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Title: BS EN 15273-1 Railway applications - Gauges

Part 1: General - Common rules for infrastructure and rolling stock and Infrastructure

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

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Submission of Comments

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

English Version

Railway applications - Gauges - Part 1: General - Common rules for Rolling Stock and Infrastructure

Applications ferroviaires- Gabarits - Partie1 :
Explications de base et règles communes pour Matériel
roulant et Infrastructure

Bahnanwendungen - Begrenzungslinien - Teil 1:
Allgemeines - Gemeinsame Vorschriften für Fahrzeuge
und Infrastruktur

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.

This draft European Standard was established by CEN in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.



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 (prEN 15273-1:2023) 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, together with prEN 15273-4:2023, will supersede EN 15273-1:2013+A1:2016.

prEN 15273 series consists of the following parts:

- prEN 15273-1:2023, *General -common rules for Rolling stock and Infrastructure* gives the general explanations of gauging and defines the sharing of the space between Rolling stock and infrastructure;
- prEN 15273-2:2023, *Rolling stock* gives the rules for dimensioning vehicles;
- prEN 15273-3:2023, *Infrastructure* gives the rules for positioning the infrastructure;
- prEN 15273-4:2023, *Catalogue of defined gauges* includes a non-exhaustive list of reference profiles and parameters to be used by infrastructure and Rolling stock;
- prCEN/TR 15273-5:2023, *Background, explanation and worked examples*.

The characteristics of issue 2023 of prEN 15273 series are:

- introduction of absolute and comparative gauging process in parts 1, 2, 3 and 5;
- specific rules given for each defined gauge in prEN 15273-2:2023 and prEN 15273-3:2023 are replaced by a common general set of basic formulae applicable for all. The applicable reference profile and the specific associated rules are given in part 4;
- a new prEN 15273-4:2023 gives the catalogue of gauges and associated rules coming from EN 15273-1:2013+A1:2016;
- a new prCEN/TR 15273-5:2023 gives background elements coming from EN 15273-1:2013+A1:2016 and worked examples.

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

- the series was fully restructured, from three parts to five parts;
- Clause 3 and clause 4 now refer to prEN 15273-1:2023 where all terms and symbols are defined;
- harmonisation of symbols and index level for all parts of this series of standards;
- grouping in Annex A of the calculation elements specific to all defined templates from the paragraphs of Clauses 5, 6, 7 and 8;
- grouping in Annex B of elements specific to the defined kinematic gauge of Clauses 5, 6, 7 and 8;
- grouping in Annex C of elements specific to the static gauge defined in Clauses 5, 6, 7 and 8;
- improvement and grouping into Annex D of the dynamic gauge specific elements defined in Clauses 5, 6, 7 and 8;

prEN 15273-1:2023 (E)

- content of 7.3.1.1.3 and 7.3.1.3 moved into prCEN/TR 15273-5:2023;
- Annexes B, C, D and F moved into prEN 15273-4:2023;
- removal of Annexes E, I and K;
- reordering of Annex H;
- Annex J moved into prCEN/TR 15273-5:2023;
- creation of normative Annex E for the description of the absolute gauging process;
- creation of normative Annex F for the description of the comparative gauging process.

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s) / Regulation(s).

For relationship with EU Directive(s) / Regulation(s), see informative Annex ZA, which is an integral part of this document.

Introduction

The aim of this document is to define the rules for the calculation and verification of the dimensions of rolling stock and infrastructure from a gauging perspective.

This document sets out gauging processes taking into account the relative movements between rolling stock and infrastructure as well as the necessary margins or clearances.

prEN 15273-1:2023 covers generic explanations and methods of gauging and is used in conjunction with the following parts:

- *Part 2: Rolling stock;*
- *Part 3: Infrastructure;*
- *Part 4: Catalogue of defined gauges;*
- *Part 5: Background, explanation and worked examples.*

1 Scope

This document contains:

- the definitions and symbols for all EN 15273 documents;
- the general explanation of various elements and phenomena affecting heavy rail gauging;
- the general explanation of various calculation methods and processes applicable to the heavy rail gauging that allow the dimensioning of the rolling stock and the infrastructure.

This document is applicable to heavy rail vehicles and networks using various track gauges. Other vehicles and networks are outside the scope of this document, but the rules may be applied to them.

This document is not applicable to the gauges “S” and “T” for track gauge 1 520 mm.

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.

prEN 15273-2:2023, *Railway applications — Gauges — Part 2: Rolling stock*

prEN 15273-3:2023, *Railway applications — Gauges — Part 3: Infrastructure*

prEN 15273-4:2023, *Railway applications — Gauges — Part 4: Catalogue of defined gauges*

prCEN/TR 15273-5:2023, *Railway applications — Gauges — Part 5: Background, explanation and worked examples*

EN 15313:2016, *Railway applications - In-service wheelset operation requirements - In-service and off-vehicle wheelset maintenance*

EN 15663:2017+A1:2018, *Railway applications — Vehicle reference masses*

EN 50119:2020, *Railway applications — Fixed installations — Electric traction overhead contact lines*

EN 50367:2020, *Railway applications — Current collection systems — Technical criteria for the interaction between pantograph and overhead line (to achieve free access)*

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 standardisation at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

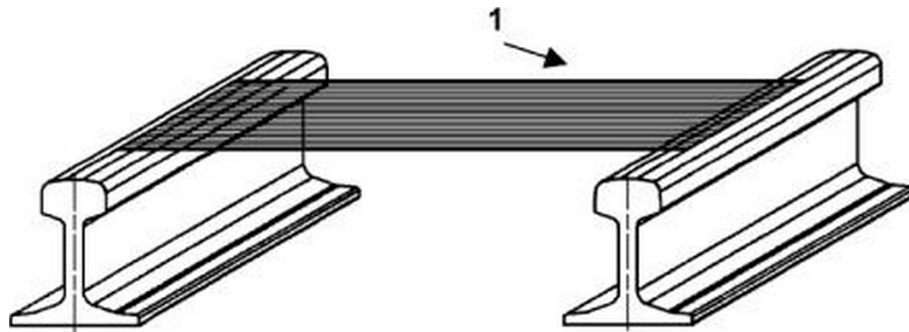
3.1 gauging process

procedure by means of which the dimensional compatibility of rolling stock and infrastructure is determined

3.2

running plane

plane tangential to the running surface as defined in EN 17343:2020, 3.1.5.3.2 and as shown in Figure 1



Key

- 1 running plane

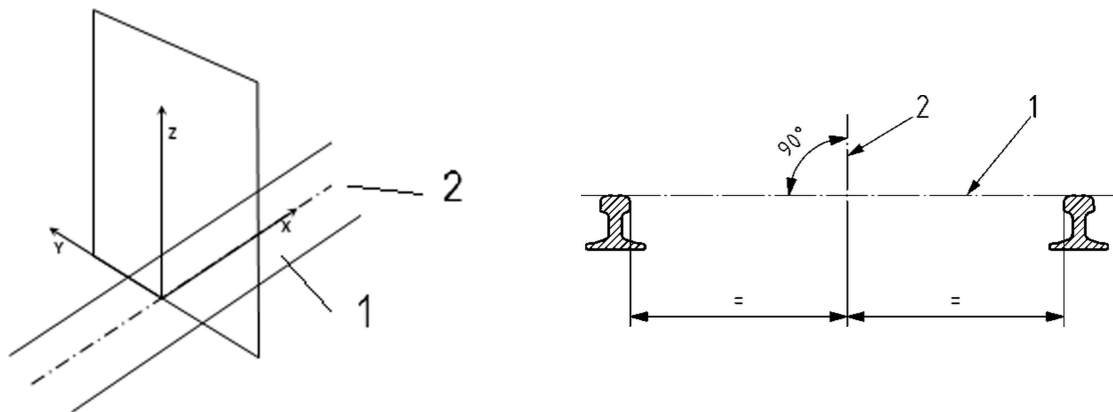
Figure 1 — Running plane

3.3

normal co-ordinates

co-ordinates defined in a plane normal to the longitudinal centreline of the rails at a nominal position on a theoretically perfect track

Note 1 to entry: One of these axes is the intersection of the normal plane with the running plane. The other axis, commonly referred to as vertical axis, is perpendicular to the running plane. For calculation purposes, the vertical axis is used as a common reference for infrastructure and rolling stock (see Figure 2).



Key

- 1 running plane (X and Y)
2 longitudinal centreline of the vehicle and of the track (X)
3 vertical centreline of the vehicle (Z)

Figure 2 — Normal co-ordinates

3.4

effective track position

used during the absolute gauging process, and represents a position that the track could realistically or with high probability occupy relative to structures or to an adjacent track at some times within its maintenance cycle

3.5

reference vehicle

theoretical or actual vehicle, the parameters of which are used to establish the rules associated with a reference profile to obtain a gauge

3.6

comparator vehicle

existing rolling stock already geometrically compatible with infrastructure and operating on a specified route to be used for the comparative gauging process

3.7

defined gauge

reference profile and its associated rules allowing definition of the outer dimensions of the rolling stock and the space to be cleared by the infrastructure

Note 1 to entry: According to the calculation method implemented, the gauge will be a static, kinematic or dynamic.

3.8

reference profile

CR

virtual line related to the normal coordinates and used, together with the associated rules, as a common basis to determine infrastructure gauge and the vehicle gauge

3.9**upper part**

part of the reference profile as set out in prEN 15273-4:2023 for the defined gauges

Note 1 to entry: This corresponds to the upper sector for the absolute and comparative gauging process.

3.10**lower part**

part of the reference profile as set out in prEN 15273-4:2023

Note 1 to entry: This corresponds to the lower sector for the absolute and comparative gauging process.

3.11**bottom line**

line corresponding to the minimum height of the construction gauge

3.12**curve overthrow** **dg**

distance in direction Y or Z between the track and the vehicle in a curve

Note 1 to entry: See details in Figures A.2; E.2 for horizontal curve and A.7 for vertical curve.

Note 2 to entry: “curve overthrow” can also be called “geometric overthrow”.

3.13**associated rules**

set of rules associated with each reference profile in order to size the infrastructure or rolling stock

3.14**lateral projection** **S**

sum of these two values:

- S_R , value agreed between Infrastructure Manager and Railway Undertaking based on the lateral curve overthrow of reference vehicles;
- S_L , is the widening of the track gauge.

Note 1 to entry: See prCEN/TR 15273-5:2023 for more explanations.

Note 2 to entry: Lateral projection is also known as saillie.

3.15**vertical projection** **S_v**

value agreed between Infrastructure Manager and Railway Undertaking based on the vertical curve overthrow of reference vehicles

Note 1 to entry: See prCEN/TR 15273-5:2023 for more explanations.

Note 2 to entry: Vertical projection is also known as saillie.

3.16**absolute (swept envelope) vehicle gauge**

vehicle gauge which may have multiple swept envelopes associated with it

3.17

absolute (swept envelope) infrastructure gauge

absolute (swept envelope) vehicle gauge(s) plus track tolerances and clearance

Note 1 to entry: Absolute (swept envelope) Infrastructure gauges are used to facilitate construction and maintenance of the infrastructure, not compatibility.

3.18

clearance

free space or allowance between two elements, in particular, for absolute and comparative gauging process, the minimum calculated distance between the swept envelope of a vehicle and fixed infrastructure or between swept envelopes of two vehicles on adjacent tracks

3.19

absolute gauging process

set of rules allowing the comparison of the swept envelope of a vehicle with infrastructure profiles on a given route and vehicles on adjacent track

3.20

comparative gauging process

set of rules allowing the comparison of the swept envelopes of a candidate vehicle and a comparator vehicle in order to assess route compatibility

3.21

swept envelope

cross sections perpendicular to the running plane encompassing all the points swept by the vehicle under consideration with its dynamic displacements in any possible position combined with running and operating conditions on a track of a given quality

3.22

hybrid gauging process

combination of various gauging processes applied to a vehicle to assess route compatibility

3.23

displacement coefficient

A

factors applied to the clearance between wheelsets and track and to the lateral clearances between wheelsets and bogie frame and between bogie frame and body

3.24

quasi-static roll

movement resulting from the inclination of the suspended parts under the influence of gravity (canted track) and/or centrifugal acceleration (curved track) without taking account of any additional dynamic effects

3.25**roll centre** **C**

point C is known as the roll centre of the vehicle and its distance h_c from the running plane is known as the height of the roll centre

h_c may be measured or calculated, in the case of extreme vehicle/bogie positions, this h_c height shall be taken into account with regard to one of the vehicle/bogie bumps stops:

- rotation movement stop;
- central movement stop.

3.26**cant** **D**

amount by which one running rail is raised above the other running rail, in a track cross section

3.27**equilibrium cant** **D_{eq}**

cant at a particular speed at which the vehicle will have a resultant force perpendicular to the running plane

3.28**cant excess**

difference between applied cant and a lower equilibrium cant

Note 1 to entry: See prCEN/TR 15273-5:2023 for details.

3.29**cant deficiency** **I**

difference between applied cant and a higher equilibrium cant

Note 1 to entry: See prCEN/TR 15273-5:2023 for details.

3.30**cross level**

cant measured on the track

3.31**flexibility coefficient** **s**

ratio of the angle η (angle between the vertical axis of the carbody tilted on its suspensions and the plane perpendicular to the running plane) to the angle δ (between the running plane and the horizontal plane) with the vehicle stationary on a canted track

Note 1 to entry: See detailed explanation in Annex A.

3.32**dissymmetry** **η_0**

angle η_0 between the centreline of the body of a stationary vehicle on a level track and the vertical axis

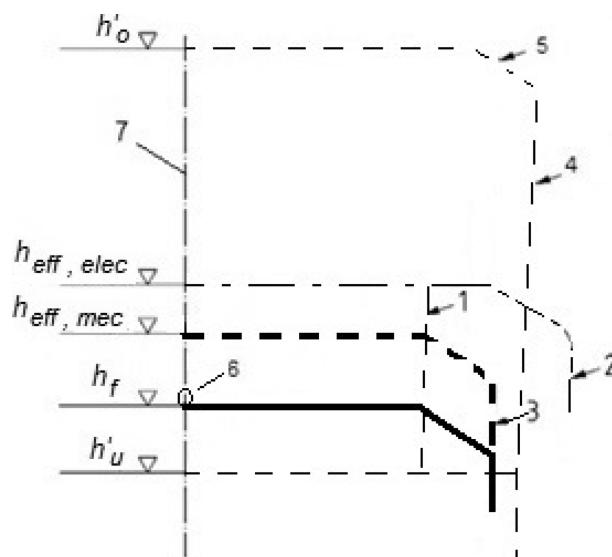
Note 1 to entry: The dissymmetry may come from construction tolerance or off-centred loading. See detailed explanation in Annex A.

3.33

pantograph gauges

reference profile with its associated rules which verifies that the raised pantograph head remains within the allocated space

Note 1 to entry: See Figure 3.



Key

- 1 electrical pantograph gauge (with insulated horn)
- 2 electrical pantograph gauge (with non-insulated horn)
- 3 pantograph
- 4 pantograph reference profile
- 5 corner according to the form of the pantograph
- 6 contact wire with the pantograph in a collecting position
- 7 track centreline

Figure 3 — Pantograph gauges

Note 1 to entry: See Figure B.4. for more details.

3.34

mechanical pantograph gauge

reference profile and its associated rules allowing definition of the space to be cleared by all the structures in order to ensure passage of the pantograph in the raised position, taking account of the maintenance allowances and of the displacements considered by the Infrastructure Manager

Note 1 to entry: See Figure 4.

3.35

electrical insulating distance

distance to be maintained between two parts at different electrical potentials in given atmospheric conditions in order to ensure electrical insulation

3.36**electrical pantograph gauge**

reference profile and its associated rules allowing the definition of the space to be cleared taking account of the required electrical insulating allowance relative to the live parts of the pantograph in the raised position

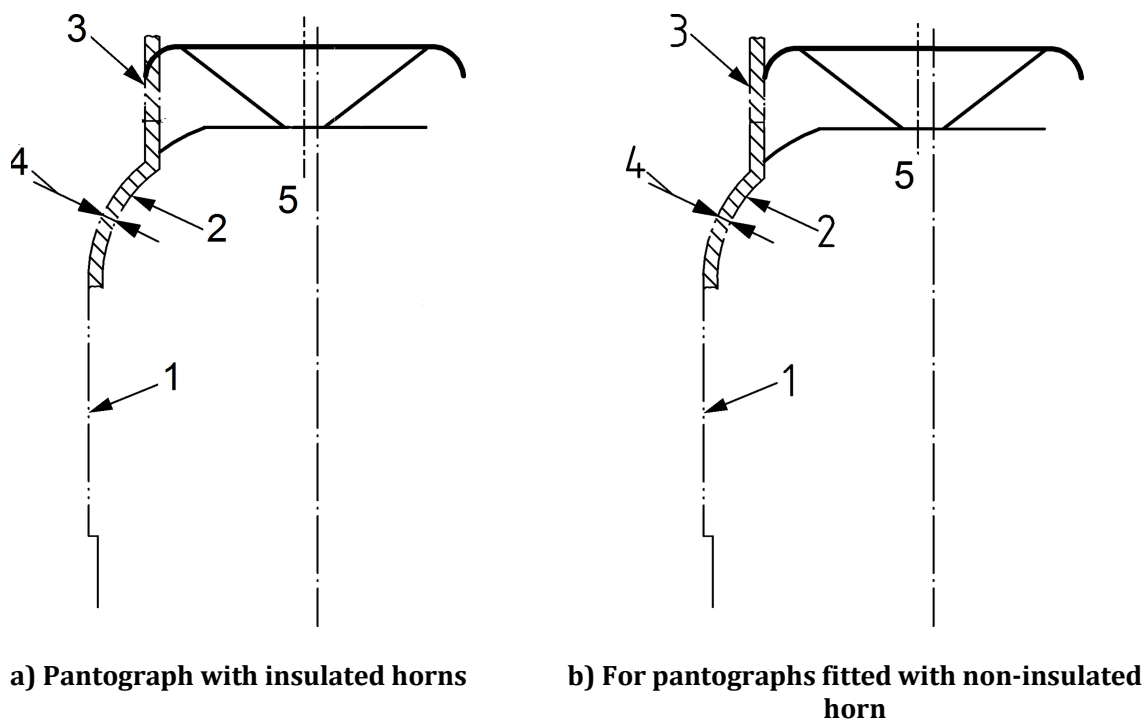
Note 1 to entry: See Figure 4.

3.37**gauge for live parts mounted on the roof**

reduced gauge relative to the maximum construction gauge taking account of a sufficient insulating clearance to the non-live parts of the infrastructure

Note 1 to entry: See Figure 5.

Note 2 to entry: Live parts are electrically non-protected parts of the vehicle, they are not allowed to penetrate the shaded area.

**Key**

- 1 maximum construction gauge
- 2 space which shall not be penetrated by non-insulated parts likely to remain live
- 3 pantograph reference profile
- 4 electrical insulating clearance for rolling stock
- 5 pantograph with its maximum displacements

Figure 4 — Gauge for non-insulated live parts on vehicle roof

3.38**vehicle profile**

outline of the vehicle cross section perpendicular to its longitudinal axis at any point along its length

3.39

maximum rolling stock construction gauge

maximum size to which rolling stock can be constructed

Note 1 to entry: See Figure 6.

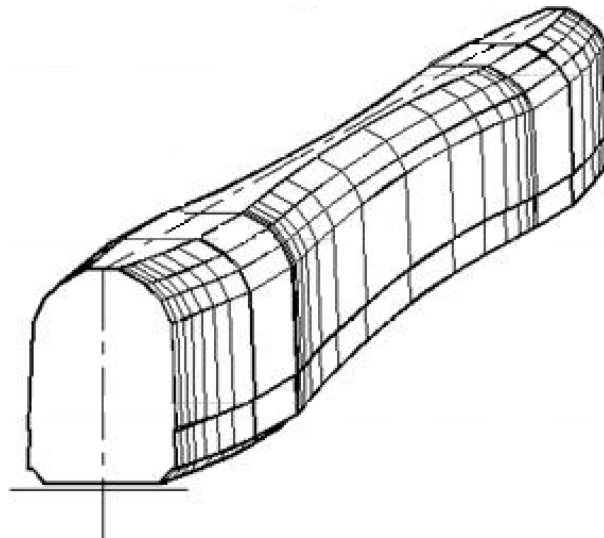


Figure 5 — Space available for the construction of a vehicle

3.40

vehicle nominal construction gauge

maximum rolling stock construction gauge, reduced by the construction tolerances according to the gauging method

3.41

infrastructure gauge

space to be clear of all objects to permit safe operation

Note 1 to entry: The infrastructure gauge is defined on the basis of the reference profile by applying the associated rules.

3.42

infrastructure verification limit gauge

space not to be encroached upon at any time to ensure completely safe passage of traffic

3.43

infrastructure installation limit gauge

space to be clear taking into account a maintenance allowance defined according to the line speed and to the track quality at the time of the infrastructure installation

3.44

infrastructure installation nominal gauge

space to be clear of any obstacle in order to enable train operations and track maintenance by incorporating allowances for safety, maintenance and additional allowances defined by the Infrastructure Manager

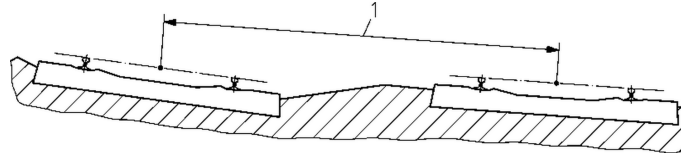
3.45

uniform infrastructure gauge

infrastructure installation nominal gauge of constant cross-section used for the infrastructure

3.46**distance between track centres****EA**

distance between the centres of the two adjacent tracks concerned, measured parallel to the running plane of the track with the least cant, and called the reference track

**Key**

1 distance EA

Figure 6 — Distance between track centres

Note 1 to entry: It is possible to measure the distance between two track centres horizontally but for gauging applications, distance is measured parallel to the running plane of the track with the least cant

3.47**verification limit distance between track centres**

minimum distance to be maintained at all times between adjacent tracks to ensure completely safe passage of traffic within the gauge used on the two tracks by avoiding any risk of interference between the vehicles

3.48**installation limit distance between track centres**

minimum distance between adjacent tracks including maintenance allowances to ensure completely safe passage of traffic within the gauge used on the two tracks by avoiding any interference between the vehicles

3.49**nominal installation distance between track centres**

distance between two adjacent tracks that generally has a suitable allowance to permit ease of design, laying, monitoring and maintenance, the operation of exceptional consignments or any other aspect (including aerodynamic effects, for example)

3.50**track fixity**

level of track restraint from movement in any direction, used by absolute gauging

4 Symbols and abbreviations

4.1 Common symbols

For the purposes of this document, the following symbols and abbreviations given in Table 1 and Table 2 are applicable.

Table 1 — Common sub- and superscripts

Index	Designation
'	Superscript standing for “pantograph”, unless stated otherwise
> 0	Subscript designating the value that is taken into account only if it is positive; negative value is regarded as being equal to zero
0	Subscript designating “conventional” or “reference value”
<i>a</i>	Subscript designating “outside” of a curve or “beyond” bogie pivots or axles
<i>A</i>	Subscript designating: — “motor” bogie or “independent wheelset” on a motor vehicle when used with respect to running gears, or — “leading” bogie or “independent wheelset”, or — “first” bogie or wheelset (the order is selected indifferently – see B below)
<i>B</i>	Subscript designating: — “trailing” bogie or wheelset on a motor vehicle when used with respect to running gears, or — “trailing” bogie or “independent wheelset”, or — “second” bogie or wheelset otherwise (the order is selected indifferently – see A above)
<i>chr</i>	Subscript standing for “check rail”
<i>cin</i>	Subscript standing for “kinematic gauging method”
<i>Cro</i>	Subscript standing for “crocodile”
<i>CR</i>	Subscript standing for “reference profile”
<i>cnc</i>	Subscript standing for “concave”
<i>cnv</i>	Subscript standing for “convex”
<i>cw</i>	Subscript standing for “contact wire”
<i>dat</i>	Subscript standing for “datum point”
<i>det</i>	Subscript standing for “detonator”
<i>dyn</i>	Subscript standing for “dynamic” gauging method
<i>elec</i>	Subscript standing for “electrical insulation” and for “electrical pantograph gauge”
<i>fb</i>	Subscript standing for “ferry boat”

Table 1 — Common sub- and superscripts (ends)

Index	Designation
<i>gr</i>	Subscript standing for “groove”
<i>h</i>	Subscript standing for “horizontal”
<i>i</i>	Subscript designating “inside” of a curve, or of two concentric tracks, or “between” bogie pivots or axles
<i>inf</i>	Subscript designating “infrastructure”
<i>lim</i>	Subscript standing for “limit” value
<i>max</i>	Subscript standing for “maximum value”
<i>mec</i>	Subscript standing for “mechanical parts of the pantograph”
<i>min</i>	Subscript standing for “minimum value”
<i>mh</i>	Subscript standing for “marshalling hump”
<i>nez</i>	Subscript standing for “platform edge”
<i>nom</i>	Subscript standing for “nominal” value
<i>o</i>	Subscript standing for “upper”
<i>osc</i>	Subscript standing for “oscillation”
<i>p</i>	Subscript standing for “tilting”
<i>PT</i>	Subscript standing for “point PT”
<i>q</i>	Subscript standing for “platform”
<i>r</i>	Subscript standing for “reference vehicle”
<i>rl</i>	Subscript standing for “actual” value
<i>SE</i>	Subscript standing for “swept envelope”
<i>St</i>	Subscript standing for static gauging method
<i>Stl</i>	Subscript standing for “static loading”
<i>u</i>	Subscript standing for “lower”
<i>v</i>	Subscript standing for “vertical”
<i>veh</i>	Subscript standing for “vehicle”
<i>voie</i>	Subscript standing for “track”
<i>wag</i>	Subscript standing for “wagon”
<i>whe</i>	Subscript standing for “wheel”

For the purposes of this standard, in cases of combined subscripts the different components are separated by commas (e.g. $M_{2,d}$), unless stated otherwise by the list of symbols.

Symbols and abbreviations not explicitly defined in Table 2 are either defined where used in the document or composed using symbols and abbreviations found in Table 1 and Table 2.

Table 2 — Symbols and abbreviations

Symbol	Designation	Unit
a	Distance between bogie pivots or between axles of a vehicle without bogies	m
A	Displacement coefficient	—
Abt	Adjustment value of the pantograph displacement	m
Aff	Downward suspension displacement value including spring tolerances	m
AR	Distance between wheel backs	m
b	“Semi-width”: distance of a point on a carbody section or on an infrastructure section, measured with respect to the track centre and parallel to the running plane	m
b_j	Suspension semi-width: $j = 1$ standing for primary suspension, $j = 2$ standing for secondary suspension	m
b_a	Distance between the external face of the wheel and the guidance face inside of the rail (running edge)	m
b_{chr}	Gap between rail and check-rail	m
b_{fr}	Width to be cleared for the ejection of collector shoes	m
b_G	Half lateral distance between side bearers	m
b_i	Distance between the inner wheel face and the inner rail face	m
b_q	Distance of the platform relative to the track centre line, measured parallel to the running plane	m
b'_q	Distance of the platform relative to the inside edge of the closest rail, measured parallel to the running plane.	m
b_{rj}	Semi-width of reference vehicle $j = 1, \dots, n$	m
b_{sl}	Semi-width of left pantograph head support	m
b_{sr}	Semi-width of right pantograph head support	m
b_{Step1}	Semi-width of the first step level	m
b_{Step2}	Semi-width of the second step level	m
b_{vehj}	Semi-width of vehicle $j = 1, \dots, n$	m
b_w	Pantograph semi-width	m
c	Calculation constant	—
c_{elec}	Insulating distance for rolling stock according to voltage of power supply system	m
c_w	Pantograph insulating horn width	m
C	Roll centre of the vehicle	—

Symbol	Designation	Unit
CR	Reference profile	—
D	Distance between wheel flanges at wear limit measured 10 mm below the wheel tread (see EN 15313)	m
Dg	Geometric overthrow of the vehicle in a horizontal curve (dg_v in vertical curve)	m
d_l	Lateral deviation of the contact wire (including any side wind loading)	m
D	Cant	m
D'	Intermediate cant value between 0 and D	m
D_{eq}	Equilibrium cant	m
D_L	Minimum limit value for D used in the calculation of the lateral clearances	m
D_{sup}	Additional cant to be taken into account according to the track quality for dynamic method	m
D_{pl}	Displacement	m
D_{max}	Maximum value for cant used by the Railway Undertaking for the quasi-static effect calculation	m
e	Vertical reduction of the reference profile	m
e_p	Offset of the pantograph due to the vehicle characteristics	m
e_v	Lowering of track components	m
E	Lateral reduction relative to the reference profile (E_v in vertical direction)	m
$E_{a,a}$	Lateral reduction from the reference profile relative to the outside face of the wheel, beyond axles	m
$E_{a,i}$	Lateral reduction from the reference profile relative to the outside face of the wheel, between axles	m
$E_{i,i}$	Lateral reduction from the reference profile relative to the inside face of the wheel, between axles	m
E_{fr}	Width to be cleared for removing brake shoes (scotches)	m
$E_{chr,a}$	Lateral reduction with respect to the check rail, beyond the wheelsets	m
$E_{chr,i}$	Lateral reduction with respect to the check rail relative to the inside face of the wheel, between the wheelsets	m
EA	Distance between the centre lines of two adjacent tracks	m
E_v	Vertical reduction of the reference profile for the lower parts	m
f	Vertical deflection of the pantograph	m
fc	Vertical displacement of a point on a carbody section due to camber or sag under maximum load conditions	m

Symbol	Designation	Unit
f_{cr}	Deflection due to creep (ageing) of suspension components	m
f_s	Raising of the contact wire	m
f_{so}	Raising of the contact wire at the lowest temperature, measured relative to its position for the mean temperature	m
f_t	Vertical displacement of a point on a carbody section due to camber or sag under tare load conditions	m
f_{tol}	Suspension setup tolerance	m
f_v	Contact wire sag. Initial sag including the sag between the droppers	m
f_w	Contact wire sag at the highest temperature, measured relative to its position for the mean temperature	m
f_{wa}	Pantograph frame rise due to the contact strip wear	m
f_{ws}	Pantograph skew generated by the offset contact point	m
f_z	Vertical suspension static displacement under maximum load conditions	m
F	Fixed value taken into account in the lateral projection	m
Flc	Structure deformation of the car body due to the static loading, called “body sag” between the bogie pivots and “body camber” beyond them	m
F_w	Maximum sum of the traction forces at the wheel-rail contact of the considered wheelset	N
gap	Distance between the platform edge and the step nose or door sill	m
g	Acceleration due to gravity	m/s ²
G	Centre of gravity of the carbody	—
h	Height of a point measured from the running plane	m
h_{det}	Lower limit of the parts located outside the end axles (guard irons (lifeguards), sanders etc.) for passing over detonators	m
h_{dat}	Height above rail level of the datum point for vehicle movements due to suspension displacements	m
h_c	Vehicle roll centre height	m
h_{c0}	Conventional value of the roll centre height	m
h_{eff}	Effective height of the raised pantograph	m
h_f	Nominal height of the contact wire without any influence of the pantograph in collecting position or other effects	m
h_{minCR}	Minimum height of the reference profile taken into account for the platform installation	m

Symbol	Designation	Unit
h_p	Height of the body tilt centre of a tilting vehicle	m
$h_{u\min}$	Height of the lower horizontal line of the reference profile NOTE 1 This minimum height is specified for the vertical geometric displacements of the rolling stock below the reference profile according to the vertical curve of the track.	m
$h_{u\min 1}$	Height of the lower horizontal line between rails of the special reference profile of the lower parts for vehicles having to pass over marshalling humps and rail brakes NOTE 2 This minimum height is specified for the vertical geometric displacements of the rolling stock below the reference profile according to the vertical curve of the track.	m
$h_{u\min 2}$	Height of the lower horizontal line outside rails of the special reference profile of the lower parts for vehicles having to pass over marshalling humps and rail brakes NOTE 3 This minimum height is specified for the vertical geometric displacements of the rolling stock below the reference profile according to the vertical curve of the track.	m
h_s	Height of the step	m
h_t	Installation height of the lower pantograph joint relative to the running plane	m
h_{whe}	Minimum height for vehicle parts near the wheel	m
I	Cant deficiency	m
I'_c	Intermediate cant deficiency value between 0 and I_c	m
I'_p	Intermediate cant deficiency value taken into account for tilting body vehicles	m
I_c	Maximum cant deficiency in conventional vehicles used by the Infrastructure Manager for his routes	m
I_{eq}	Equivalent cant deficiency	m
I_L	Minimum limit value for I used in the calculation of the lateral clearances	m
I_{max}	Fixed cant deficiency value used by the Railway Undertaking for the maximum quasi-static effect calculation	m
I_{sup}	Additional cant deficiency to be taken into account according to the track quality for dynamic method	m
j	Minimum vertical reference clearances at the level of the side bearers	m
J	Vertical clearance at the level of the side bearers	m
JP	Joint at the switch toe end of the stock rail	
k	Safety factor	—

Symbol	Designation	Unit
k_h	Coefficient used to take into account the influence of the height	
K	Coefficient used in the calculation of qs value	—
l	Track gauge, actual distance between the rail running edges	m
l_b	Width of wheel	m
l_{chr}	Position of the check rail relative to the non-adjacent rail running edge	m
l_{orn}	Flange-way clearance	m
L	Conventional distance between the contact points of the wheels on the rails of the same track (the values are set out in prEN 15273-4:2023)	m
m_d	Lateral allowance outside of the gauge, authorised for an open door	m
m_s	Lateral allowance outside of the gauge, authorised for a deployed step	m
M	Margin included in an allowance or a clearance	m
M_1	Mandatory margin	m
$M_{1,d}$	Part of the mandatory margin M_1 due to the loading dissymmetry and the suspension adjustment	m
$M_{1,osc}$	Part of the mandatory margin M_1 due to the oscillations	m
M_2	Infrastructure maintenance margin	m
$M_{2,d}$	Part of the usable margin due to the cross-level errors T_D	m
$M_{2,voie}$	Part of the usable margin M_2 due to the lateral displacement of the track	m
M_3	Additional infrastructure margin	m
M_e	Axle load	kg
M_{elec}	Insulation margin for infrastructure according to the voltage	m
M_{fb}	Vertical margin for the passage onto ferries	m
MP	Theoretical positioning point of a switch - mathematical switch toe	
$M_{1,v}$	Mandatory vertical margin	m
$M_{2,v}$	Maintenance vertical margin	m
$M_{3,v}$	Additional vertical margin	m
n	Distance from an axle or a pivot to the cross-section under consideration.	m
p	Bogie wheelbase	m
P	A point on the reference profile used to determine the distance between track centres	—
P'	Value used to verify the pantographs	m

Symbol	Designation	Unit
P_{om}	Flange-way gap allowing for passage of the wheel flange.	m
PT	End lateral point of the reference profile upper face	—
PT'	Point reached by point PT during its upward vertical movement	—
q	Lateral clearance between wheelset and bogie frame, or wheelset and body for vehicles not fitted with bogies	m
q^s	Displacement due to the quasi-static roll taken into account by the infrastructure	m
Q	Displacement due to the complete quasi-static roll	m
r	Reserve value	m
reb	Vehicle rebound	m
R	Curve radius	m
R_c	Critical curve radius	m
R_{minTB}	Minimum horizontal curve radius in presence of track brakes	m
R_p	Minimum curve radius, below which the tilting vehicle speed shall be reduced	m
R_{th}	Theoretical curve radius of junction work	m
s	Flexibility coefficient	—
s_d	Flange width	m
s_{eq}	Flexibility coefficient equivalent value	—
s_n	Flexibility coefficient of the pantograph carrying structure	—
S	Projection outside the reference profile	m
S_f	Fixed value introduced in the calculation of overthrows	m
S_l	Part of the lateral projection due to the effect of the track gauge widening	m
$Supl$	Supplementary value determined by the Infrastructure Manager for the infrastructure installation nominal gauge	m
S_R	Part of the lateral projection due to the geometric overthrow in a curve of radius R	m
t	Flexibility index of the pantograph head raised to h'_0 under the influence of a lateral force of 300 N	m
t_{gr}	Groove depth	m
T_b	Construction tolerance of the rolling stock in the lateral direction	m
T_{charge}	Angle of dissymmetry, considered in $\eta_{0,r}$ for the case of poor load distribution	Deg
T_D	Cross-level variation between two maintenance intervals	m
T_N	Margin taking into account the vertical displacement of the track	m

Symbol	Designation	Unit
T_{osc}	Margin taking into account the vehicle oscillations due to track irregularities	m
T_q	Platform installation tolerance	m
T_{susp}	Angle of dissymmetry, considered in $\eta_{0,r}$ for poor suspension adjustment	deg
T_{voie}	Lateral displacement of the track between two periods of maintenance	m
U_{sr}	Maximum allowed wheel wear	m
V_{line}	Line speed	m/s or km/h
V	Vehicle speed	m/s or km/h
V_c	Non-tilting vehicle maximum speed	m/s or km/h
V_p	Tilting vehicle maximum speed	m/s or km/h
V'_c	Intermediate value of a non-tilting train speed	m/s or km/h
V'_p	Intermediate value of the tilting train speed	m/s or km/h
VF	Fixed value used for pantograph gauge calculation	m
VF_{I_0}	Fixed value considered at the upper verification point of the pantographs for a cant deficiency I_0	m
$VF_{I_{max}}$	Fixed value considered at the upper verification point of the pantographs for a cant deficiency I_{max}	m
w	Lateral clearance between bogie and body	m
w_{∞}	Lateral clearance between bogie and body on a straight track	m
$w_{(R)}$	Lateral clearance between bogie and body varying according to the track curve radius	m
X	Distance between points A and B used for the calculation of e_v	m
y	Distance between the theoretical centre and the geometric centre of the bogie	m
Y	Residual lateral clearance for stationary vehicle	m
y_p	Pantograph movement due to the re-centring system	m
y_q	Vertical coordinate of the platform edge in a locally defined {x-y} coordinate system	m
z	Part of the quasi-static roll taken into account by the Railway Undertaking	m
z'	Difference between the lateral roll based on the calculation and the actual roll of the upper verification point of the pantograph	m
z''	Difference between the lateral roll based on the calculation and the actual roll of the lower verification point of the pantograph	m

Symbol	Designation	Unit
z_0	Fixed value available to the Railway Undertaking on the outside of the static reference profile	m
z'_p	Difference between calculated lateral roll and actual roll at the upper verification point of the pantograph mounted on a vehicle with a tilting body or which is submitted to $I_p > I_c$	m
z''_p	Difference between calculated lateral roll and actual roll at the lower verification point of the pantograph mounted on a vehicle with a tilting body or which is submitted to $I_p > I_c$	m
α	Additional angle of roll of the body due to the clearance to the side bearers	deg
α_{osc}	Angle corresponding to the value T_{osc}	deg
α_p	Pantograph tilting angle	deg
α'	Angle of the inclined part of the pantograph head relative to the horizontal	deg
α''	Angle made by the ramp between the pier and the ferry	deg
β	Switch entry angle of switches and crossings	rad
β_p	Carbody tilting angle relative to the bogie	deg
γ	Centrifugal acceleration	m/s ²
γ'_D	Centripetal acceleration due to the cant	m/s ²
γ'_I	Centrifugal acceleration resulting from the cant deficiency	m/s ²
$\Sigma_v \lambda$	Allowance corresponding to the optimised sum of the values of margins taken into account by the infrastructure in the vertical direction	m
λ	Angle made by the straight line joining the centre of gravity at the roll centre with the vertical	deg
μ	Rail-wheel adhesion coefficient	—
η	Angle of roll of the vehicle relative to the running plane	deg
η_0	Angle of dissymmetry of a vehicle due to construction tolerances, to suspension adjustment and to unequal load distributions	deg
η'_0	Angle of dissymmetry of a vehicle for which the clearance to the side bearers does not exceed j	deg
$\eta_{0,r}$	Reference angle η_0 taken into account in the agreement	deg
θ	Angle resulting from the suspension adjustment tolerances	rad
τ	Pantograph construction and installation tolerance: deviation tolerated between the carbody centreline and the middle of the pantograph head without any lateral force	m

4.2 Specific symbols for absolute and comparative gauging processes

For the purposes of this document, the following symbols and abbreviations given in Table 3 are also applicable.

Table 3 — Symbols and abbreviations

Symbol	Description	Unit
$b_{obstacle}$	Semi-width of a point on the infrastructure	m
$b_{SE,D,V}$	Semi-width of a point on the swept envelope at a given cant excess and train speed	m
$b_{SE,I,V}$	Semi-width of a point on the swept envelope at a given cant deficiency and train speed	m
b'_e	Semi-width of highest point on pantograph head	m
δ_{dg}	Addition to overthrow calculated at centreline, to account for vehicle width	m
Dpl_y	Time history of vehicle lateral displacement due to suspension movements	m
$Dpl_{y(1)}$	Time history of vehicle lateral displacement due to suspension movements over leading bogie pivot	m
$Dpl_{y(2)}$	Time history of vehicle lateral displacement due to suspension movements over trailing bogie pivot	m
$Dpl_{y(3)}$	Time history of vehicle lateral displacement due to suspension movements at vehicle longitudinal centreline	m
$Dpl_{y,D,V}$	Vehicle lateral displacement due to suspension movements at a given cant excess and train speed	m
$Dpl_{y,I,V}$	Vehicle lateral displacement due to suspension movements at a given cant deficiency and train speed	m
$Dpl_{y,w}$	Lateral displacement due to wheelset movement	m
$Dpl_{y,w(1)}$	Lateral displacement due to wheelset movement for leading bogie	m
$Dpl_{y,w(2)}$	Lateral displacement due to wheelset movement for trailing bogie	m
$Dpl_{y,w,R}$	Lateral displacement due to wheelset movement at a given horizontal curve radius	m
Dpl_z	Time history of vehicle vertical displacement due to suspension movements	m
$Dpl_{z(1)}$	Time history of vehicle vertical displacement due to suspension movements over leading bogie pivot	m
$Dpl_{z(2)}$	Time history of vehicle vertical displacement due to suspension movements over trailing bogie pivot	m
$Dpl_{z(3)}$	Time history of vehicle vertical displacement due to suspension movements at vehicle longitudinal centreline	m
$Dpl_{z,D,V}$	Vehicle vertical displacement due to suspension movements at a given cant excess and train speed	m

Symbol	Description	Unit
$Dpl_{z,I,V}$	Vehicle vertical displacement due to suspension movements at a given cant deficiency and train speed	m
$Dpl_{zd,D,V}$	Vehicle vertical downwards displacement due to suspension movements at a given cant excess and train speed	m
$Dpl_{zd,I,V}$	Vehicle vertical downwards displacement due to suspension movements at a given cant deficiency and train speed	m
$Dpl_{zu,D,V}$	Vehicle vertical upwards displacement due to suspension movements at a given cant excess and train speed	m
$Dpl_{zu,I,V}$	Vehicle vertical upwards displacement due to suspension movements at a given cant deficiency and train speed	m
dg_{CL}	Horizontal geometric throw ignoring vehicle width	m
$dg_{v,ARL}$	Vertical geometric throw outboard of the bogie pivots ignoring vehicle height	m
E_s	Pantograph head support vertical stiffness	N/m
F_m	Pantograph contact force	N
F_{sl}	Force on left pantograph head support	N
F_{sr}	Force on right pantograph head support	N
F_σ	Number of standard deviations of displacements due to dynamic suspension movements	-
$h_{osbtacle}$	Height above rail level of a point on the infrastructure	m
$h_{SE,D,V}$	Height above rail level of a point on the swept envelope at a given cant excess and train speed	m
$h_{SE,I,V}$	Height above rail level of a point on the swept envelope at a given cant deficiency and train speed	m
i	Number of cant cases	-
j	Number of speed cases	-
K_p	Safety factor on passing clearance	-
L_o	Nominal lateral position of overhead contact wire relative to track centreline	m
l_{actual}	Actual track gauge	m
M_c	Clearance	m
$M_{c,req}$	Required clearance	m

Symbol	Description	Unit
n_D	Number of test values per cant case	-
n_{B-B}	Distance to the nearest pivot of carbody section B-B	m
n_{C-C}	Distance to the nearest pivot of carbody section C-C	m
pv	Predicted value	-
q_e'	Encroachment of the pantograph head	m
q_θ	Time history of vehicle roll displacement due to suspension movements	rad
$q_{\theta(1)}$	Time history of vehicle roll displacement due to suspension movements over leading bogie pivot	rad
$q_{\theta(2)}$	Time history of vehicle roll displacement due to suspension movements over trailing bogie pivot	rad
$q_{\theta(3)}$	Time history of vehicle roll displacement due to suspension movements at vehicle longitudinal centreline	rad
$q_{\theta,D,V}$	Vehicle roll displacement due to suspension movements at a given cant excess and train speed	rad
$q_{\theta,I,V}$	Vehicle roll displacement due to suspension movements at a given cant deficiency and train speed	rad
T_{BOD}	Carbody build tolerance	m
$T_{POS,y}$	Carbody measurement datum lateral tolerance relative to track centreline	m
$T_{POS,z}$	Carbody measurement datum vertical tolerance relative to track centreline	m
$T_{e,y}$	Effective lateral allowance due to track displacements	m
$T_{e,y,D}$	Effective lateral allowance due to track displacements when running at cant excess	m
$T_{e,y,I}$	Effective lateral allowance due to track displacements when running at cant deficiency	m
$T_{e,z}$	Effective vertical allowance due to track displacements	m
$T_{e,z,D}$	Effective vertical allowance due to track displacements when running at cant excess	m
$T_{e,z,I}$	Effective vertical allowance due to track displacements when running at cant deficiency	m

Symbol	Description	Unit
T_{im}	Infrastructure measurement tolerance	m
T_{rm}	Vehicle measurement tolerance	m
T_w	Maximum allowable uncompensated wheel wear	m
$T_{y,o}$	Additional overall vehicle tolerance for other lateral effects	m
T_{zveh}	Total vertical vehicle construction tolerance	m
T_{zd}	Downwards static vehicle suspension displacement	m
$T_{zd,o}$	Additional overall vehicle tolerance for other downwards effects	m
$T_{zd,s}$	Downwards vehicle suspension height setup tolerance	m
T_{zsc}	Vertical suspension displacement due to creep of components	m
T_{zu}	Upwards static vehicle suspension displacement	m
$T_{zu,o}$	Additional overall vehicle tolerance for other upwards effects	m
$T_{zu,s}$	Upwards vehicle suspension height setup tolerance	m
T_{η_0}	Carbody measurement datum roll tolerance relative to track running plane	rad
tv	Test value	-
δ_{CW}	Lateral position of displaced overhead contact wire relative to track centreline	m
δ_{dg_a}	Correction term for throw formulae based on vehicle centreline outboard of the bogie pivots	m
δ_{dg_i}	Correction term for throw formulae based on vehicle centreline between the bogie pivots	m
δ'	Lateral displacement of pantograph head centreline relative to track centreline	m
$\delta_{v_{sl}}$	Vertical displacement of left pantograph head support	m
$\delta_{v_{sr}}$	Vertical displacement of right pantograph head support	m
σ_{F_m}	Standard deviation of the contact force	N
σ_{Dpl_y}	Standard deviation of lateral displacements due to suspension movement	m

Symbol	Description	Unit
$\sigma_{Dpl_{y,I,V}}$	Standard deviation of lateral displacements due to suspension movement at a given cant deficiency and train speed	m
σ_{Dpl_z}	Standard deviation of vertical displacements due to suspension movement	m
$\sigma_{Dpl_{z,D,V}}$	Standard deviation of vertical displacements due to suspension movement at a given cant excess and train speed	m
$\sigma_{Dpl_{z,I,V}}$	Standard deviation of vertical displacements due to suspension movement at a given cant deficiency and train speed	m
$\sigma_{q_{\theta,D,V}}$	Standard deviation of roll displacements due to suspension movement at a given cant excess and train speed	rad
$\sigma_{q_{\theta,I,V}}$	Standard deviation of roll displacements due to suspension movement at a given cant deficiency and train speed	rad

5 Approaches to gauging

5.1 Railway gauging processes

A defined gauging process assures the interoperability of rolling stock on various routes with an independent management of the infrastructure on the one hand and of the rolling stock on the other, based on common rules to share the responsibilities.

Other processes, such as absolute gauging and comparative gauging, can be used for optimising the sizing of the rolling stock using specific infrastructure profiles with appropriate safety clearances.

5.2 How to use prEN 15273 series

- prEN 15273-1:2023 gives general explanations and the common rules for sharing the responsibilities between Railway Undertaking and Infrastructure Manager;
- prEN 15273-2:2023 gives the rules for sizing the rolling stock according to a defined gauge and the process to define a swept envelope for absolute and comparative gauging.

The use of defined gauges to build a new vehicle does not need any agreement from the Infrastructure Manager. Depending on the intended compatibility level, the calculation shall be done following a static, kinematic or dynamic defined method.

The use of an absolute gauging process needs an agreement with the Infrastructure Manager.

A comparative gauging process requires consideration of a swept envelope of an existing vehicle already running on the same specific route.

- prEN 15273-3:2023 gives the rules for sizing the infrastructure and the necessary margins to obtain appropriate clearances. This applies both to fixed obstacles and to the distance between adjacent tracks.

For defined gauging, the infrastructure gauge is defined on the basis of reference profile and its associated rules coming from an agreement between the Infrastructure Manager and the Railway Undertaking.

- prEN 15273-4:2023 gives the reference profiles and the associated values for the defined gauges applied in prEN 15273-2:2023 and prEN 15273-3:2023 according to the sharing of responsibilities given in prEN 15273-1:2023;
- prCEN/TR 15273-5:2023 gives some worked examples and an historical background about the origin of the conventions.

Figure 7 and Figure 8 give a general overview of the relationship between the various parts of the gauging standard.

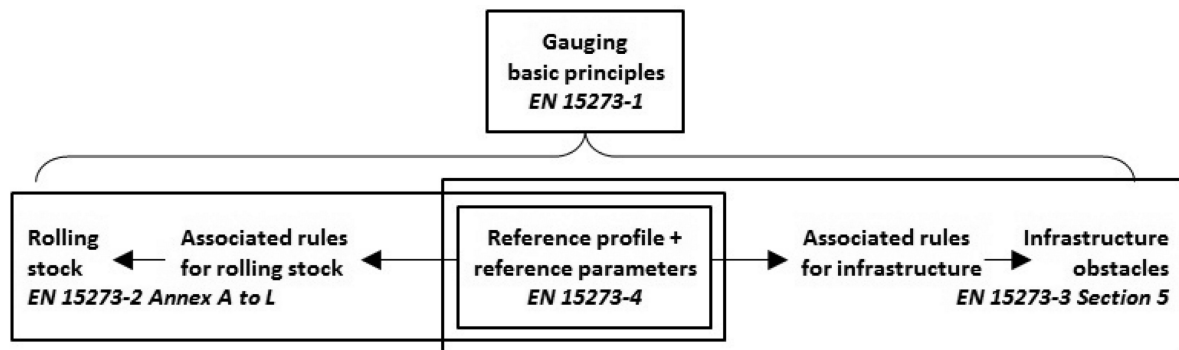


Figure 7 — Kinematic, static and dynamic defined gauging process

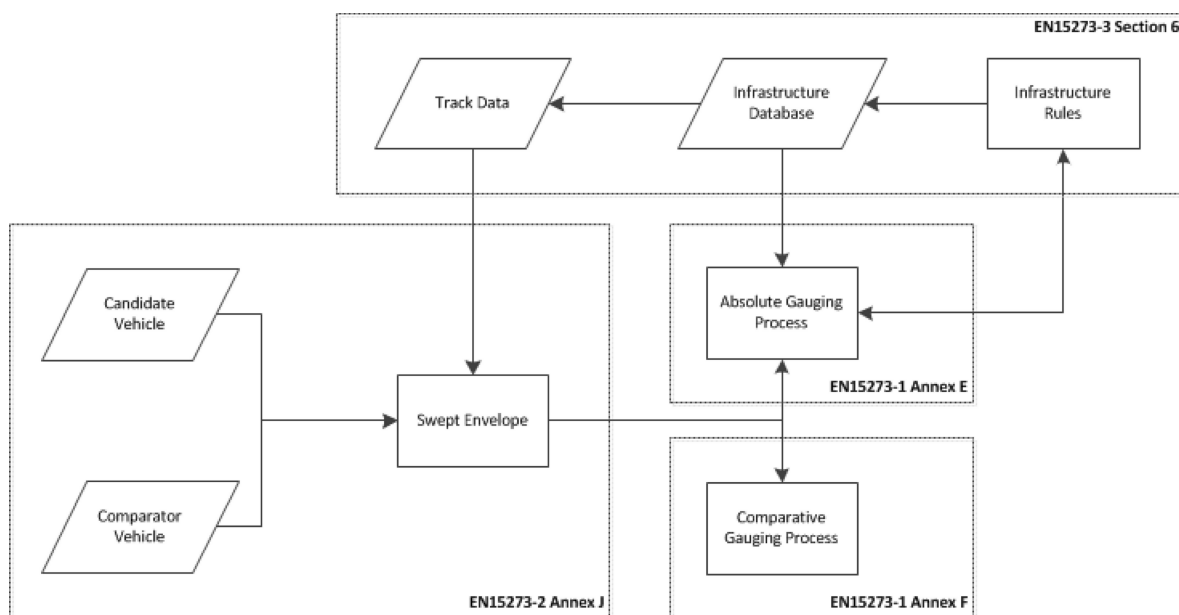


Figure 8 — Absolute and comparative gauging process

5.3 Choosing a defined gauge or a gauging process

5.3.1 Interoperability between Railway Undertaking and Infrastructure Manager

This document proposes:

- defined gauging methods used for interoperability of the rolling stock on various infrastructure;
- absolute gauging process used for specific routes;
- comparative gauging process used for specific routes.

Choosing a defined gauge or a gauging process depends mainly on the interoperability level to be ensured between rolling stock and the various dedicated infrastructure.

The organisation responsible for the rolling stock shall refer to the Infrastructure Manager to know which process shall be used.

Defined gauges apply for an independent managing of the rolling stock and Infrastructure Manager.

An absolute gauging process may be used where detailed infrastructure data is available for specific routes.

A comparative gauging process may be used where it is possible to use existing rolling stock as a reference.

5.3.2 Defined gauging methods

The three following calculation methods are used for defined gauges with common rules for the rolling stock and the infrastructure:

- defined kinematic gauges;
- defined static gauges;
- defined dynamic gauges.

The three calculation methods allow for different degrees of interoperability of rolling stock on independent infrastructure respecting the same gauge:

- defined kinematic gauges are interoperable up to a maximum value of cant D_{max} or cant deficiency I_{max} ;
- defined static gauges ensure the compatibility of vehicles for which the flexibility of the suspensions does not exceed a specified limit value s_{lim} ;
- defined dynamic gauges ensure compatibility of vehicles on infrastructure that complies with the specified track quality.

This standard defines the responsibilities:

- for the Railway Undertaking:
 - compliance with the gauge concerned;
 - maintenance of this compliance over time.
- for the infrastructure:
 - compliance with the gauge concerned;
 - maintenance of this compliance over time;
 - infrastructure monitoring.

The interoperability of rolling stock using various infrastructure without specific control of compatibility is only assumed by the defined kinematic gauges.

The clauses of the prEN 15273:2023 series described in Table 4 apply:

Table 4 — Clauses of the prEN 15273:2023 series

Rules	Parts	Clause or subclause	Description
Common	prEN 15273-1:2023 (this part)	6	Elements involved in a gauging process
		7.1	Defined gauges by calculation
		Annex A	Specific considerations for the classic calculations of defined gauges
		Annex B	Defined kinematic gauges
		Annex H	Steps for access and egress – Location and gaps with platform
	prEN 15273-4:2023	6	Reference profile – Kinematic gauges
Specific for rolling stock	prEN 15273-2:2023	Annex A	Common rules for defined kinematic gauges
		Annex B	General principles for passive tilting vehicles and non-tilting vehicles operating with $I = I_p > I_c$ to use with a defined kinematic gauge
		Annex C	General principles for active tilting vehicles and pantograph associated with a re-centring system to use with a defined kinematic gauge
		Annex D	Graphical method
		Annex E	Application of defined kinematic gauges for rolling stock
		Annex N	List of documents for rolling stock assessment for defined gauges

Rules	Parts	Clause or subclause	Description
Specific for the various infrastructure	prEN 15273-3:2023	5.2	General information on all the gauging methods
		5.3	Kinematic gauging method
		5.6.3.2.1.1	Distance between track centres - Kinematic
		5.7	Elements of variable layout
		5.8.1	Determination of the free passage gauge of the pantograph - General
		5.8.2	Mechanical infrastructure pantograph gauge for the kinematic gauging method
		5.8.3	Electrical infrastructure pantograph gauge for the kinematic gauging method
		5.10.1	Items of intended close proximity - Rules for installation of platform edges
		5.12	Tilting trains
		5.13	Ferries
		5.14	Verification and maintenance of the gauge
		Annex A Table A.1	Recommended values for calculation of the allowances in defined and absolute gauging - Values for calculation of the allowances in defined gauging
		Annex B	Defined gauging - Lower parts
		Annex C	Determination of reference vehicle characteristics
		Annex D	Gauge maintenance guideline for defined gauging
		Annex E	Calculation example for determination of the gauge in a turnout
		Annex F	Tilting trains
		Annex G	Uniform gauge

5.3.3 Absolute gauging process

The absolute gauging process relates the position of the infrastructure to the vehicle and can be used with static, kinematic or dynamic swept envelopes.

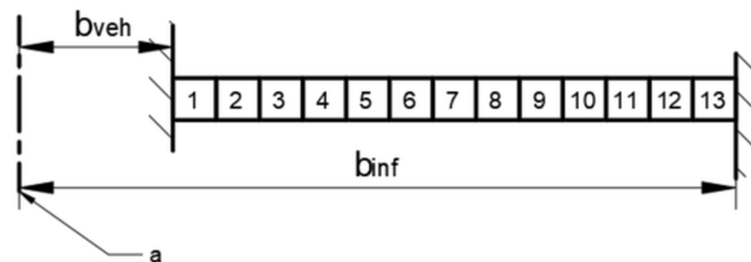
5.3.4 Comparative gauging process

The comparative gauging process refers to the swept envelope of an existing vehicle already in use on a specific route.

6 Elements involved in a gauging process

6.1 General diagram in the lateral direction

An overview of the lateral elements included in a gauging process is illustrated in Figure 9 and Figure 10. Full explanations and application/combinations of particular elements are found in the relevant annex for each gauging process.



Key

- a track and vehicle centreline

Figure 9 — General diagram in the lateral direction

Table 5 — Elements included in a gauging process in the lateral direction

Key	Description
1	Vehicle tolerances (construction, maintenance, measurement tolerances, ...)
2	Lateral geometric overthrow according to the horizontal curve radius of the track
3	Lateral movements between the body and bogie according to the horizontal curve radius of the track
4	Lateral movements between wheelset and bogie frame
5	Lateral movements of the wheelsets on the track
6	Lateral effect of vehicle dissymmetry
7	Lateral bending of the carbody
8	Lateral effect of the roll of the frame due to the clearance of the side bearers
9	Lateral component of the vehicle roll due to the excess cant or cant deficiency according with the suspension flexibility
10	Lateral component of the vehicle roll due to the track quality
11	Lateral component of the vehicle roll due to cross-level variation
12	Lateral movements of the track
13	Other clearances and/or margins (see more details in prEN 15273-3:2023)

For adjacent tracks, the distance between track centres is taken into account within the following general diagram according to Table 5.