

— range of parameters of car bodies to be used together with the running gear (see 5.5);

— wear limits which are essential to sustain an acceptable running behaviour (maintenance rules are outside the scope of this document).

Examples for such information can be found in Annex C to Annex L, where these are given for already accepted running gear.

5.3 Range of running gear parameters for dispensation from on-track tests

The functional details of the running gear relevant to the running behaviour during on-track tests according to EN 14363 shall be specified in the acceptance process. Table 1 and Table 2 give an indication of which parameter shall be available for acceptance purposes. In addition, the following shall be specified:

— admissible speed V_{adm};

— admissible cant deficiency I_{adm}.

Following successful testing according to 5.2 the acceptable parameter variation range for a dispensation from on-track tests for single-axle running gear and bogies is given by the range between the nominal tested parameters of the running gear and the extended range where specified in Table 1 and Table 2 for single-axle running gear and bogies. All parameters given in these tables are nominal values. The upper limit of the acceptable range depends on the maximum tested value of the respective parameter, the lower limit on the minimum tested value.

Successful testing means that on-track tests according to EN 14363 showed compliance with the acceptance criteria given in these standards.

To extend the applicable parameter range of a standardized running gear, test results of a third tested vehicle outside the previously tested range shall be used.

Table 1 — Accepted parameter ranges for a single axle running gear which was tested successfully according to 5.2

Nominal parameter		Minimum	Maximum
Vertical eigenfrequency (see Annex C)	ν_z	$0{,}9 \cdot \nu_{z,tested}$ in load range	$1{,}12 \cdot \nu_{z,tested}$ in load range
Vertical damping		nominal characteristics of tested running gear	
Lateral and longitudinal suspension characteristics		nominal characteristics of tested running gear	
Distance between centres of axle bearings (suspension base)	$2b_z$	$2b_{z,\,tested} - 100$ mm	$2b_{z,\,tested} + 170$ mm
Nominal wheel diameter	D	$D_{tested} - 90$ mm	$D_{tested} + 90$ mm

Table 2 — Accepted parameter ranges for a bogie which was tested successfully according to 5.2

Nominal parameter		Minimum	Maximum
Bogie axle distance (between outer axles of the bogie)	$2a^+$	$2a^+_{\text{tested}}$	$2a^+_{\text{tested}}$ + 0,2 m
Vertical eigenfrequency (see Annex C)	ν_z	$0{,}9 \cdot \nu_{z,\text{tested}}$ in full range between tare and loaded condition	$1{,}12 \cdot \nu_{z,\text{tested}}$ in full range between tare and loaded condition
Vertical damping		nominal characteristics of tested running gear	
Axle guiding longitudinal		nominal characteristics of tested running gear	
Axle guiding lateral		nominal characteristics of tested running gear	
Lateral secondary suspension characteristics		nominal characteristics of tested running gear	
Distance between centres of axle bearings (suspension base)	$2b_z$	$2b_{z,\text{tested}}$ − 100 mm	$2b_{z,\text{tested}}$ + 170 mm
Yaw moment of bogie [a]	M^*_z	$0{,}8 \cdot M^*_{z,\text{tested}}$	$1{,}2 \cdot M^*_{z,\text{tested}}$
Moment of inertia of whole bogie (around z-axis)	I^*_{zz}	-	$1{,}1 \cdot I^*_{zz,\text{tested}}$
Nominal wheel diameter	D	D_{tested} − 90 mm	D_{tested} + 90 mm
Nominal height of centre pivot relative to centre of wheelset	h_{cp}	$h_{cp,\text{tested}}$ − 150 mm	$h_{cp,\text{tested}}$ + 50 mm

[a] For a friction based yaw resistance torque measured at two specified loads typical for tare and loaded condition. For other systems, appropriate parameters shall be used to control stability and safety against derailment in tare condition and maximum guiding force in loaded conditions.

5.4 Description of the interface between running gear and vehicle body

A description of the physical interface between running gear and vehicle body shall include:

— the yaw characteristics of the running gear;

— range of vertical characteristics of side bearers (if applicable);

— range of characteristics of secondary suspension (stiffnesses, hysteresis/damping) (if applicable);

— drawings.

5.5 Range of vehicle body parameters for dispensation from on-track tests

The functional details of the vehicle body relevant to the running behaviour during on-track tests according to EN 14363 shall be specified in the acceptance process. Table 3 gives an indication of which parameter shall be available for acceptance purposes.

Table 3 — Accepted parameter range for vehicles (including articulated wagons and permanently coupled units) equipped with a running gear which was tested successfully according to 5.2

		Minimum	Maximum
Distance between wheelsets (non bogie vehicles)	$2a^*$	For $2a^*_{tested} < 6{,}0$ m: $2a^*_{tested}$ [c] For $2a^*_{tested} \geq 6{,}0$ m: Highest value of either 6,0 m or $2a^*_{tested} - 1{,}0$ m [c]	Lowest value of either 10,0 m or $2a^*_{tested} + 1{,}0$ m
Distance between bogie centres (bogie vehicles)	$2a^*$	For $2a^*_{tested} < 6{,}5$ m: $2a^*_{tested}$ [c] For $2a^*_{tested} \geq 6{,}5$ m: Highest value of either 6,5 m or $2a^*_{tested} - 0{,}5$ m [c]	$2a^*_{tested} + 3{,}0$ m
Centre of gravity height of tare wagon	$h_{cg,\,tare}$	-	$1{,}2 \cdot h_{cg,tare,tested,\,max}$
Centre of gravity height of loaded wagon	$h_{cg,\,loaded}$	-	$1{,}2 \cdot h_{cg,loaded,tested,\,max}$ [b]
Coefficient of height of centre of gravity – loaded vehicle [a]	χ	-	$\chi_{loaded,tested,max} \cdot (1 + 0{,}8\,(\lambda' - 1))$ with λ' – factor for track loading parameters (see 3.10)
Torsional coefficient per vehicle body	c_t^*	$> 0{,}5 \cdot 10^{10}$ kNmm^2/rad	-
Mean axle load of the tare wagon (non-bogie wagon)	$P_{mean,tare}$	If $P_{mean,tare,tested} \leq 6{,}75$ t: Lowest value of either 5,75 t or $P_{mean,tare,tested}$ else $0{,}85 \cdot P_{mean,tare,tested}$	-
Mean axle load of the tare wagon (bogie wagon)	$P_{mean,tare}$	If $P_{mean,tare,tested} \leq 4{,}7$ t: Lowest value of either 4 t or $P_{mean,tare,tested}$ else $0{,}85 \cdot P_{mean,tare,tested}$	-
Maximum axle load	P	-	$1{,}05 \cdot P_{tested}$