SLOVENSKI STANDARD
SIST EN 13848-5:2008+A1:2011

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Železniške naprave - Zgornji ustroj - Kakovost tirne geometrije - 5. del: Ravni kakovosti tirne geometrije

Railway applications - Track - Track geometry quality - Part 5: Geometric quality levels - Plain line

Bahnanwendungen - Oberbau - Qualität der Gleisgeometrie - Teil 5: Geometrische Qualitätsstufen - Gleise

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

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93.100	Gradnja železnic	Construction of railways

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Foreword

This document (EN 13848-5:2008+A1:2010) 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of an identical text or by endorsement, at the latest by October 2010, and conflicting national standards shall be withdrawn at the latest by October 2010.

This document includes Amendment 1, approved by CEN on 2010-03-22.

This document supersedes EN 13848-5:2008.

The start and finish of text introduced or altered by amendment is indicated in the text by tags ⟩A1⟨ ⟩A1⟨.

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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 96/48/EC of 23rd July 1996 on the interoperability of the trans-European high-speed rail system amended by the EU Directive 2004/50/EC of the European Parliament and of the Council of 29th April 2004.

For relationship with EU Directive, 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: Characterisation 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* [1)]

— ⟩A1⟨ *Part 5: Geometric quality levels — Plain line* ⟩A1⟨

According to the CEN/CENELEC Internal Regulations, the national standards organizations 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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

[1)] To be published.

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.

This standard covers the following topics:

— description of quality levels;

— relative importance of parameters;

— immediate action limit;

— considerations on other quality levels.

This European Standard applies to high-speed and conventional plain line 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.

For lines covered by the high speed infrastructure TSI, the requirements stated in the HS INS TSI prevail. Any track geometry parameter not covered by the HS INS TSI needs to be compliant with this European Standard.

2 Normative references

Not applicable.

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
QN1 level
refer to EN 14363

3.4
QN2 level
refer to EN 14363

3.5
QN3 level
refer to EN 14363

4 Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations 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
HS INS TSI	High Speed Infrastructure Technical Specification for Interoperability	
ℓ	Twist base-length	m
λ	Wavelength	m
N/A	Not applicable	
r	Curve radius	m
u	Cross level	mm
V	Speed	km/h

5 Background

The importance of knowing the track geometric quality arose in the middle of 20th century, when European infrastructure managers developed their own track recording vehicles allowing a continuous measurement of track geometry and based on this, their own track geometry quality evaluation standards.

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 a minimum track geometry quality to ensure safe operation of trains based on the experience of various European infrastructure managers.

6 Overview

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

It can be significant in:

— optimisation of track geometry maintenance works;

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

— harmonising 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 railways. Furthermore, this standard takes into account, as far as possible, the previous studies made on this topic:

— Annex C of EN 14363:2005;

— *TSI* for high-speed line infrastructure;

— ORE Question B55 report N.o 8 (1983).

7 Assessment of track geometric 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.

NOTE 1 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 have to 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. Parts 2, 3 and 4 of EN 13848 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 for 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* differ from the 3 vehicle acceptance levels QN1, QN2 and QN3 used in EN 14363. More particularly QN3 is quite different from *IAL* because, according to EN 14363, it characterises track sections which do not exhibit the usual track geometry quality. Quality level QN3, however, does not represent the most adverse but still tolerable maintenance status which still allows regular train operations.

NOTE 2 A further quality level of track geometry can be used for track works acceptance (see EN 13231-1).

NOTE 3 The intervention limit depends on the corrective maintenance policy, the frequency of inspection and defect growth rate.

8 Immediate action limits

8.1 Introductory remarks

The immediate action limit values given in this standard are derived from experience and from theoretical considerations of the wheel-rail interaction as physical tests with different vehicles up to the point of derailment are not practicable.

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.

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.

The immediate action limits given in the following tables and figures are normative.

With the exception of track gauge, all values stated are absolute.

8.2 Track gauge

The values provided in the following tables apply to the nominal track gauges 1 435 mm, 1 524 mm and 1 668 mm. Networks using other nominal track gauges shall adjust the values accordingly.

The reference for the track gauge in the *HS INS TSI* is 1 435 mm.

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

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

Speed (in km/h)	Nominal track gauge to peak value (in mm) *IAL*		Nominal track gauge to peak value (in mm) *HS INS TSI* (reminder)	
	Minimum	Maximum	Minimum	Maximum
$V \leq 80$	-11	+35	-9	+35
$80 < V \leq 120$	-11	+35	-9	+35
$120 < V \leq 160$	-10	+35	-8	+35
$160 < V \leq 230$	-7	+28	-7	+28
$230 < V \leq 300$	-5	+28	-5	+28

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 (in mm)	
	Minimum	Maximum
$V \leq 40$	*N/A*	+32
$40 < V \leq 80$	-8	+32
$80 < V \leq 120$	-7	+27
$120 < V \leq 160$	-5	+20
$160 < V \leq 230$	-5	+20
$230 < V \leq 300$	-3	+20

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

Table 4 — Gauge – *HS INS TSI IAL* – Minimum value of mean gauge (mm) over 100 m in service, on straight track and in curves of radius *R* > 10 000 m (reminder)

Speed (in km/h)	Minimum value of mean gauge (mm) over 100 m in service, on straight track and in curves of radius *R* > 10 000 m
$V \leq 160$	1 430
$160 < V \leq 200$	1 430
$200 < V \leq 230$	1 432
$230 < V \leq 250$	1 433
$250 < V \leq 280$	1 434
$280 < V \leq 300$	1 434
$V > 300$	1 434

8.3 Longitudinal level

Table 5 — Longitudinal level – *IAL* – Isolated defects – Mean to peak value

Speed (in km/h)	Mean to peak value (in 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	33
$230 < V \leq 300$	16	28

The mean, in the table above, is calculated over a length of at least twice the higher wavelength in the *D1* or *D2* range. In practice the mean will be close to zero and therefore zero to peak values may be used.

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

NOTE For speeds less than or equal to 40 km/h, the limit can be relaxed to 31 mm.

8.4 Cross level

This standard gives no *IAL* values for cross level because the risk associated with a cross level defect is tied to twist and cant deficiency. *IAL* values for twist are given in 8.6. Cant deficiency limits depend on the track alignment design and construction rules, and the characteristics of the traffic, on each network.

Each infrastructure manager may specify limits for his own network taking into account the above characteristics.