BS EN 15313:2024



BSI Standards Publication

Railway applications — In-service wheelset operation requirements — In-service and off-vehicle wheelset maintenance

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National foreword

This British Standard is the UK implementation of EN 15313:2024. It supersedes BS EN 15313:2016, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee RAE/3/-/1, Railway Applications - Wheels and Wheelsets.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Bahnanwendungen - Radsätze und Drehgestelle - Radsatzinstandhaltung

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European foreword

This document (EN 15313:2024) 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of an identical text or by endorsement, at the latest by April 2025, and conflicting national standards shall be withdrawn at the latest by April 2025.

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 15313:2016.

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

— a clearer definition of the signs to identify thermal overload of wheels and associated pictures;

— the maintenance requirements to be followed when thermal overloading of a wheel is identified.

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative Annex ZA, which is an integral part of this document.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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

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Introduction

The objectives of this amendment to EN 15313:2016 are to:

— incorporate the appropriate results of the ERA Joint Network Secretariat “broken wheels” and Joint Sector Group task force.

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1 Scope

To ensure safety and interoperability, this document gives:

— the limits for in-service and off-vehicle wheelsets;

— the operations to be carried out for which the specific values (and/or criteria) remain to be defined in the maintenance plan.

This document applies to wheelsets and axleboxes complying with the following European standards:

— EN 13103-1:2017+A1:2022;

— EN 13260:2020, EN 13261:2020, EN 13262:2020;

— EN 13979-1:2023;

— EN 13715:2020;

— EN 13749:2021+A1:2023;

that comprise:

— the axle fitted with wheels of diameters greater than or equal to 330 mm;

— axleboxes with bearings and grease.

This document is also applicable to wheelsets:

— fitted with brake discs, final drive, transmission or noise-damping systems, as appropriate;

— not complying with the above European standards, but complying with the international requirements in force, for example in UIC leaflets, before the approval of these standards;

— with tyred wheels;

— with resilient wheels.

For equipment not covered by Directive (EU) 2016/797, this European Standard can be applied, noting that different values can be used.

All dimensions in this document are in millimetres (mm).

It is necessary to describe in a specific document the tasks to be performed in order to maintain wheelsets within the limits defined therein.

NOTE The specific values and criteria are defined in an appropriate maintenance plan.

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 13260:2020, *Railway applications — Wheelsets and bogies — Wheelsets — Product requirements*

EN 13261:2020, *Railway applications — Wheelsets and bogies — Axles — Product requirements*

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EN 13262:2020, *Railway applications — Wheelsets and bogies — Wheels — Product requirements*

EN 13715:2020, *Railway applications — Wheelsets and bogies — Wheels — Tread profile*

EN 13979-1:2023, *Railway applications — Wheelsets and bogies — Monobloc wheels — Technical approval procedure — Part 1: Forged and rolled wheels*

EN 15085-2:2020+A1:2023, *Railway applications — Welding of railway vehicles and components — Part 2: Requirements for welding manufacturer*

EN ISO 9712:2022, *Non-destructive testing — Qualification and certification of NDT personnel (ISO 9712:2021)*

EN ISO 9934-1:2016, *Non-destructive testing — Magnetic particle testing — Part 1: General principles (ISO 9934-1:2016)*

EN ISO 9934-2:2015, *Non-destructive testing — Magnetic particle testing — Part 2: Detection media (ISO 9934-2:2015)*

EN ISO 9934-3:2015, *Non-destructive testing — Magnetic particle testing — Part 3: Equipment (ISO 9934-3:2015)*

3 Terms, definitions, symbols and abbreviated terms

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

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

3.1
technical expert
person(s) competent in the maintenance of wheelsets

3.2
ECM
Entity in Charge of Maintenance

3.3
wheelset maintenance levels
maintenance of wheelsets is divided into 3 maintenance levels:

— reprofiling;

— medium wheelset maintenance;

— heavy wheelset maintenance

Note 1 to entry: Reprofiling is a maintenance level that corresponds to reprofiling of wheels (in-service or off-vehicle) and depends mainly on the wear of the wheel or the tread defects.

Note 2 to entry: Medium wheelset maintenance corresponds to off-vehicle overhaul of wheelset (revision of bearing and reprofiling of wheels).

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Note 3 to entry: Heavy wheelset maintenance corresponds to the off-vehicle replacement of the wheels. This maintenance level is in principle defined by the wear limit of the wheel.

3.4
maintenance plan
structured and documented set of tasks comprising the activities, instructions, resources and the length of time necessary in order to perform the maintenance (see also definitions in EN 13306:2017; Maintenance — Maintenance terminology and EN 17018:2019; Railway applications — Rolling stock maintenance — Terms and definitions)

3.5
in-service wheelset maintenance
maintenance of in-service wheelsets comprises all of the operations which are performed on wheelsets between medium and/or heavy maintenance levels

3.6
NDT
non-destructive testing

3.7
MT
magnetic particle testing

3.8
UT
ultrasonic testing

3.9
VT
visual testing

3.10
resilient wheels
wheels that contain rubber elements between the tyre and the web

3.11
witness mark
area of unmachined material which can remain after reprofiling to demonstrate that the minimum of material has been removed

3.12
wagon overhaul
planned heavy maintenance operation on a wagon

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4 Maintenance

4.1 General

Maintenance involves:

— maintenance of in-service wheelsets/axleboxes;

— maintenance of off-vehicle wheelsets/axleboxes;

— special maintenance attention after in-service incidents (e.g. overloads, hot axlebox detection, wheelset bearings subject to water ingress, etc.).

An in-service wheelset shall be maintained by a maintenance undertaking qualified in this type of wheelset.

For maintenance of wheelsets, as a minimum, the following shall be utilized:

— a maintenance plan;

— service experience;

— an organization for component and production management;

— specific wheelset maintenance tools;

— qualified staff for non-destructive testing and welding.

4.2 Maintenance organization

4.2.1 Maintenance organization plan

The general maintenance of the wheelsets is organized as shown in Figure 1.

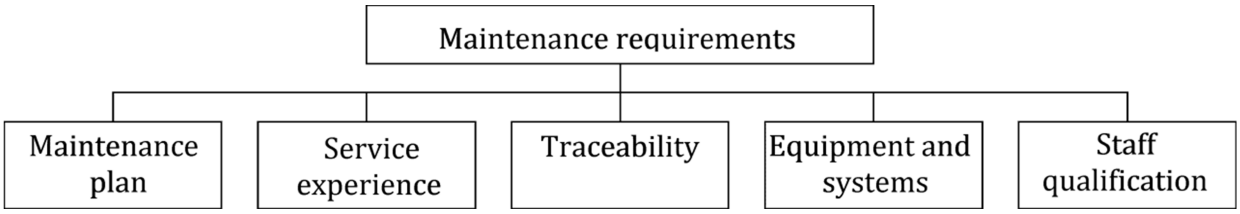


Figure 1 — General maintenance organization

4.2.2 Maintenance plan

For wheelset maintenance, it is necessary to have a maintenance plan for the wheelsets when in-service and off-vehicle.

The maintenance plan shall specify:

— the actions to be performed to meet the requirements and mandatory operations listed in this document;

— the maintenance intervals;

— any specific measures to be implemented.

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The maintenance plan shall be written by an organization having recognized experience in the wheelset maintenance field and approved by the technical expert for the owner undertaking.

4.2.3 Service experience

The maintenance plan shall be reviewed to include:

— the service experience based on the performance of parts in service;

— the corrective actions necessary for dealing with defects;

— remedial actions for criteria detected outside of the limits specified in the maintenance plan;

— corrective actions for limits based on data from in-line monitoring devices.

The principle for revising the maintenance plan based on service experience is presented in Figure 2.

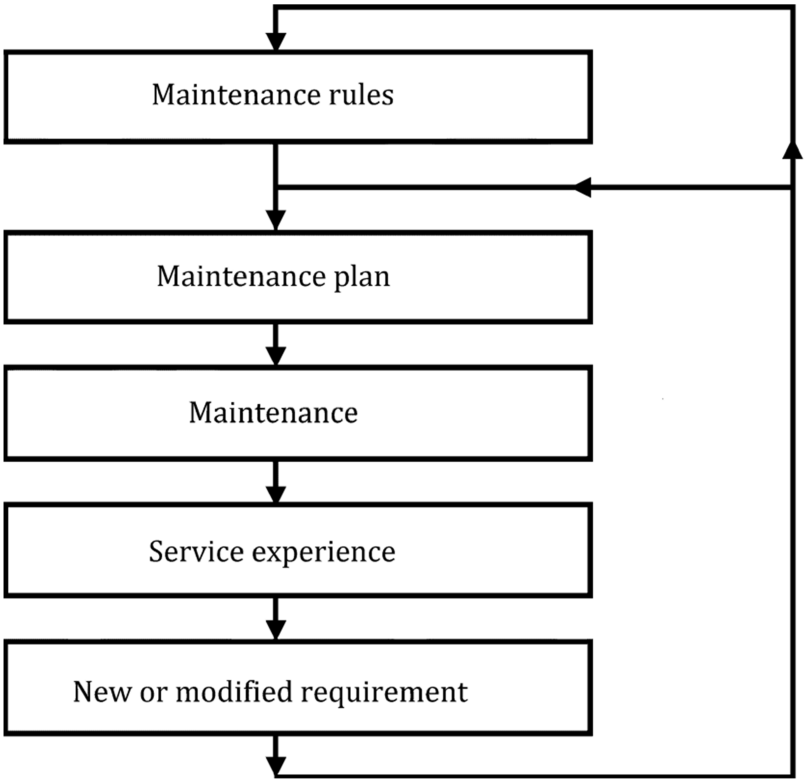


Figure 2 — Service experience

4.2.4 Traceability – storage – transportation

4.2.4.1 Wheelset identification

In order to ensure traceability, in-service wheelsets shall have marks complying with the requirements of EN 13260:2020, EN 13261:2020 and EN 13262:2020.

It is recommended to have:

— the owner's mark on the wheel (e.g. on the hub, with the same requirement as for the other marks, as specified in EN 13262:2020 and/or painted on the web, etc.);

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— external identification on wheelset with axleboxes fitted (e.g. tag or metal plate on the axlebox, collar on the axle, radio frequency identification (RFID), etc.).

None of the external identification marks shall adversely affect the axle or its components.

All the identification marks shall be described in a specific document to support the management of the wheelsets during their service lives.

The markings are to be applied to the wheelsets when the latter are subject to medium and heavy maintenance.

It is recommended, where possible, for these markings to be applied retrospectively, even when the wheelset components were not manufactured in accordance with EN 13261:2020 or EN 13262:2020.

NOTE When transponders are used for identification, the procedures and instructions are given in Chapter 4 "Guideline for MRO identification" of the document "RFID in RAIL – European Guideline for the Identification of Railway Assets using GS1 Standards".

4.2.4.2 Traceability of operations and transfers

The traceability shall be ensured throughout the life of the in-service wheelset and its components by recording its maintenance life history (e.g. various operations and property transfers).

4.2.4.3 Database

4.2.4.3.1 General

The traceability of the original data and maintenance life history shall be recorded in a database.

The contents of the database and process for capturing information shall be described in a specific procedure.

The consistency of the records shall be checked on a regular basis.

4.2.4.3.2 Freight wagons

For freight wagon wheelsets, the minimum content of the database, the time period to store the data and the measures resulting from lack of traceability are given in Annex A. The data shall be recorded in an electronic database.

For new freight wagon wheelsets, the data in Tables A.1 to A.6 shall be collected before the wheelset is placed in service.

For in-service freight wagon wheelsets, the data shall be collected at the earliest opportunity according to the maintenance plan (see 7.1).

Collected maintenance data are identified in categories I, II and III in Annex A, according to the minimum time for retaining the information.

In the event of a change of owner and/or ECM, all available wheelset data shall be transferred to the new owner and/or ECM.

4.2.4.3.3 Non-freight vehicles

For non-freight vehicles, the content of Annex B may be taken into consideration in ensuring adequate traceability.

4.2.4.4 Storage

Component parts, equipment, consumables, etc. are to be protected against damage, as well as against environmental degradation according to manufacturer's recommendations, if applicable.

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For wheelsets stored, the bearings fitted to the wheelsets shall be rotated at a frequency based on service experience. 24 months maximum is recommended.

4.2.4.5 Handling and transportation conditions for new or maintained wheelsets

The processes and means of handling, transporting and storing shall not be the cause of damage to wheelsets, their components and their protective covers. The handling, transportation and storage shall not damage the most stressed areas, such as the wheel seat transitions.

The bearings, journals and other exposed equipment shall be protected against corrosion and mechanical damage.

Written procedures specifying how these objectives will be reached shall be available.

4.3 Equipment and systems

All railway-specific tools, gauges and systems for wheelset maintenance (e.g. checking for circularity defect, stresses in the wheel rim, non-destructive testing, etc.) shall be approved to ensure that requirements of this standard are met.

A reference file shall be created for all railway-specific equipment in order to ensure that it meets the requirements.

This file shall indicate that the equipment or railway-specific system has the appropriate levels of sensitivity and repeatability in line with the desired objective. Performance sustainability shall be demonstrated by means of calibrated reference equipment.

In addition, when new methods are used, it shall be ensured that the results achieved with the new equipment or system are at least equivalent to those obtained with the former (e.g. differentiation between parts with or without defects, etc.).

4.4 Staff certification and competence

Certification is necessary for staff carrying out:

a) non-destructive testing:

   the staff shall be qualified according to EN ISO 9712:2022 (Industrial Sector: Railway Maintenance) or equivalent and authorized to work on specific processes;

NOTE EN 16910-1 gives guidance for the training of operators.

b) welding operations:

   the staff shall be qualified according to EN 15085-2:2020+A1:2023 or equivalent for components where welding is authorized.

4.5 Qualification of an undertaking for the maintenance of in-service or off-vehicle wheelsets

The qualification principle shown in Figure 3 applies to each of the following activities:

a) maintenance of in-service wheelsets;

b) maintenance of off-vehicle wheelsets;

c) maintenance activity component (example: reprofiling).

The qualification shall be reviewed before its extension to a new type of wheelset/axlebox.

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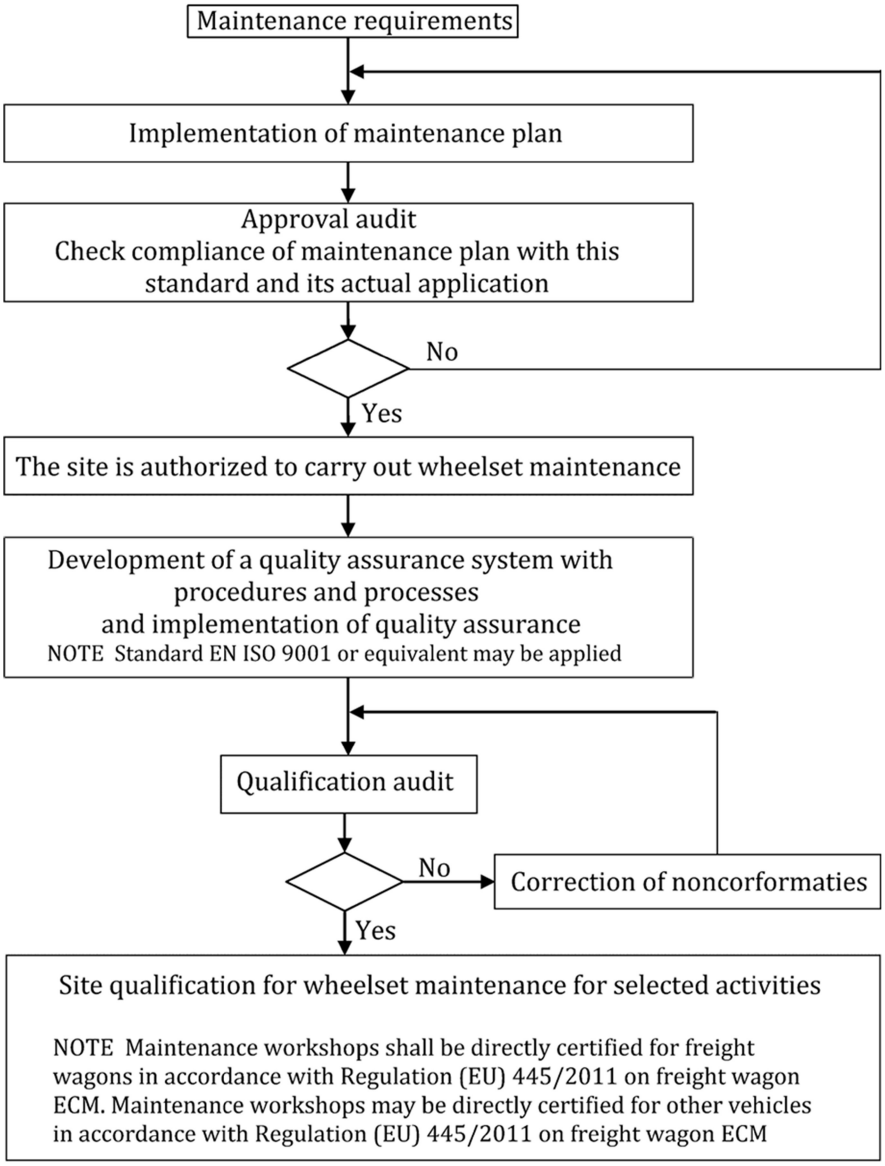


Figure 3 — Flow chart for qualification of a maintenance undertaking

5 Definition and illustrations of a wheelset, its associated components and defects

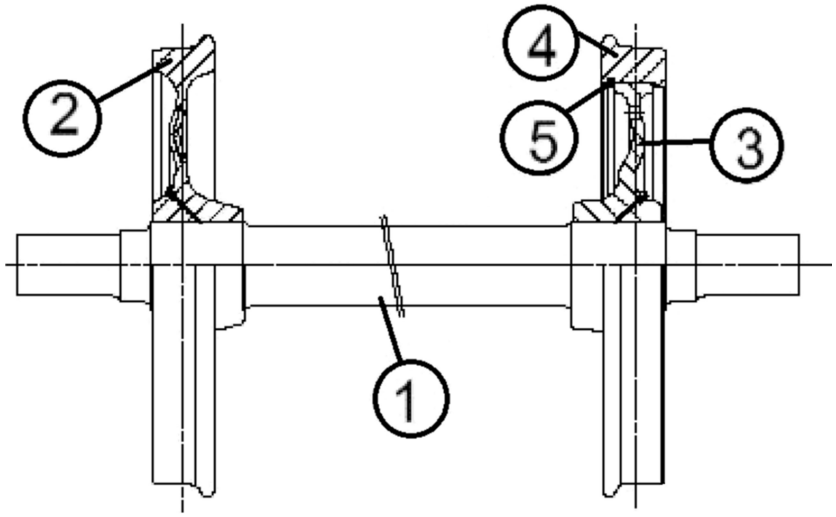
5.1 Definition and illustrations of a wheelset

5.1.1 Wheelset

The various components of a wheelset are shown in Figures 4 a) and 4 b).

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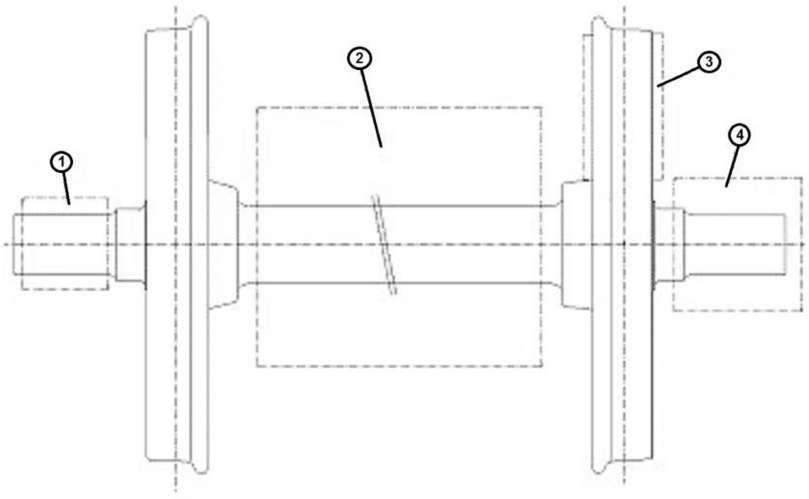
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Key

1 axle
2 monobloc wheel
3 wheel centre
4 tyre
5 retaining ring

a) Wheelset - principal components



Key

1 bearings
2 brake disc, transmission or final drive
3 wheel-fitted brake disc
4 axlebox with bearings

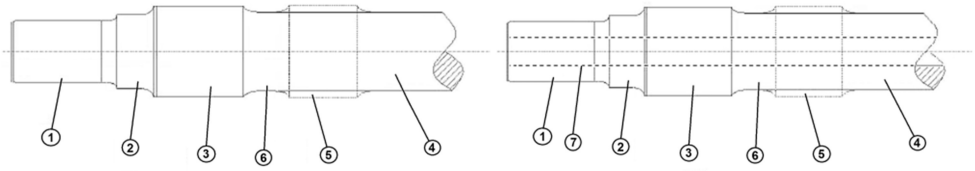
b) Wheelset - other components

Figure 4 — Wheelset

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5.1.2 Axle

The axle for all types of wheelset is shown in Figure 5.



Key

1	journal
2	abutment
3	wheel seat
4	axle body
5	seat for brake disc, transmission or final drive
6	transition zone between seats
7	axle bore

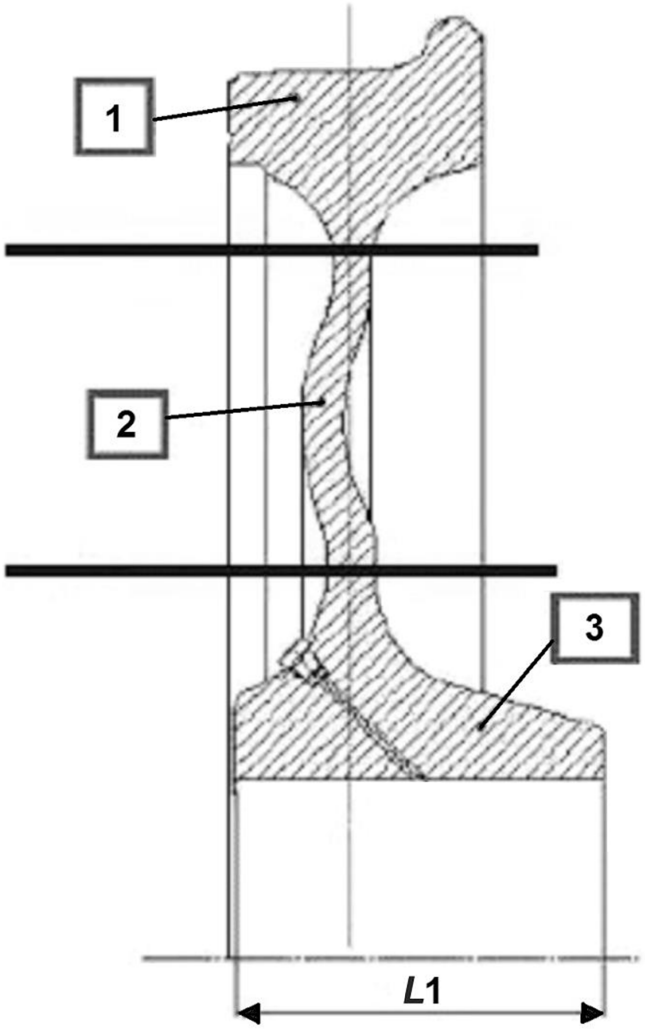
Figure 5 — Axle

NOTE Axles can be solid or hollow.

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5.1.3 Wheel

The monobloc wheel is shown in Figure 6.



Key

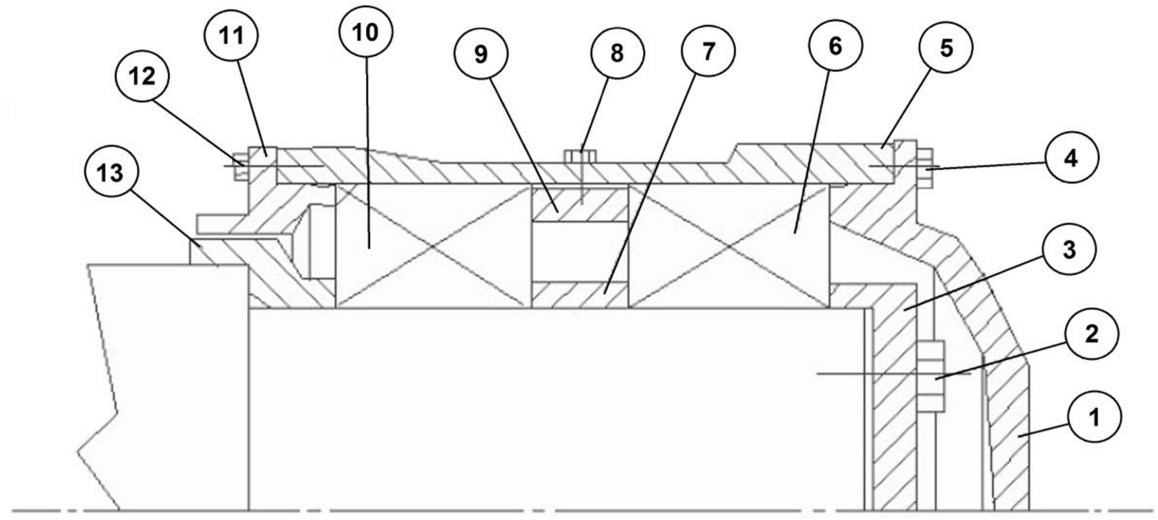
1	rim
2	web
3	hub
*L*1	hub lenght

Figure 6 — Monobloc wheel

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5.1.4 Axlebox

The basic axlebox is shown in Figure 7.



Key

1	front cover
2	end cap bolt and locking device
3	end cap
4	front cover bolt and locking device
5	axlebox body
6	outer bearing
7	internal spacer
8	lubrication point
9	external spacer
10	inner bearing
11	rear cover
12	rear cover bolt and locking device
13	abutment ring

Components 6 – 7 – 9 and 10 may be replaced by a “cartridge” bearing.

The different types of sealing system are to be added as a function of the type of bearing.

Figure 7 — Basic axlebox

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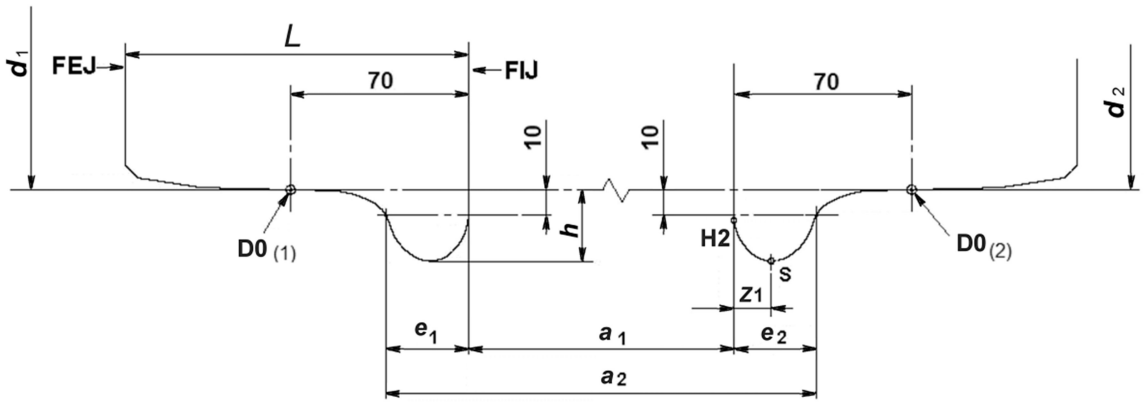
5.2 Functional references of the rail-wheel interface

5.2.1 Wheelset functional references

The essential dimensional references of the interface are defined in Figure 8.

The tread profile is defined in EN 13715:2020.

Dimensions in millimetres



Key

a_1	back-to-back dimension
a_2	front-to-front dimension ($a_1 + e_1 + e_2$)
D0	location of the wheel tread, 70 mm from its internal face. (1) wheel 1, (2) wheel 2
e_1, e_2	flange thicknesses
h	flange height
H2	finishing point of the flange, on the internal face of the wheel
L	rim nominal width
$Z1$	internal zone of flange ($H_2 - S$)
FEJ	external face of the rim
FIJ	internal face of the rim
S	connection at the tip of the flange
d_1, d_2	wheel diameters

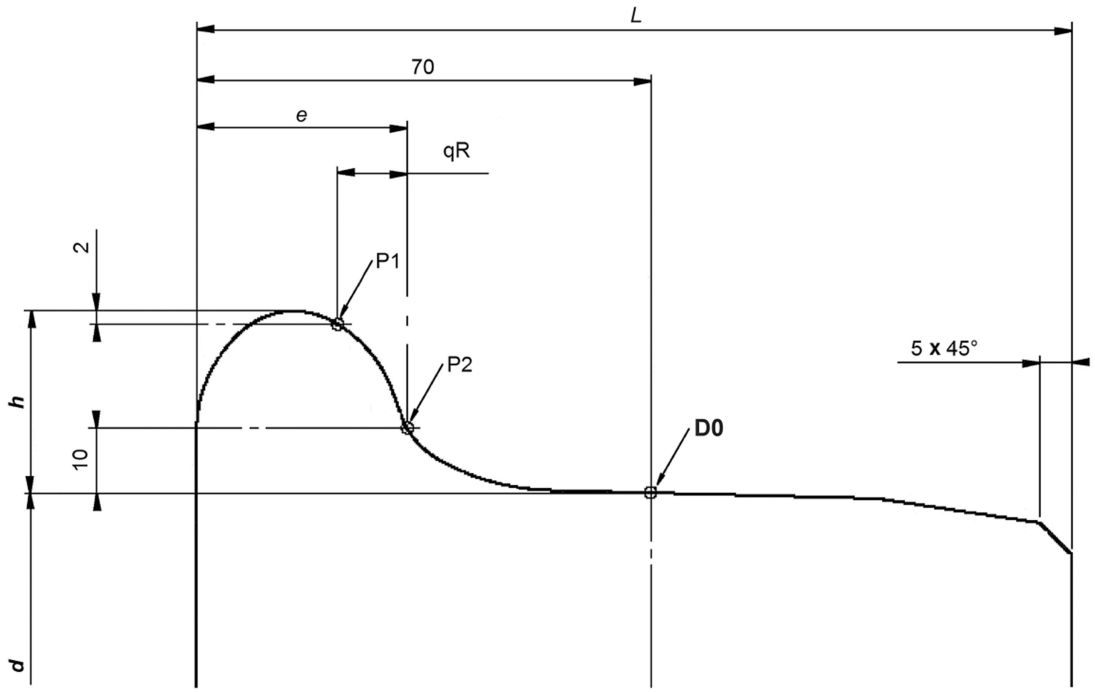
Figure 8 — Interface dimensions – Wheelset functional references

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5.2.2 Wheel functional references

The essential dimensional references of the wheel are defined in Figure 9.

Dimensions in millimetres



Key

d	wheel diameter
D0	location of the wheel tread, 70 mm from its internal face
h	flange height
L	rim nominal width
e	flange thickness
qR	flange angle dimension between P1 and P2
5 × 45°	nominal chamfer

Figure 9 — qR value and wheel functional references

NOTE The terms listed in Figures 8 and 9 conform to EN 13715:2020 (Tread profile) and EN 13260:2020 (Wheelsets).

5.3 Definitions and illustrations of defects

Definitions and illustrations of defects are given in Annex C.

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6 Requirements and operations

6.1 General

As indicated in the Introduction, this standard defines:

a) requirements for all owners/undertakings (e.g. maximum and minimum dimensions, rail interface dimensions, etc.);

b) maintenance to be carried out. The acceptance criteria are to be specified in the maintenance plan on the basis of service experience.

The requirements defined in 6.2 and 6.4 shall be assessed in accordance with the maintenance plan.

The tread profile and wheel dimensions after reprofiling shall be defined on the basis of:

c) the results of vehicle acceptance testing (e.g. stability verification, etc.);

d) the service experience.

The criteria shall be either as defined in 6.2 and 6.4 (allowable limits for safe operation) or as defined in the maintenance plan based on service experience.

The detection method for defects shall include:

e) manual;

f) visual; or

g) automatic.

6.2 Requirements

6.2.1 In-service limit dimensions and positions

6.2.1.1 General

The maximum and minimum values are given in Tables 1 to 6. The different interface dimensions are given in Figure 8.

In the case of wheels where the actual diameter passes from one category to another, it is permissible to use either of the values. This shall be documented in the maintenance plan.

6.2.1.2 Flange height "*h*"

The limit values as a function of the diameter are specified in Table 1.

Table 1 — Flange height "*h*"

d [a] *(mm)*	$d \leq 630$	$630 < d \leq 760$	$760 < d$
h minimum (mm)	31,5	29,5	27,5
h maximum (mm)	36,0		

[a] Wheel diameter (actual dimension).

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6.2.1.3 Flange thickness "*e*"

The limit values as a function of the diameter are specified in Table 2.

Table 2 — Flange thickness "*e*"

d [a] *(mm)*	$d \leq 760$	$760 < d \leq 840$	$840 < d$
e minimum [b] [c] (mm)	27,5	25,0	22,0
e maximum [b] (mm)	33,0		

[a] Wheel diameter (actual dimension).

[b] This does not apply to wheelsets having reduced wheel flanges or wheelsets without wheel flanges that are not involved in track guidance.

[c] In all cases, the value of "a_2" shall be within the limits defined in Table 4.

6.2.1.4 "qR" dimension

The minimum value of qR is 6.5 mm.

6.2.1.5 Back-to-back dimension "a_1"

The limit values as a function of the diameter are specified in Table 3.

Table 3 — Back-to-back dimension "a_1"

d [a] (mm)	$d \leq 760$	$760 < d \leq 840$	$840 < d$
a_1 minimum (mm)	1 359	1 358	1 357
a_1 maximum (mm)	1 363		

[a] Wheel diameter (actual dimension).

This value shall be checked between the internal faces of the rim, close to the top of the rail, with the wheelset under load.

The resumption/recovery of the a_1 dimension is permitted if the width of the rim after reprofiling is within the tolerances required by this document.

No correction is permitted after a derailment or detection of a loose wheel.

6.2.1.6 Front-to-front dimension "a_2"

The limit values as a function of the diameter are specified in Table 4.

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Table 4 — Front-to-front dimension

d [a] (mm)	$d \leq 760$	$760 < d \leq 840$	$840 < d$
a_2 minimum [b] (mm)	1 415	1 412	1 410
a_2 maximum (mm)	1 426		

[a] Wheel diameter (actual dimension).

[b] This does not apply to wheelsets having reduced wheel flanges or wheelsets without wheel flanges that are not involved in track guidance.

This value shall be checked with the wheelset under load at the point on the flange front equivalent to the point 10 mm below D0 (top of rail).

Specific values can be defined after stability testing of the vehicles (Annex D gives the front-to-front dimension characteristics for the wheelsets of two-axle wagons loaded at 22,5 t per axle).

The following condition shall be met:

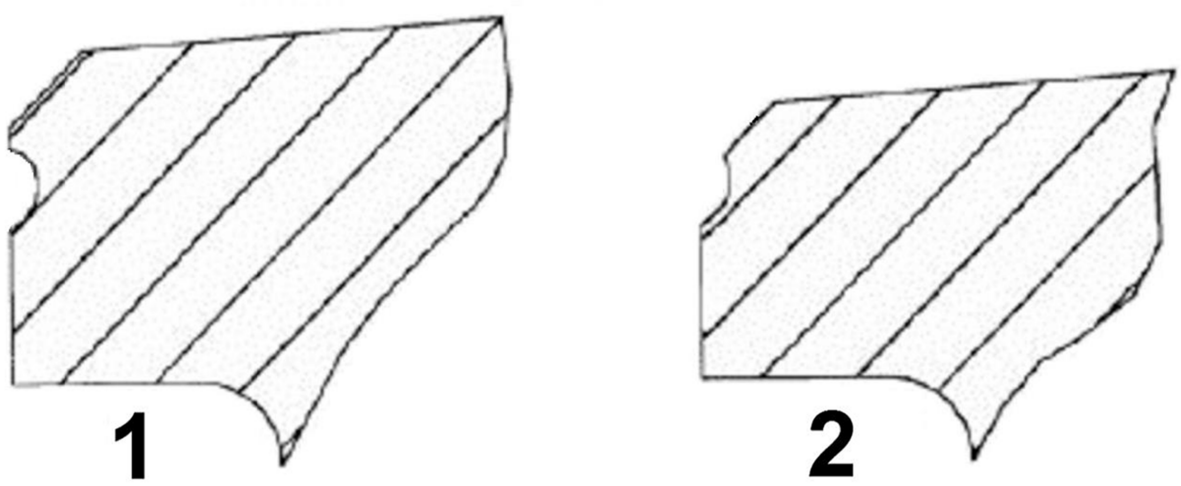
$$a_2 \text{ min} \leq a_1 + e_1 + e_2 \leq a_2 \text{ max}$$

The front-to-front dimension may be calculated from the value of the back-to-back dimension and the flange thickness of the two wheels.

6.2.1.7 Wear groove

The wear groove, when mandatory, shall always be fully visible after reprofiling or in service. The acceptance criteria is shown in Figure 10.

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Key

1 permitted

2 not permitted

Figure 10 — Wear groove

6.2.1.8 Wear limit and last reprofiling diameters

The wear limit and last reprofiling diameters shall be specified. The difference between these two diameters is as follows:

a) the wear limit diameter is defined at the wheel design stage;

b) the last reprofiling diameter shall be defined relative to the wear limit diameter so that it does not have a lower value in service.

The wear limit diameter and last reprofiling diameter are defined in EN 13979-1:2023.

6.2.1.9 Chamfer

The chamfer is defined in Figure 9. The nominal dimensions are: 5 × 45°.

The tolerance on each dimension is ±2.

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6.2.1.10 Rim width "*L*" without roll-over

The nominal rim widths and their tolerances are given in Table 5.

Table 5 — Nominal rim width "*L*" without roll-over and tolerances

Nominal rim width "*L*" (mm)	Tolerance (mm)
135	−2 / +1
140	

NOTE Specific values from certain former state railways are given in Annex E for vehicles not subject to Directive (EU) 2016/797.

6.2.2 Special maintenance action for freight wagon axles according to axle load

Many European freight wagon wheelsets are currently equipped with axles designated as types A and B (see Annex F). For the enhanced loading operation, with constant use at high axle load, additional maintenance actions are required.

NOTE 1 For the definitions of type A and B, see UIC 510-1:1978.

Table 6 lists the maintenance intervals and maintenance actions that have to be applied to ensure safe operational conditions for these axle types corresponding to the axle loads.

NOTE 2 These values have been derived from experience gained by users in applications in European operation.

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Table 6 — Special maintenance actions for freight wagon axles according to axle load

Axle type	Axle load *M* (t)	Additional criteria	Corresponding additional maintenance action
For type A-I; A-II; A-III(1) axles operated from 20 t up to 21 t axle load in standard maintenance plan and re-classified back to 20 t operation:		Re-integrate axle in standard maintenance plan with UT of the wheel seat at the next reprofiling, medium or heavy maintenance level of the wheelset	
Type A-I; A-II; A-III(1)	$21 < M$	Not covered by this document	Scrap
Type A-III (2)	$20 < M \leq 20{,}6$	Inside design limits, validated by service	No special requirements
Type A-III (2)	$20{,}6 < M \leq 21$	Limited mileage between medium or heavy maintenance: 400 000 km or the equivalent time in service	NDT with fitted wheels — UT at wheel seat — UT or MT at transition radii
Type A-III (2)	$21 < M \leq 22$	Limited mileage between medium or heavy maintenance: 200 000 km or the equivalent time in service	
Type B	$22{,}5 < M \leq 23{,}5$	Inside design limits but use to be checked case by case in accordance with wagon parameters and permitted infrastructure axle load	No special requirements

6.2.3 Maintenance decision criteria for in-service wheels for all types of wheel

6.2.3.1 Limit lengths of wheel tread defects (e.g. flats, metal build-up, shelling, cavities, scaling, tread indentation, isolated transverse cracking, material loss, etc.) (C.2.1 to C.2.6) and circularity defects (C.2.7)

Limit values for defects in service relative to the axle load, speed and wheel diameter are given in Table 7.

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Table 7 — Limit lengths of wheel tread defects

M (t)		$M \leq 18$			$18 < M \leq 22{,}5$				$22{,}5 < M$		
V (km/h)		$V \leq 160$	$160 < V \leq 200$	$200 < V$	$V \leq 120$	$120 < V \leq 160$	$160 < V \leq 200$	$200 < V$	$V \leq 100$	$100 < V \leq 120$	$120 < V$
d (mm)	$1\,000 < d$	80	60	40	80	60	50	35	X	X	X
	$840 < d \leq 1\,000$	60	50	30	60	50	35	25	60	50	30
	$630 < d \leq 840$	40	30	25	40	30	25	20	40	X	X
	$550 < d \leq 630$	35	25	X	X	X	X	X	X	X	X
	$d < 550$	30	X	X	X	X	X	X	X	X	X

M: axle load in tonnes (t).
d: actual wheel diameter
X: reserved (no application known)

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The values given in Table 7 are the maximum allowable values in service for the largest defect found on the wheel tread.

Different values for equipment not subject to Directive (EU) 2016/797 may be used according to service experience.

If defects exceed the dimensions of Table 7, the defects shall be eliminated by reprofiling and the axle bearings shall be checked according to service experience.

Permissible values for circularity defects, Δr, shall be defined in the maintenance plan. Indicative values are given in Annex G. Circularity defects may be detected during medium and heavy maintenance.

6.2.3.2 Spalling (Thermal effects due to tread braking) (C.2.8)

Acceptable if it is the only defect on the tread.

6.2.3.3 Rolling contact fatigue (C.2.9)

Acceptable if it is the only defect on the tread.

6.2.3.4 Thermal cracks (C.2.10)

Thermal cracks (linear defect) are not permitted.

In cases where a flanging brake block is detected (friction between the brake block and the external lateral face of the rim, the area of the wheel tread affected shall be examined for thermal cracks.

Where a flanging brake block is detected, it is recommended that the position of the tread brake unit/brake equipment is checked.

6.2.3.5 Wheel tread roll-over (C.2.11)

The maximum permitted value for the wheel tread roll-over is 5 mm.

6.2.3.6 Damage to chamfered corner (C.2.12)

This defect is permitted if the damage has not evolved into a crack.

6.2.3.7 Wheel tread – grooves and channels (C.2.13)

Grooves, rounded in form and no sharp edges, with a depth more than 2 mm are not permitted.

Channels, characterized by shape edges, are not permitted.

6.2.3.8 False flange (C.2.14)

A false flange with a depth more than 2 mm is not permitted.

6.2.3.9 Damage on the flange (C.2.15)

The metal flow in zone P1–flange tip, defined in Figure 9, is acceptable if the representative qR dimension is greater than 6,5 mm. Damage, sharp edges or burrs N° 1, 3 or 4 defined in C.2.15 Figure C.22 are not accepted.

There shall be no radial surface marks that exhibit a notch effect (e.g. crack, NDT indication, etc.).

6.2.3.10 Radial marks and radial defects on the internal side of the rim (FIJ) (C.2.16)

Radial marks on the internal side of the rim are permitted. (Figure C.23 a)).

There shall be no radial surface marks that exhibit a notch effect (Figures C.23 b and c).

Radial defects associated with the presence of thermal effects at the rim-web transition are not permitted.

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6.2.3.11 Damage resulting from identification markings (C.2.17)

Cracks from any marking are not permitted.

6.2.3.12 Damage from lathe driving tools (C.2.18)

Axial or radial sharp-edged marks are not acceptable on the external face of the rim (FEJ).

6.2.3.13 Defects on the external face of the rim (FEJ)

There shall be no marks or radial cracks.

6.2.3.14 Defects on the web and the hub of a wheel (C.2.19 to C.2.22)

The web and hub shall not have any:

a) cracks, sharp-edged notches or any other irregularity;

b) marks resulting from the removal of defects by means of a procedure not included in the maintenance plan;

c) cracks of mechanical or thermal origin around any fixing holes, for example the holes on the transmission gear or other noise and/or vibration damping devices and brake discs fitted on the wheel web, wheel web holes, etc.

6.2.4 Maintenance decision criteria for in-service wheels for specific wheel types

6.2.4.1 Deep sub-surface tread defect on monobloc wheel (C.3.1)

If service experience shows damage originating from wheel tread defects, the inspection and maintenance requirements to be met shall be defined in the maintenance plan.

6.2.4.2 Defects on the web of a wheel used as a braking surface (C.3.2.1)

The requirements to be met by wheels where a web is used as a braking surface shall be defined in the maintenance plan.

6.2.4.3 Thermal overloading of wheels - Overheating affecting the wheel rim/web transition on monobloc wheels (C.3.2.2)

Overheating of the transition zone can result in a wheel distortion defect (C.6.2), development of residual tensile stresses in the rim and thermal cracks.

Signs for a thermal overload of a wheel are:

— clearly burnt paint at connection between rim and wheel web (peeled or blistered paint);

— traces of rust at connection between rim and wheel web;

— fusion/ melting of brake blocks;

— deterioration of the wheel tread with build-up of metal;

— bluish coloured rim from overheating;

— flanging brake blocks;

— hot wheel detection by the infrastructure monitoring system;

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— back-to-back distance (outside the limits defined in Table 3).

When thermal overloaded wheels are identified, the following measures shall be applied:

a) on non-thermostable wheels (not complying with the thermomechanical assessment according to EN 13979-1:2023):

   — residual stress measurement;

   — back to back distance measurement between the wheels;

   — reprofiling;

   — NDT of the tread (after reprofiling);

NOTE Systematic reprofiling of large reduction in diameter and visual inspection of the tread according to service experience can replace residual stress measurements and NDT of the tread.

b) on thermostable wheels complying with EN 13979-1:2023 (freight wagons are identified with white marks on the axlebox, see Figure 12), the measures have to be applied in the next scheduled off-vehicle wheelset maintenance.

For ER6 or ER7 monobloc wheels, the maximum allowable residual stresses are as follows:

— 300 MPa for monobloc wheels of unknown fracture toughness of the rim;

— 400 MPa for monobloc wheels of fracture toughness of the rim as specified in EN 13262:2020.

Some methods for measuring the residual stress of the wheel rims are given in the document B169 RP6:1995 [8].

6.2.4.4 Tyred wheel defects (C.3.3)

The requirements for tyred wheels are defined in Annex H.

6.2.5 Damage acceptance limits for axle bodies

6.2.5.1 Damage caused by corrosion (C.4.1 and C.4.2)

Corrosion pitting that is greater than what service experience shows acceptable is not permitted.

Axles, where the condition of the surface according to the illustrations in Annex I requires a treatment process, shall be rectified (depending on geometric limits) or removed from service in order to prevent potential crack propagation. This intervention shall be undertaken no later than during medium maintenance for wheelsets in accordance with the requirements of the maintenance plan.

The treatment process may be turning, grinding, blasting, etc.

The treated areas shall be subjected to NDT (excluding VT).

In the case of the presence of damage to the coating (bubbles, partial detachments, etc.) that does not permit a clear evaluation of the surface condition under the coating, then the coating is to be removed until the surrounding area is clear of corrosion.

6.2.5.2 Circumferential defects around the whole circumference (C.4.3.1)

Channels are not permitted.

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6.2.5.3 Circumferential defect on a singular zone (C.4.3.2)

Circumferential cracks are not permitted.

6.2.5.4 Notches and impact damage (C.4.4)

Sharp-edged notches are not permitted.

Criteria and limits of repairs shall be defined in the maintenance plan.

6.2.5.5 Longitudinal defects (C.4.5)

Limit criteria shall be defined in the maintenance plan on the basis of service experience.

6.2.5.6 Damage in the interference fit zones (C.4.6)

Limits shall be defined in the maintenance plan. This damage can only be detected during heavy maintenance.

6.2.6 Criteria for axlebox (C.5)

Criteria shall be defined in the maintenance plan.

6.2.7 Criteria on wheelsets

6.2.7.1 In-service axial or angular movement of a wheel or of one of the other components (C.6.3)

No axial movement of a wheel is permitted.

For angular movement of the wheel, specific requirements shall be applied in the maintenance plan, on the basis of service experience.

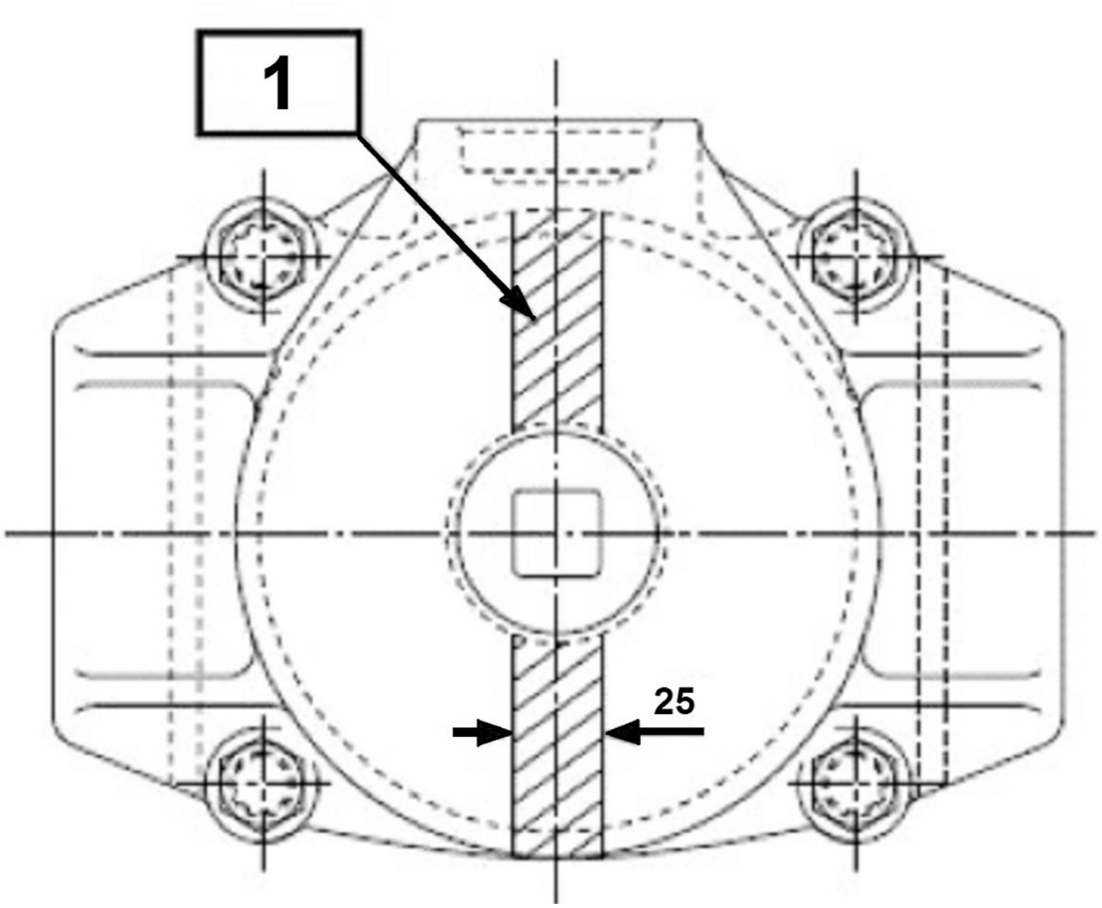
Movement of other components assembled on the axle shall be defined in the maintenance plan based on service experience.

6.2.7.2 Marking of wheelsets with wheels designed according to EN 13979-1:2023

Axleboxes of freight vehicles with outboard journals and fitted with EN 13979-1:2023 compliant wheels shall be marked with a vertical white line on their outer cover. This marking is shown in Figure 11.

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Dimensions in millimetres



Key

1 white mark and width

Figure 11 — White mark on axlebox – Wheel marking according to EN 13979-1:2023

6.2.7.3 Electrical resistance of wheelsets after heavy maintenance

After heavy maintenance, the electrical resistance of wheelsets equipped with monobloc wheels shall meet the requirements of EN 13260:2020.

6.2.8 Specific requirements for tyred wheels and resilient wheels

Specific requirements shall be defined in the maintenance plan.

These requirements shall at least reject:

— cracked or broken tyres;

— thin tyres;

— damage to the retaining ring (loose, cracked or broken ring);

— lateral movement of the tyre;

— loose tyre;

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— make up pieces between the wheel centre and the tyre;

— discontinuous non-monobloc ring.

A tyre is considered to be loose if at least one of the following conditions is met:

— tyre rotation on the wheel centre that can be indicated by the white lines painted on the components. For powered wheelsets, specific requirements relating to the radial offset of the tyre shall be indicated in the maintenance plan, on the basis of service experience;

— does not ring true when tapped;

— loose retaining ring;

— corrosion between tyre and wheel centre over more than 1/3 of the circumference.

Additional requirements for resilient wheels shall be defined in the maintenance plan. These shall include, as a minimum:

— inspection of the integrity of the rubber elements;

— inspection of the earth-braids and the mechanical connections at the tyre and web;

— a procedure to confirm the electrical continuity;

— verification of the required clearances between rim and the wheel centre;

— a tyre concentricity check during major maintenance operations.

An example of requirements for tyred wheels and resilient wheels is presented in Annex H.

6.2.9 Limit value for axle wheel seat diameter

The minimum diameter of the axle wheel seat shall be defined in the maintenance plan.

Minimum wheel seat diameter for all Type A axles (see Annex F) shall be limited to 182 mm when operated at 20 t.

NOTE This value has been derived from experience gained by users in applications in European operation.

6.3 Reprofiling operation

Wear on the profile and tread defects which exceed the requirements of this standard or of the maintenance plan shall when possible be repaired by means of reprofiling.

Before performing any reprofiling operation, the following data shall be obtained from the technical expert for the owner undertaking:

— the reprofiling site;

— the profile to be taken into account according to EN 13715:2020;

— the reprofiling dimensions (e.g. flange thickness, front-to-front dimensions, etc.).

If any defect is present in a wheel, a reprofiling operation shall be planned on the basis of service experience so that dimensions of the damage does not exceed the criteria specified in Table 7.

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