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Nadomešča:
SIST EN 13848-5:2008+A1:2011

Železniške naprave - Zgornji ustroj - Kakovost tirne geometrije - 5. del: Ravni kakovosti tirne geometrije - Preproste linije, kretnice in križišča

Railway applications - Track - Track geometry quality - Part 5: Geometric quality levels - Plain line, switches and crossings

Bahnanwendungen - Oberbau - Qualität der Gleisgeometrie - Teil 5: Geometrische Qualitätsstufen - Gleise, Weichen und Kreuzungen

Applications ferroviaires - Voie - Qualité géométrique de la voie - Partie 5 : Niveaux de qualité géométrique de la voie - Voie courante et appareils de voie

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ICS:

45.080	Tračnice in železniški deli	Rails and railway components
93.100	Gradnja železnic	Construction of railways

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Railway applications - Track - Track geometry quality - Part 5: Geometric quality levels - Plain line, switches and crossings

Applications ferroviaires - Voie - Qualité géométrique de la voie - Partie 5 : Niveaux de la qualité géométrique de la voie - Voie courante et appareils de voie

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European foreword

This document (EN 13848-5:2017) 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of an identical text or by endorsement, at the latest by February 2018, and conflicting national standards shall be withdrawn at the latest by February 2018.

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 13848-5:2008+A1:2010.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 2008/57/EC.

For relationship with EU Directive 2008/57/EC, see informative Annex ZA, which is an integral part of this document.

This European Standard is one of the series EN 13848 *Railway applications – Track – Track geometry quality* as listed below:

— *Part 1: Characterization of track geometry*

— *Part 2: Measuring systems – Track recording vehicles*

— *Part 3: Measuring systems – Track construction and maintenance machines*

— *Part 4: Measuring systems – Manual and light weight devices*

— *Part 5: Geometric quality levels – Plain line, switches and crossings*

— *Part 6: Characterization of track geometry quality*

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard defines the minimum requirements for the quality levels of track geometry, and specifies the safety related limits for each parameter as defined in EN 13848-1 and measured by any track geometry measurement system as defined in EN 13848-2, EN 13848-3 and EN 13848-4.

This European Standard covers the following topics:

— immediate action limits (IAL);

— recommendations on tolerance levels for isolated defects;

— relative importance of parameters with respect to the vehicle behaviours.

The necessity to measure, the frequency of measurements and the selection of measured parameters are not covered by this European Standard.

This European Standard applies to high-speed and conventional lines, including switches and crossings, of 1 435 mm and wider gauge railways provided that the vehicles operated on those lines comply with EN 14363 and other vehicle safety standards.

This European Standard does not apply to Urban Rail Systems.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 13848-1:2003+A1:2008, *Railway applications - Track - Track geometry quality - Part 1: Characterisation of track geometry*

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

EN 13803:2017, *Railway applications - Track - Track alignment design parameters - Track gauges 1 435 mm and wider*

3 Terms and definitions

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

3.1
nominal track gauge
reference value for track gauge used by individual networks

3.2
design track gauge
design value of track gauge for a given track section, which might be different from the nominal track gauge

3.3
mean track gauge
sliding arithmetic mean track gauge over a specified distance

Note 1 to entry: In this European Standard a length of 100 m is applied.

3.4
QN3 level
quality limit for discrete track defects in accordance with EN 14363

3.5
isolated defect
part of the signal exceeding a given limit such as *IAL*, *IL* or *AL* with at least one sample for a sampling distance of 0,25 m

Note 1 to entry: The length of the exceedance is given by the number of samples exceeding the limit.

4 Symbols and abbreviations

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

Table 1 — Symbols and abbreviations

Symbol or abbreviation	Designation	Unit
AL	Alert limit	mm or mm/m
IL	Intervention limit	mm or mm/m
IAL	Immediate action limit	mm or mm/m
D1	Wavelength range *D1*: 3 m < λ ≤ 25 m	m
D2	Wavelength range *D2*: 25 m < λ ≤ 70 m	m
D3	Wavelength range *D3*: 70 m < λ ≤ 150 m for longitudinal level Wavelength range *D3*: 70 m < λ ≤ 200 m for alignment	m
ℓ	Twist base-length	m
λ	Wavelength	m
N/A	Not applicable	
R	Curve radius	m
D	Cross level	mm
V	Speed	km/h

5 General Considerations

The importance of assessing the track geometric quality arose in the middle of the 20th century. Therefore, European Infrastructure Managers developed their own track recording vehicles allowing a continuous measurement of track geometry and based on this experience, their own track geometry quality evaluation standards evolved.

These independent developments resulted in different measuring and evaluation methods which are no longer adequate in the light of the requirements of European railway interoperability. This is because it is difficult to compare the track geometry conditions of various European infrastructures. Yet, at least for safety reasons, it is necessary to make such comparisons. The main purpose of the standard is to define minimum requirements for track geometry based on isolated defects to ensure safe operation of trains. It is based on both the experience of various European Infrastructure Managers and current track conditions.

This European Standard sets out quality levels, in particular immediate action limits (IAL), with the aim of harmonizing European track geometry quality standards.

It can be significant in:

— setting minimum requirements for the level of track geometry quality in order to manage safe operation;

— optimization of track geometry maintenance works;

— optimization of vehicle ride quality and dynamic loading of the track;

— harmonizing vehicle acceptance procedures.

Requirements given in this European Standard should be taken into account:

— by Infrastructure Managers;

— by track maintenance managers;

— by vehicle manufacturers;

— by track contractors;

— by regulatory authorities;

— for research purposes.

The values stated in this European Standard are based on the values prescribed by various European networks. Furthermore, this standard takes into account, as far as possible, the studies made on this topic:

— survey on isolated defects;

— ORE Question B55 report No 8 [6];

— Technical Report CEN/TR 16978 [7].

6 Assessment of track geometry quality

All the parameters as defined in EN 13848-1 are encompassed in this European Standard; their respective importance and their influence on vehicle behaviour are described in Annex A.

Three indicators can describe the track geometric quality:

— extreme values of isolated defects;

— standard deviation over a defined length, typically 200 m;

— mean value.

Consideration should be given to successions of isolated defects because they could generate resonance effects, and to combinations of defects in several parameters at the same location (see Annex A).

Three main levels shall be considered:

— Immediate Action Limit (*IAL*): refers to the value which, if exceeded, requires taking measures to reduce the risk of derailment to an acceptable level. This can be done either by closing the line, reducing speed or by correction of track geometry;

— Intervention Limit (*IL*): refers to the value which, if exceeded, requires corrective maintenance in order that the immediate action limit shall not be reached before the next inspection;

— Alert Limit (*AL*): refers to the value which, if exceeded, requires that the track geometry condition is analysed and considered in the regularly planned maintenance operations.

These values are given as a function of speed, which is an important factor for the evaluation of track geometry quality. EN 13848-2, EN 13848-3 and EN 13848-4 give measuring methods for track geometry whereby track geometry quality can be assessed.

The values in the tables are given for a loaded track as defined in EN 13848-1. When the measurements are made on unloaded track, the difference in the measured values that may result need to be taken into account.

The normative part of the standard gives *IAL*s for isolated defects and minimum mean track gauge and ILs for maximum mean track gauge.

The informative part of this European Standard gives *IL*s and *AL*s for isolated defects and mean track gauge, and *AL*s for standard deviations.

The track geometry limits *AL*, *IL* and *IAL* may differ from the levels defined for other purposes as for example vehicle acceptance. More particularly QN3 is quite different from *IAL* because, in accordance with EN 14363, it characterizes track sections which do not exhibit the usual track geometry quality. Quality level QN3 does not represent the most adverse condition; rather, it represents a still tolerable maintenance status which allows regular train operations.

Further quality levels of track geometry may be used for track works acceptance (see EN 13231-1).

NOTE The intervention limit depends on the corrective maintenance policy, the frequency of inspection and defect growth rate.

7 Immediate action limits

7.1 Introductory remarks

The immediate action limit values given in this standard are derived from experience, from actual track condition and from theoretical considerations of the wheel-rail interaction as physical tests with different vehicles up to the point of derailment are not practicable. A survey made among European networks showed that the values set in the tables are consistent with the current conditions.

Considering the lack of experience at speeds higher than 300 km/h, IALs for these speeds are set on the basis of extrapolation from values at lower speeds.

Exceeding these immediate action limit values requires specific measures to be implemented to reduce the risk of derailment or other hazards to an acceptable level.

It is permitted to consider only those exceedances with a minimum length of 1 m as an isolated defect. By applying this option the limit value is relaxed implicitly; therefore the limit of *IAL* shall be lowered accordingly. Typically for longitudinal level D1 reductions between 5 % and 10 % can be expected.

The wavelength range *D3* is not taken into account in the following, as it is not directly linked with safety, but more with vehicle ride quality.

With the exception of track gauge, all limit values stated below shall be applied to the mathematical absolute value of the measured track geometry parameters.

7.2 Track gauge

The values provided in the Tables 2 and 3 apply to nominal track gauges 1 435 mm and wider. In the latter case the limit values can be modified in accordance with the tolerances of the distance between the flange contact faces of the wheelset.

The minimum and maximum values in Table 2 and Table 3 refer to the nominal track gauge and are independent from the design track gauge.

This standard gives no *IAL* maximum values for mean track gauge because the risk associated with a wide mean track gauge is covered by the *IAL* values of isolated defects of track gauge. Minimum *IAL* values for mean track gauge are set in order to control one important parameter influencing equivalent conicity. Nevertheless normative intervention limit values are given for maximum mean track gauge in 8.2.

Table 2 — Track gauge – *IAL* – Isolated defects – Nominal track gauge to peak value

Speed (in km/h)	**Nominal track gauge to peak value [mm] *IAL***	
	Minimum	**Maximum**
$V \leq 80$	**−11**	**+35**
$80 < V \leq 120$	−11	+35
$120 < V \leq 160$	−10	+35
$160 < V \leq 230$	−7	+28
$230 < V \leq 300$	−5	+28
$300 < V \leq 360$	−5	+28
NOTE 1 Except for speeds higher than 300 km/h, the immediate action limits are normative. NOTE 2 These limit values are superseded by the values defined in INF TSI where applicable.		

The values in Table 2 may be stricter in switches and crossings in order to respect specific safety parameters.

Table 3 — Track gauge – *IAL* – Nominal track gauge to mean track gauge over 100 m

Speed (in km/h)	Nominal track gauge to mean track gauge over 100 m [mm]
	Minimum
$V \leq 40$	*N/A*
$40 < V \leq 80$	−8
$80 < V \leq 120$	−7
$120 < V \leq 160$	−5
$160 < V \leq 230$	−5
$230 < V \leq 300$	−3
$300 < V \leq 360$	−2
NOTE Except for speeds higher than 300 km/h, the immediate action limits are normative.	

The slow deterioration of mean track gauge gives time to plan maintenance when the intervention limit (IL) is reached, and therefore IAL values should normally not be reached.

The minimum values in Table 3 may be relaxed by 1 mm when the nominal rail inclination is 1:20.

7.3 Longitudinal level

The IAL values for longitudinal level isolated defects are given in Table 4.

Table 4 — Longitudinal level – *IAL* – Isolated defects – Zero to peak value

Speed (in km/h)	Zero to peak value [mm]	
	Wavelength range	
	D1	***D2***
$V \leq 80$	28	*N/A*
$80 < V \leq 120$	26	*N/A*
$120 < V \leq 160$	23	*N/A*
$160 < V \leq 230$	20	24
$230 < V \leq 300$	16	18
$300 < V \leq 360$	14	16
NOTE Except for speeds higher than 300 km/h, the immediate action limits are normative.		

In Table 4, for speeds less than or equal to 40 km/h, the limit can be relaxed to 31 mm.

Special attention should be paid to short wavelength defects which, although unlikely, can become dangerous when their amplitude is high.