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English Version

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

Applications ferroviaires - Exploitation des essieux en service - Maintenance des essieux en exploitation ou déposés

Bahnanwendungen - Radsätze und Drehgestelle - Radsatzinstandhaltung

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (EN 15313:2010) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2010, and conflicting national standards shall be withdrawn at the latest by October 2010.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and/or CENELEC shall not be held responsible for identifying any or all such patent rights.

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

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

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

To ensure safety and interoperability, this European Standard gives:

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

— the mandatory 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 complying with the following European Standards:

— EN 12080, EN 12081, EN 12082;

— EN 13103, EN 13104;

— EN 13260, EN 13261, EN 13262;

— EN 13979-1;

— EN 13715,

that comprise:

— the axle with wheel diameters greater than or equal to 330 mm;

— axle boxes 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 before the approval of these standards;

— with tyred wheels whose characteristics are given in Annex D.

For bilateral and domestic traffic, this document may be applied, noting that different values may be used.

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

NOTE The requirements to be met by components other than axles, wheels, axle boxes, bearings and grease (e.g. brake disc, final drive, transmission, noise-damping systems, etc.) shall be defined in a specific document.

2 Normative references

The following referenced documents are indispensable for the application 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 287-1, *Approval testing of welders — Fusion welding — Part 1: Steels*

EN 473, *Non-destructive testing — Qualification and certification of NDT personnel — General principles*

EN 13260, *Railway applications — Wheelsets and bogies — Wheelsets — Product requirements*

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

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

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

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

EN ISO 9934-1, *Non-destructive testing — Magnetic particle testing — Part 1: General principles (ISO 9934-1:2001)*

EN ISO 9934-2, *Non-destructive testing — Magnetic particle testing — Part 2: Detection media (ISO 9934-2:2002)*

EN ISO 9934-3, *Non-destructive testing — Magnetic particle testing — Part* 3: *Equipment. (ISO 9934-3:2002)*

3 Terms and definitions

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

3.1
operation
everday use of wheelsets in service on the track or during routine planned maintenance.

NOTE This term also includes any in-service problems and their treatment.

3.2
competent technical department
department having experience in the wheelset maintenance field having already written the rules

NOTE Departments of the former "networks" come into this category.

3.3
technical expert
person recognized and designated as such by the railway undertaking

3.4
former networks
historical networks existing before the publication of the European Directives and which had specified the requirements for the wheelsets registered in their respective country

4 Maintenance

4.1 General

Maintenance involves:

— maintenance of in-service wheelsets;

— maintenance of off-vehicle wheelsets;

— overhaul after in-service incidents (e.g. overloads, hot axle box detection, wheelset bearings subject to water ingress, etc.).

An in-service wheelset shall be maintained by a maintenance undertaking qualified for 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 qualified wheelset tools;

— qualified staff for non-destructive testing and welding.

4.2 Maintenance organization

4.2.1 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 the requirements and mandatory operations listed in this standard;

— the maintenance intervals;

— any specific measures to be implemented.

This maintenance plan shall be written by a competent technical department in the railway field and approved by the technical expert of the owner undertaking.

4.2.2 Service experience

The maintenance plan shall be reviewed to include:

a) the service experience based on the performance of parts in service;

b) the corrective actions necessary for dealing with defects:

1) detected outside the maintenance plan;

2) established on the track using specific devices.

The general principle of service experience is shown in Figure 1:

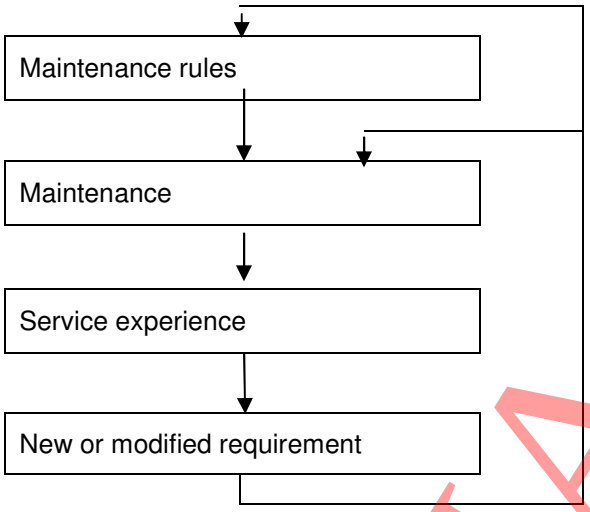


Figure 1 — Service experience

4.2.3 Traceability – storage – transportation

4.2.3.1 Wheelset identification

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

It is recommended having:

— 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; painted on the web, etc.);

— external identification on wheelset with axle boxes mounted (e.g. tag or metal plate on the axle box, collar on the axle, 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 applied to the wheelsets when the latter are being overhauled.

NOTE 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 or EN 13262.

4.2.3.2 Traceability of operations and transfers

The traceability shall be ensured throughout the life of the in-service wheelset by recording the various operations and transfers.

The traceability shall be recorded in a database (e.g. paper, electronic, etc.) and shall be validated.

The traceability shall be secured.

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

In the case of a computerized database, the consistency of the recordings shall be checked on a regular basis.

4.2.3.3 Grease storage

Grease storage areas shall be protected from direct sunlight.

4.2.3.4 Component storage

Component parts of the wheelsets shall be protected against damage and corrosion.

It is recommended storing the components in dry conditions with free air circulation.

4.2.3.5 Handling and transportation conditions for new or overhauled wheelsets

A procedure shall be written for safe handling and transporting new or overhauled wheelsets or their components.

4.3 Qualification of equipment and systems

4.3.1 General principle

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 qualified to ensure that requirements of this standard are met.

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

4.3.2 Qualification file for equipment and systems

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 473 or equivalent and authorized to work on specific processes;

b) welding operations:

the staff shall be qualified according to EN 287-1 or equivalent for components where welding is authorized.

4.5 Maintenance organization plan

The general maintenance of the wheelsets is organized as shown in Figure 2.

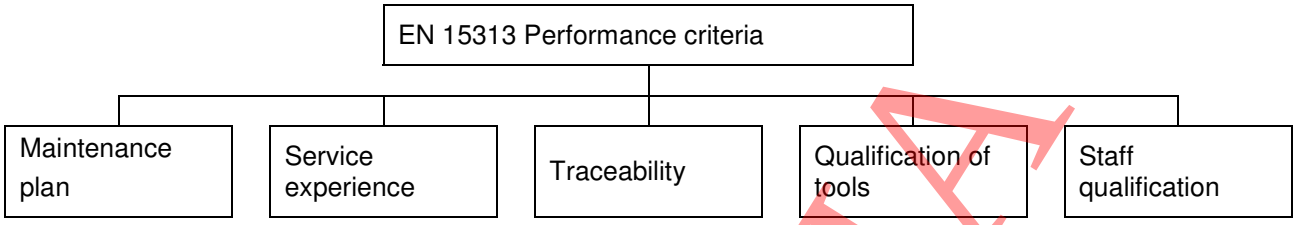


Figure 2 — General maintenance organization

4.6 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:

— maintenance of in-service wheelsets;

— maintenance of off-vehicle wheelsets;

— maintenance activity component (example: reprofiling).

The qualification shall be reviewed before its extension to a new wheelset.

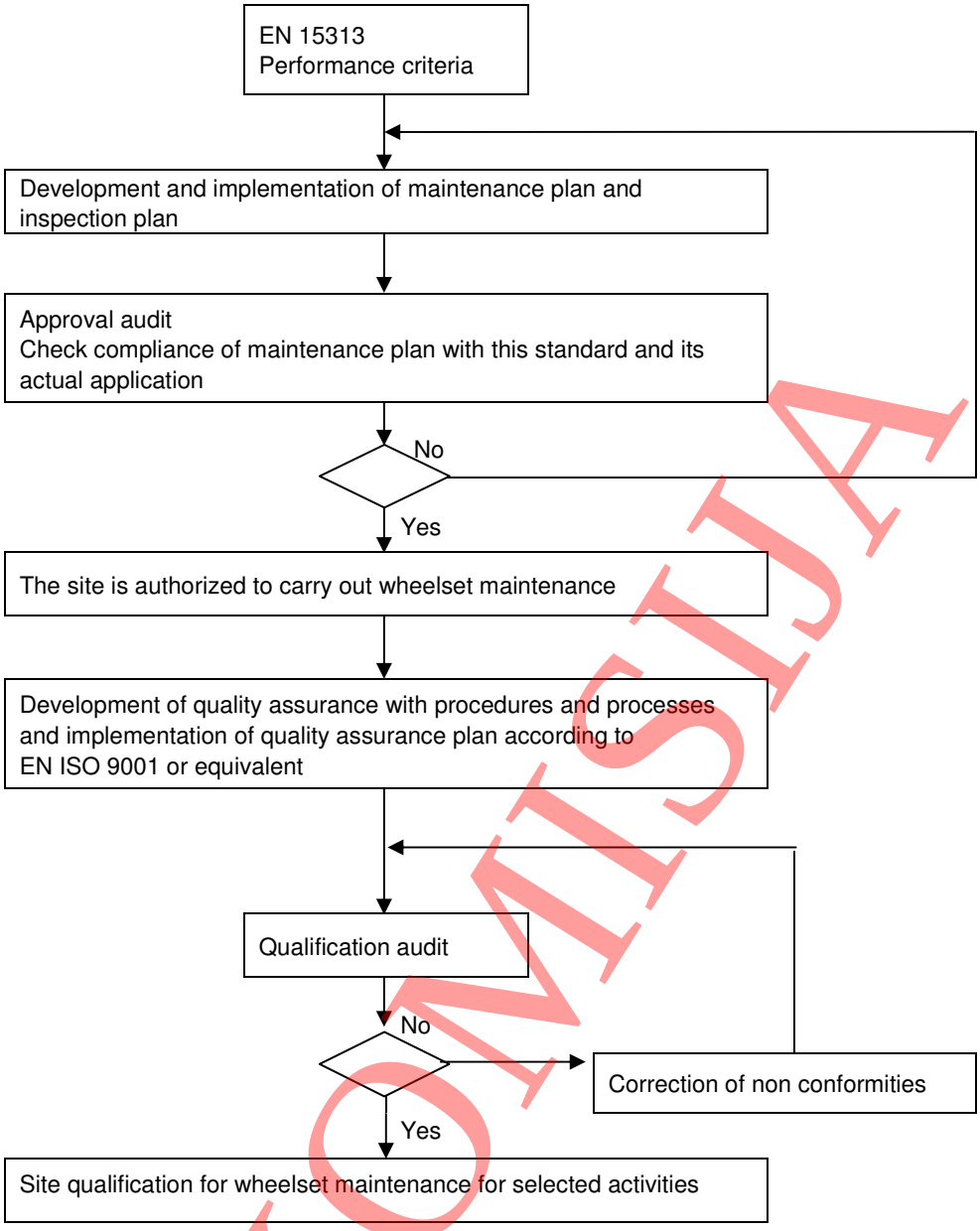


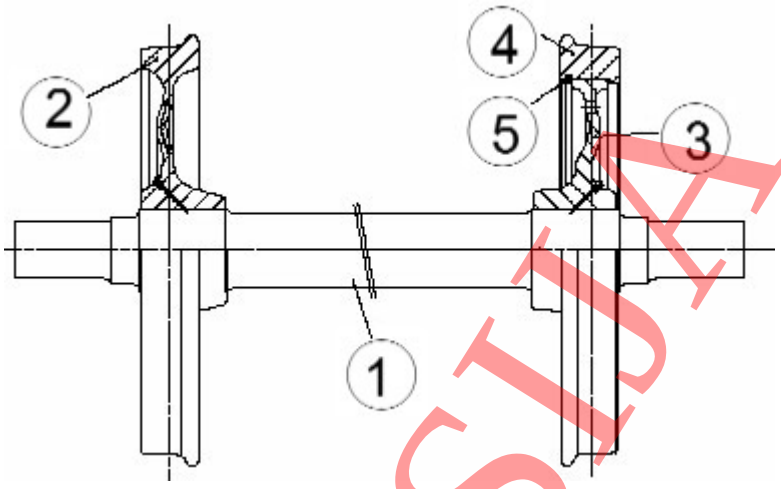
Figure 3 — Flow chart for qualification of an undertaking

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

5.1 Definition and illustrations of a wheelset

5.1.1 Wheelset

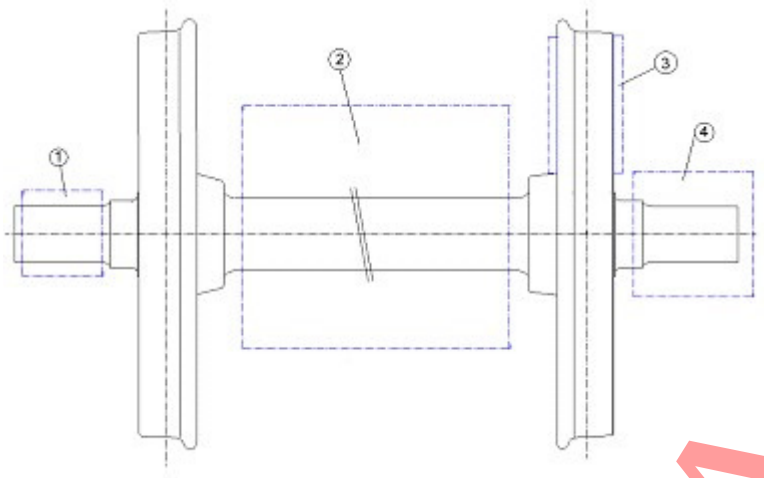
The various components of a wheelset are shown in Figures 4a) and 4b).



Key

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

a) — Wheelset — Principal components



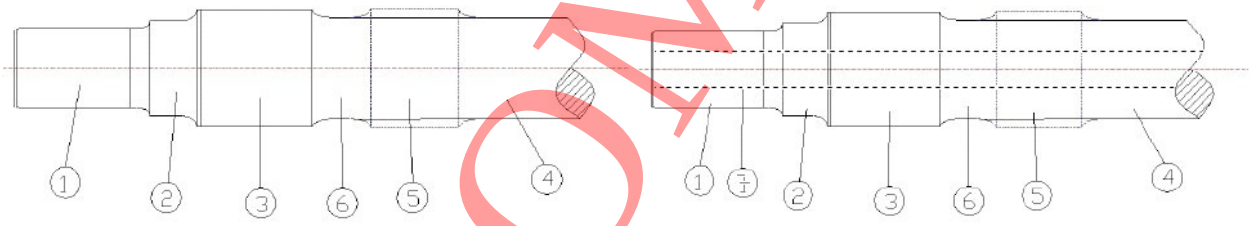
Key
1 bearings
2 brake disc, final drive or traction motor
3 wheel-mounted brake disc
4 axle box with bearings

b) — Wheeset — Other components

Figure 4 — Wheelset

5.1.2 Axle

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



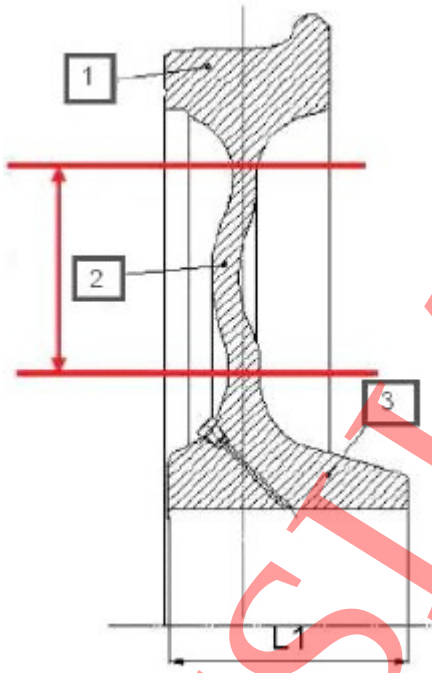
Key
1 journal
2 collar-bearing surface
3 wheel seat
4 axle body
5 seat for brake disc, final drive or traction motor
6 transition zone between seats
7 axle bore

Figure 5 — Axle

NOTE Axles may be solid or hollow.

5.1.3 Wheel

The monobloc wheel is shown in Figure 6.



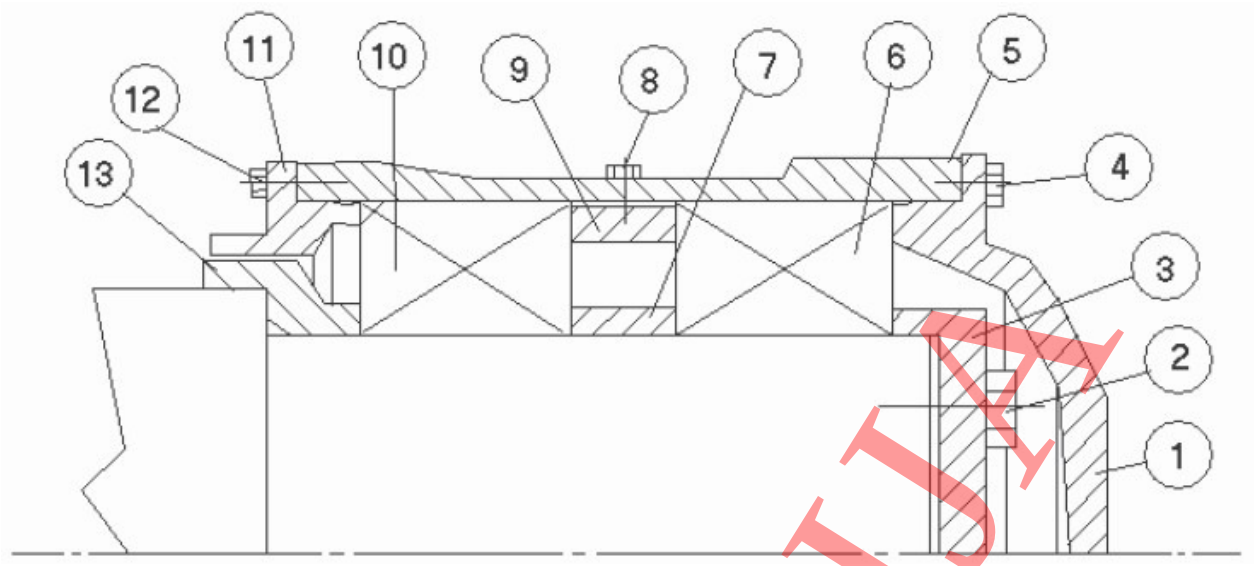
Key

1 rim
2 web
3 hub
L1 hub width

Figure 6 — Monobloc wheel

5.1.4 Axle box

The basic axle box is shown in Figure 7.



Key

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

NOTE 1 Components 6 – 7 – 9 and 10 may be replaced by a "cartridge" bearing

NOTE 2 The different types of sealing system are to be added as a function of the type of bearing

Figure 7 — Basic axle box

5.2 Functional references of the rail-wheel interface

5.2.1 General

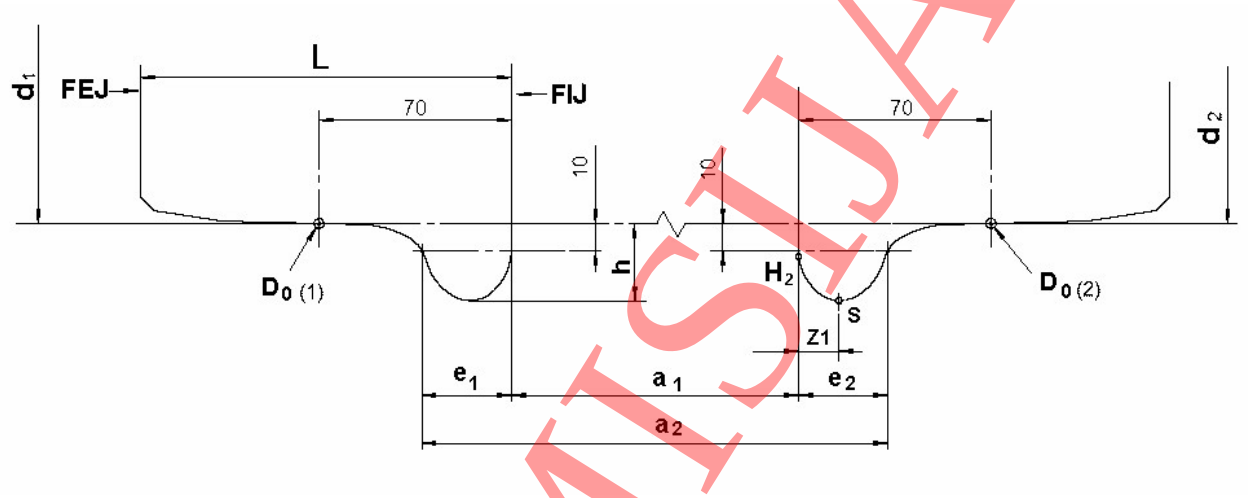
The definitions in this 5.2 are detailed in document ERRI B 169 DT 405.

5.2.2 Wheelset functional references

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

The tread profile is defined in EN 13715.

Dimensions in millimetres



Key

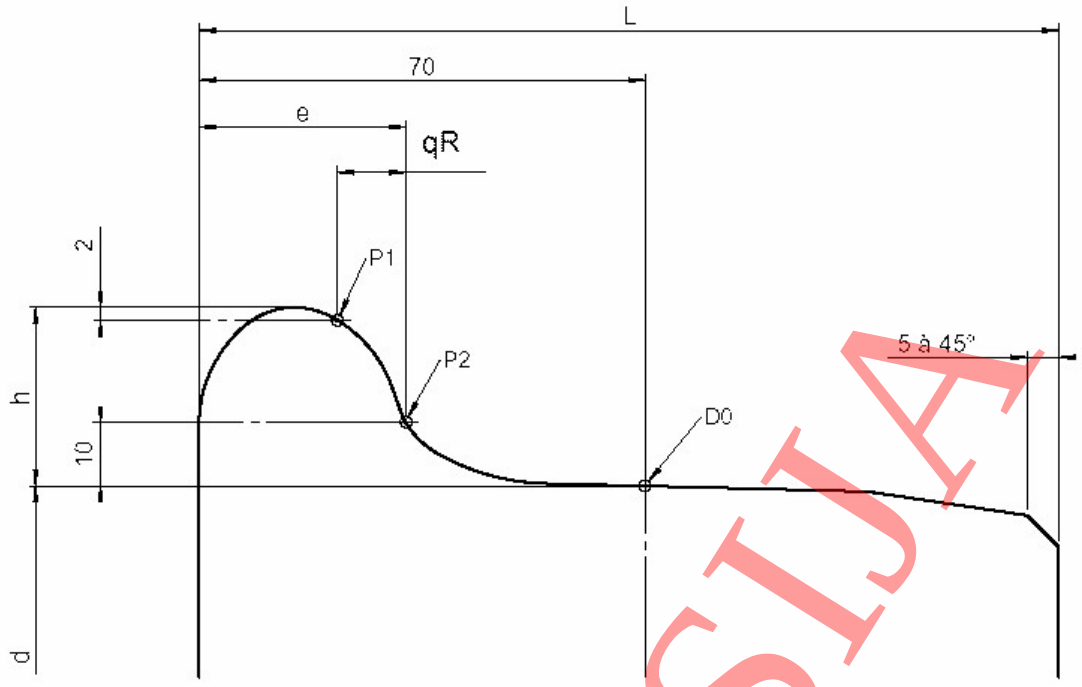
a_1	back-to-back dimension
a_2	front-to-front dimension (a1 + e1 + e2)
D_0	position of wheel tread (1) wheel 1, (2) wheel 2
e_1, e_2	flange thicknesses
h	flange height
H_2	transition point between internal face of the rim and the flange
L	rim width
Z1	internal zone of flange (H2 – S)
FEJ	external face of the rim
FIJ	internal face of the rim
S	flange tip
d_1, d_2	wheel diameters

Figure 8 — Interface dimensions — Wheelset functional references

5.2.3 Wheel functional references

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

Dimensions in millimetres



Key

d wheel diameter
D_0 position of wheel tread
h flange height
L rim width
qR flange angle dimension between P1 and P2

Figure 9 — qR value and wheel functional references

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

5.3 Definition and illustrations of defects

5.3.1 General

The defects in this 5.3 are detailed in document ERRI B 169 DT 405.

5.3.2 Defects for all types of wheel

5.3.2.1 Shelling, cavities

This defect is a local material loss in a limited zone of the running surface as shown in Figure 10.

Figure 10 — Shelling – Cavity

5.3.2.2 Spalling

This short length defect is a local material loss over the whole running surface as shown in Figure 11.

Figure 11 — Spalling

5.3.2.3 Scaling

This defect, shown in Figure 12, is a laminar metal flow over the whole running surface.

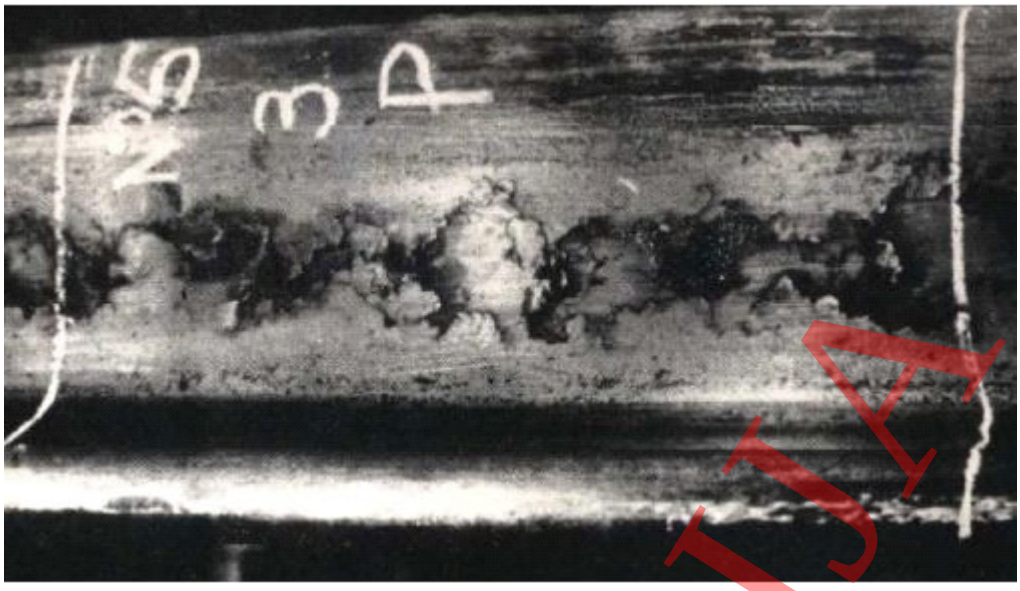


Figure 12 — Scaling

5.3.2.4 Metal build-up

Metal build-up is shown in Figure 13.

Figure 13 — Metal build-up

5.3.2.5 Wheel flat

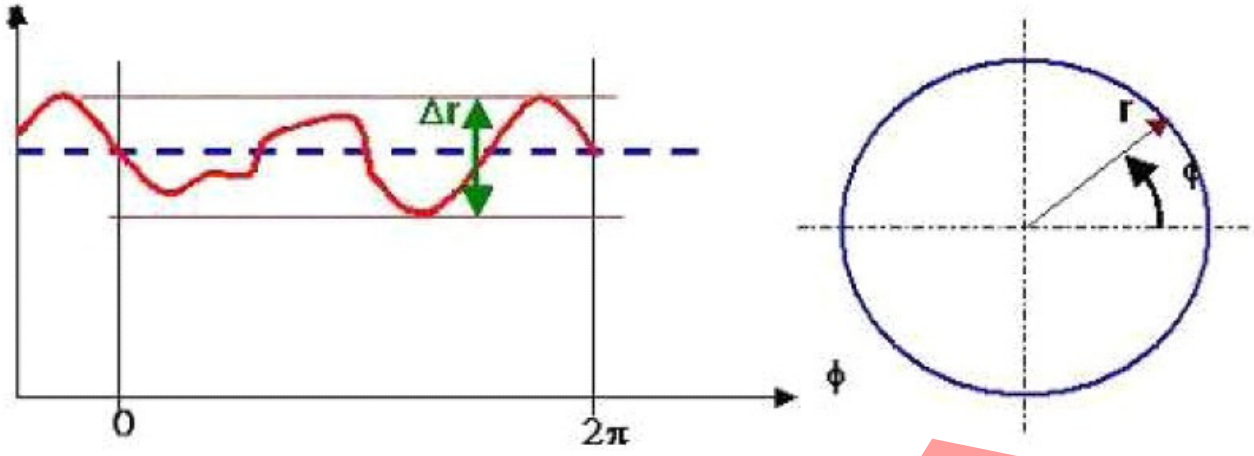
Wheel flat is shown in Figure 14.

Figure 14 — Wheel flat

5.3.2.6 Circularity defect

5.3.2.6.1 General

The circularity defect includes all in-service permanent changes to the shape of the tread contact zone of the wheel (e.g. polygonization with one or more defects around the circumference of the wheel, local tread collapse, etc.). The reference plane is taken on the running circle and includes point D_0, as shown in Figure 8. The general circularity defect is shown in Figure 15.



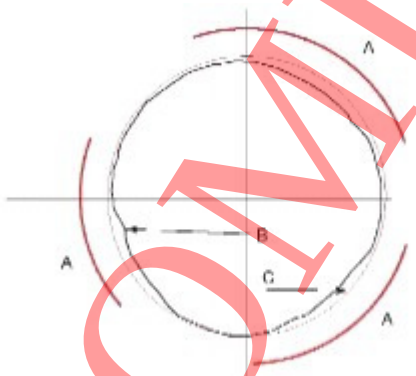
Key

circularity variation at the wheel tread surface
theoretical circle at wheel tread surface
definition of circularity defects

Figure 15 — General circularity defect

5.3.2.6.2 Polygonization and local tread collapse

Polygonization is shown in Figure 16a).



Key

A designates the circularity defect zone
B designates the actual tread shape
C designates the reference wheel tread

Figure 16a) — Polygonization

The local tread collapse is shown in Figure 16b).

There may be a shelling zone as shown in Figure 16c) in the central zone of the local tread collapse.

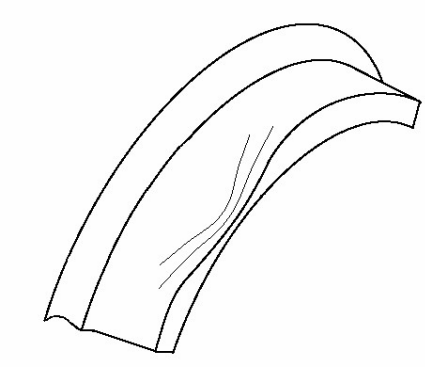


Figure 16b) — Local tread collapse

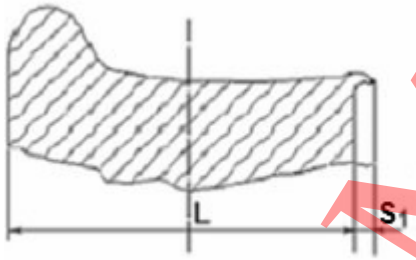
Figure 16c) — Shelling in the centre of a local tread collapse

5.3.2.7 Wheel tread surface rolling contact fatigue

These defects are represented generally by shelling as defined above in this standard.

5.3.2.8 Wheel tread roll-over

The wheel tread roll-over, of dimension S_1, is a continuous defect around the wheel tread corner circumference. It is shown in Figure 17.



Key

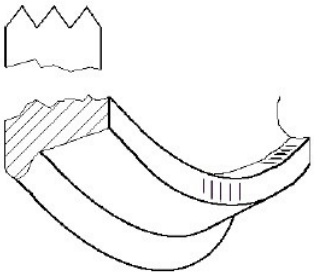
L rim width

S_1 Dimension of wheel tread roll-over

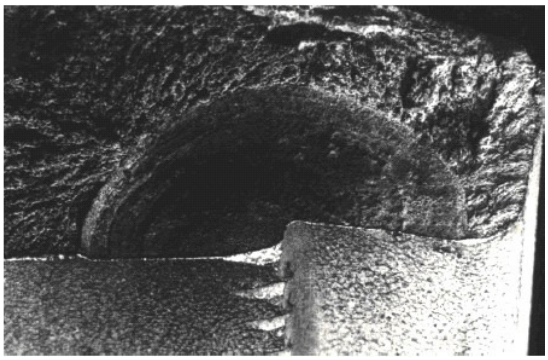
Figure 17 — Wheel tread roll-over

5.3.2.9 Tooling marks

The various types of dangerous tooling marks are shown in Figure 18.



a) Tooling marks



b) Evolution of a fatigue crack initiated on a tooling mark

Figure 18

5.3.2.10 Thermal cracks

Thermal cracks as shown in Figure 19 are linear axial defects located:

— at the interface between the brake block and the wheel, including the external face of the wheel rim-tyre (or of the tyre) in the case of flanging brake blocks (Figure 20a));

— at the flange tip in the case of brake blocks that contact both the flange and the running surface (Figure 20b)).

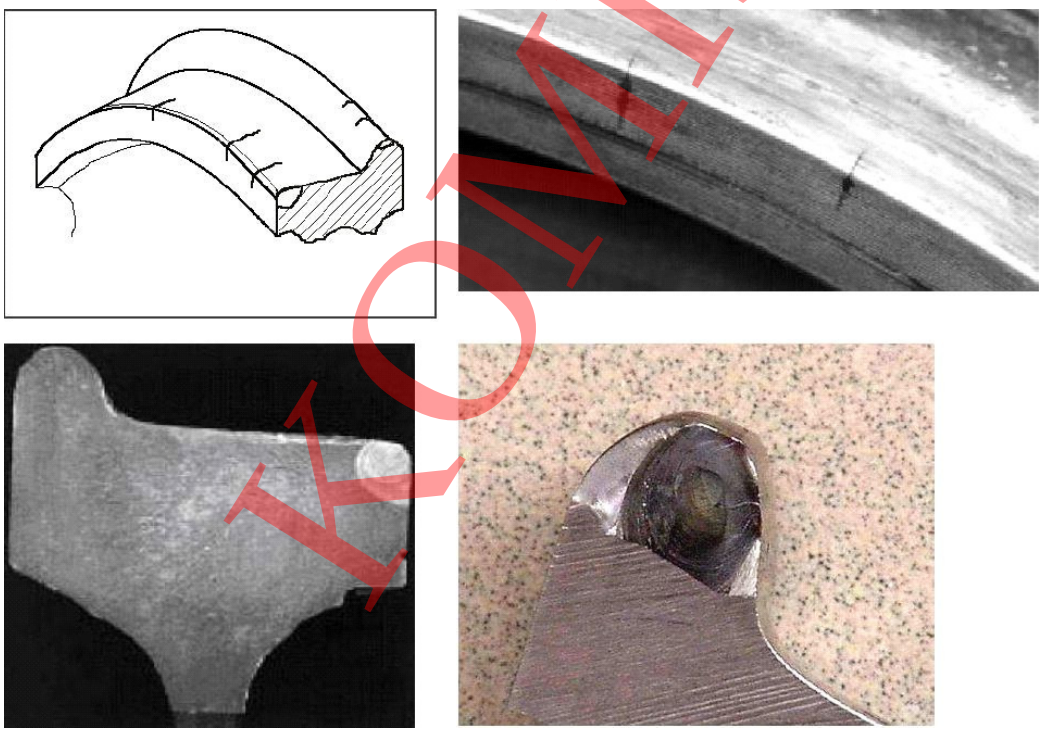
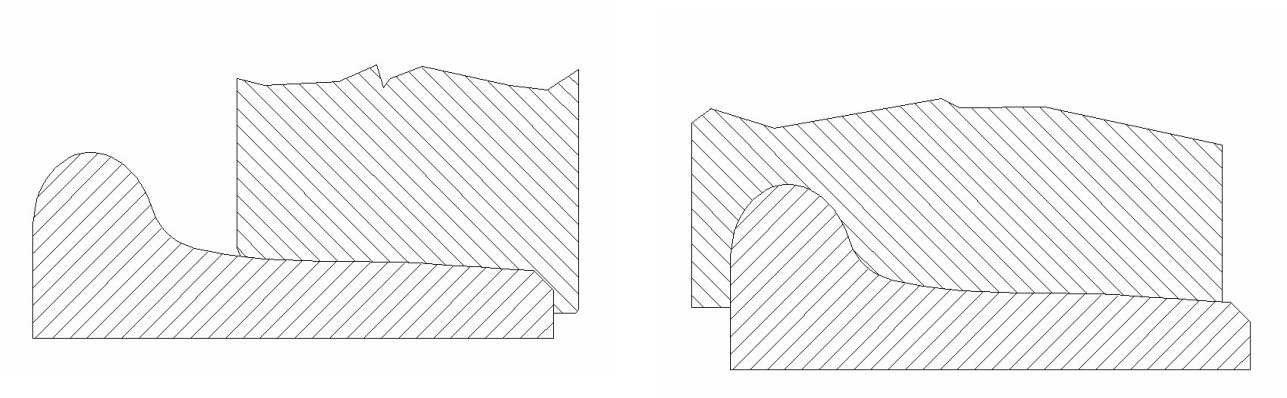


Figure 19 — Thermal cracks



a) — Flanging brake blocks

b) — Brake blocks that contact both the flange and the running surface

Figure 20 — Brake blocks

5.3.2.11 Damage marks of all types

The main types of damage marks are as follows:

— sharp-edged circumferential defects on the web or wheel centre as shown in Figure 21.

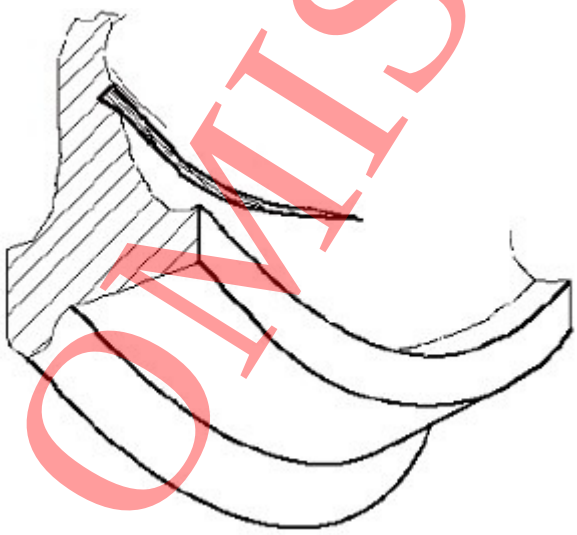


Figure 21 — Sharp-edged circumferential defects

— sharp-edged radial marks on the internal face of the wheel.

This type of defect is shown in Figure 22.

Figure 22 — Radial marks on the internal face of the wheel

— sharp-edged radial defect on the web.

This type of defect is shown in Figure 23.

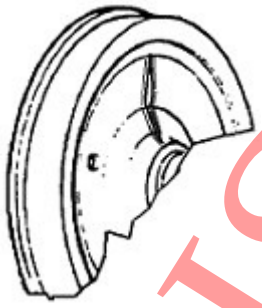


Figure 23 — Sharp-edged radial defect

5.3.2.12 Wheel web hole defects

Wheel web hole defects are shown in Figure 24.

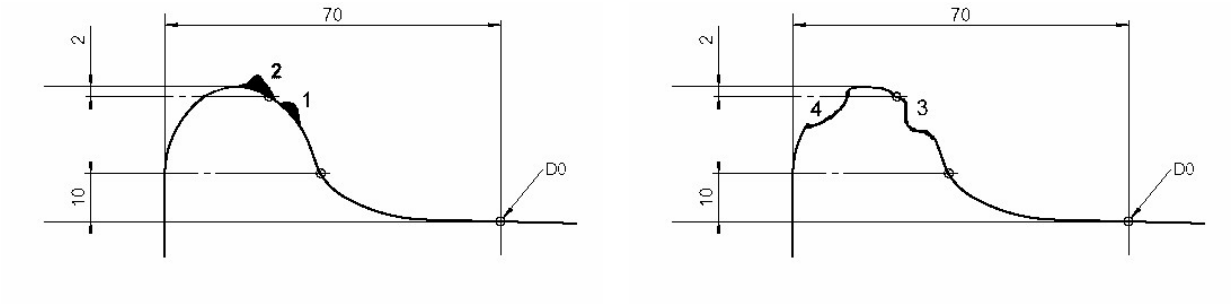
Figure 24 — Wheel web hole defects

5.3.2.13 Geometric defects at the flange tip and in zone P1–P2

Zone P1-P2 (active face of the flange) is shown in Figure 9.

Defects of this type, continuous or not, are shown in Figure 25.

Dimensions in millimetres



Key

1, 2 defect after metal flow

3, 4 material loss

Figure 25 — Metal flow or material loss from flange

5.3.3 Defects specific to monobloc wheels

5.3.3.1 Deep sub-surface tread defect

This type of defect is shown in Figure 26. Its progression in the rim is parallel to the tread.

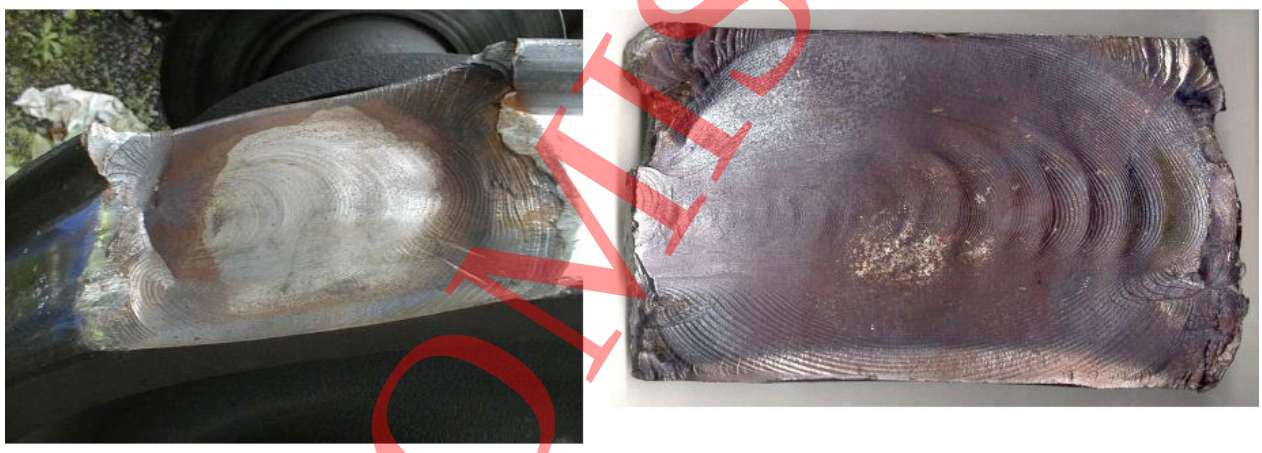


Figure 26 — Deep sub-surface tread defect

5.3.3.2 Wheel web defects

5.3.3.2.1 Thermal defects in the wheel web where used as the braking surface (integral disc wheel web or other)

This type of defect is shown in Figure 27.

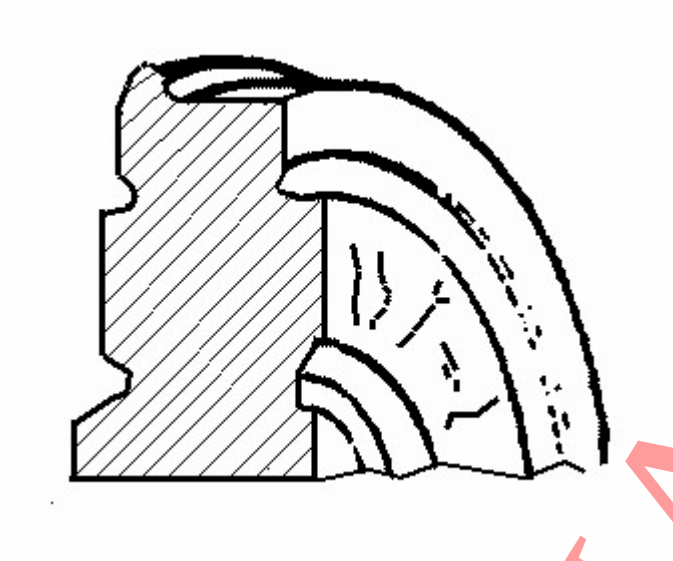


Figure 27 — Example of cracks

5.3.3.2.2 Overheating affecting the rim–tyre/web transition zone

The circular zone involved is shown in Figure 28.

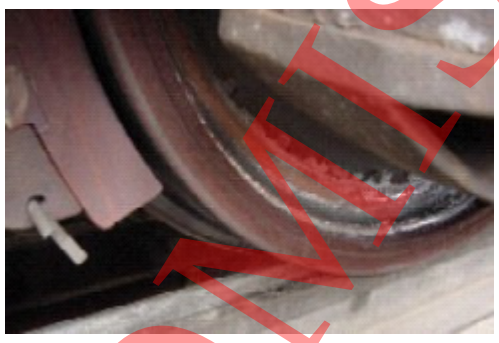


Figure 28 — Overheating of the rim–tyre/web transition zone

5.3.4 Axle defects

5.3.4.1 Axle protection defect – Corrosion

These defects resulting from poor adhesion, inadequate protection or impacts of various types are shown in Figure 29.

Figure 29 — Corrosion

5.3.4.2 Circumferential scoring/grooving

This type of defect is shown in Figure 30.

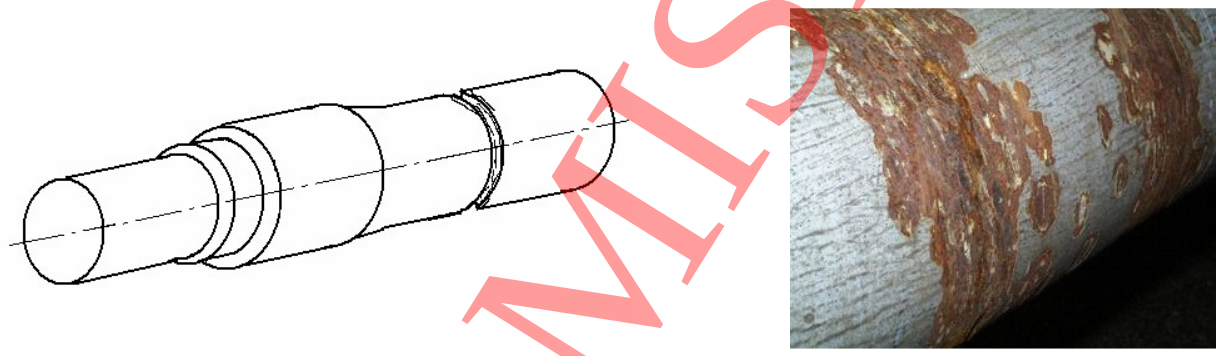


Figure 30 — Circumferential scoring/grooving

5.3.4.3 Longitudinal defects

Longitudinal defects are shown in Figure 31. They may look like cracks.

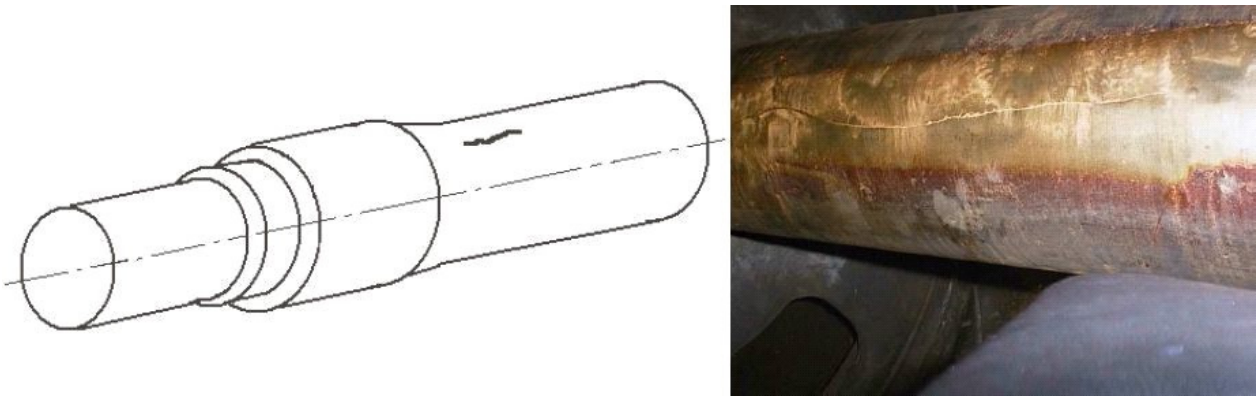


Figure 31 — Longitudinal defect

5.3.4.4 Transverse defects

Transverse defects are shown in Figure 32 and are generally located on the wheel seats or disc seats or transmission gear. They may look like cracks.

a) Transverse defect, body side **b) Transverse defect, journal side**

Figure 32 — Transverse defect

5.3.5 Axle box defects

The main axle box defects concern:

— the axle box body (cracking or failure);

— damage at the weld seams of the manganese wear plates;

— out-of-roundness of the bore of the wheelset bearing housing;

— damage allowing water or dust to penetrate;

— missing or loose locking pieces;

— missing or loose locking and mounting bolts;

— excessive wear of the bearing housing.

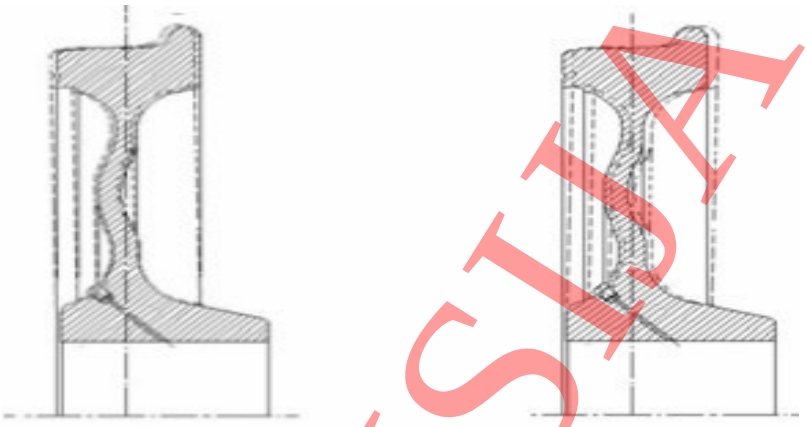
5.3.6 Wheelset defects

5.3.6.1 General

The main wheelset defects result from displacement of components relative to their bearing surface (e.g. wheel distortion/loosening, etc.). In addition, defects exist on axle boxes, transmission gear or braking equipment.

5.3.6.2 Wheel distortion

The defect results from a wheel rim axial movement relative to the wheel hub. The distortion can be on the external part of the wheelset as shown in Figure 33a) or its internal part shown in Figure 33b).



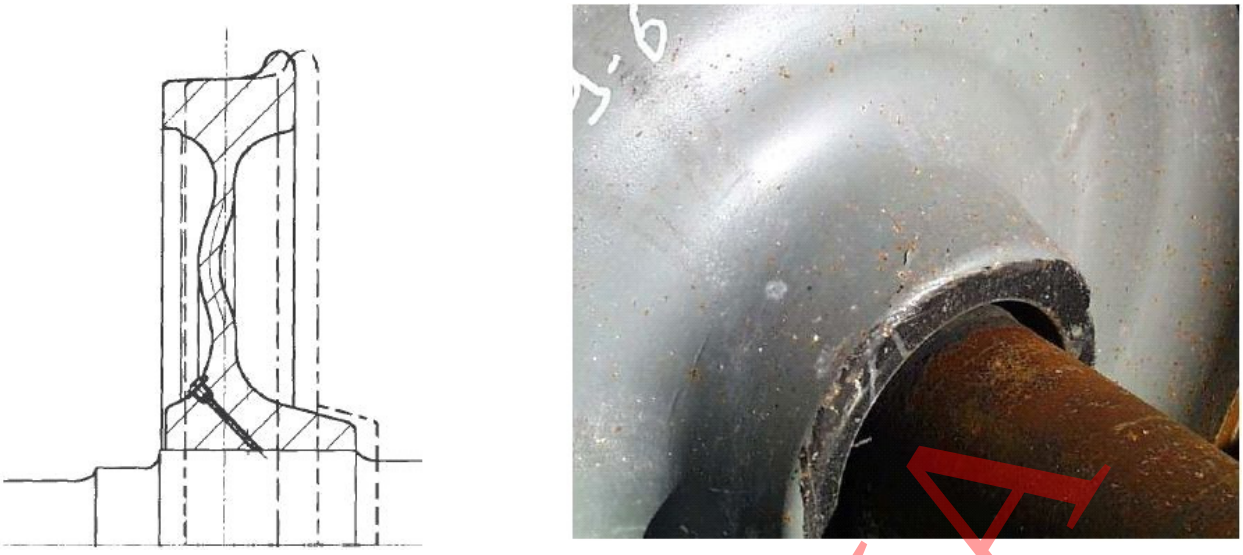
a) External distortion **b) Internal distortion**

Figure 33 — Wheel distortion

5.3.6.3 Loosened wheels, discs or other fitted components

5.3.6.3.1 Axial displacement

Axial displacement is the axial movement of a component relative to its bearing surface. This type of defect is shown in Figure 34 that illustrates the example of a wheel.



a) b)

Figure 34 — Axial displacement

5.3.6.3.2 Rotational displacement

Rotational displacement results from a rotation of a component relative to its bearing surface. This type of defect is shown in Figure 35 that illustrates the example of a wheel.

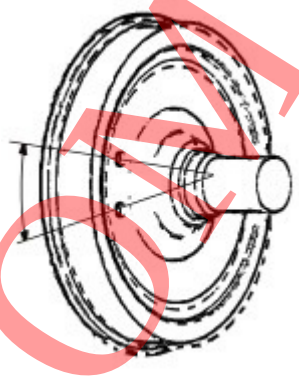
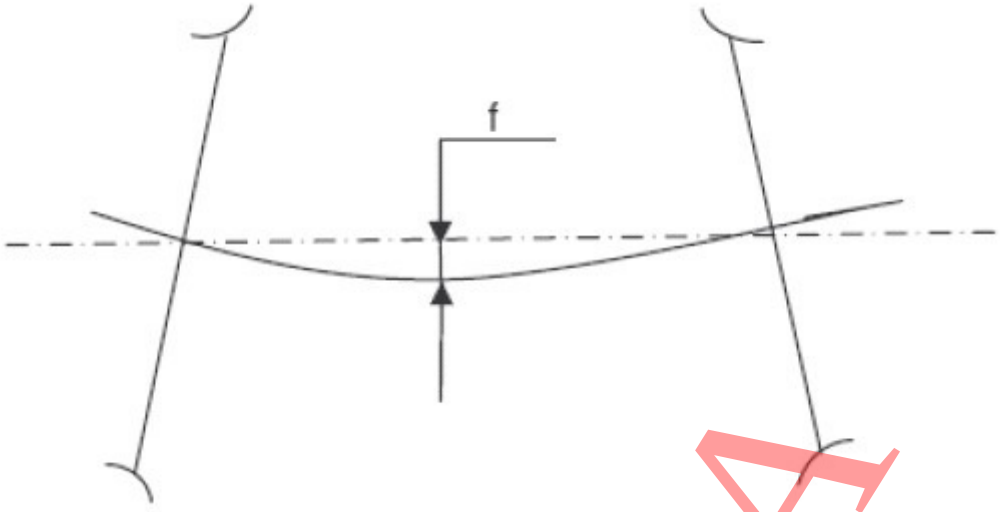


Figure 35 — Rotational displacement

5.3.6.4 Bent axle

The deformation of an axle is indicated by its non-linearity as shown in Figure 36, with the sag "f" relative to the position of the original symmetrical axle.



Key

f sag relative to the position of the original symmetrical axle.

Figure 36 — Bent axle

5.3.6.5 Brake disc defects

The defects are cracks shown in Figure 37 or fracture shown in Figure 38.

Figure 37 — Brake disc with cracks

Figure 38 — Brake disc fracture

6 Mandatory requirements and operations

6.1 General

As indicated in the Introduction, this standard defines:

— mandatory requirements for all owner undertakings (e.g. maximum and minimum dimensions, rail interface dimensions, etc.);

— mandatory operations to be carried out, but in which the criteria values are to be specified in the maintenance plan on the basis of service experience.

These requirements shall be met and the values given in 6.2.1 and 6.2.2 are the allowable limits for safe operation in service.

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

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

— the service experience.

The mandatory requirements listed above shall be carried out and defined in the maintenance plan on the basis of service experience.

The detection method for all the defects shall be:

— manual;

— visual; or

— automatic.

6.2 Mandatory 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 7. The different 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. It shall be described 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.

Tableau 1 — Flange height "*h*"

d [a]	*d* ≤ 630	630 < *d* ≤ 760	760 < *d*
h minimum	31,5	29,5	27,5
h maximum	36,0		
[a] Wheel diameter (actual dimension)			

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]	*d* ≤ 760	760 < *d* ≤ 840	840 < *d*
e minimum [b c]	27,5	25,0	22,0
e maximum [b]	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 tolerances.

NOTE The value of 25,0 mm may have to be approved by the infrastructure manager.

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*"

d[a]	*d* ≤ 760	760 < *d* ≤ 840	840 < *d*
a_1 minimum	1 359	1 358	1 357
a_1 maximum	1 363		

[a] Wheel diameter (actual dimension)

NOTE The value of 1 358 mm may have to be approved by the infrastructure manager.

This value shall be applied for any vehicle load at the point on the flange back equivalent to the point 10 mm below D_0 (top of rail).

The correction of dimension a_1 is allowed if the rim width after reprofiling is within the range of tolerances set out in this standard.

No correction is permitted after derailment or 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.

Table 4 — Front-to-front dimension

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

[a] Wheel diameter (actual dimension).

[b] Other values of "a_2" may be used for vehicles for domestic use.

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

NOTE The value of 1 412 mm may have to be approved by the infrastructure manager

This value shall be applied for any vehicle load at the point on the flange back equivalent to the point 10 mm below D_0 (top of rail).

Specific values can be defined after stability testing of the vehicles (Annex B gives the front-to-front dimension characteristics for the axles of wagons with two axles each loaded with 22,5 t axle loads).

The following condition shall be met:

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

6.2.1.7 Wear groove

The main dimensional and installation characteristics of the groove are as follows:

— groove dimensions.

The dimensional characteristics of the groove are shown in Figure 39.

Dimensions in millimetres

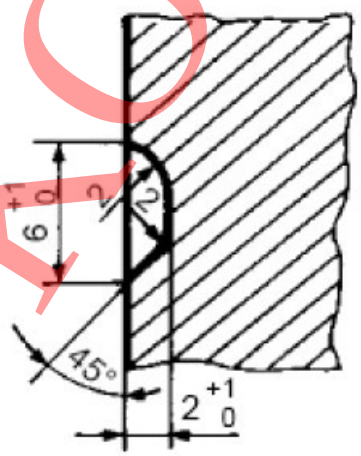


Figure 39 — Groove dimension

An alternative type of groove may be used for domestic traffic, but shall not have any sharp edge.

— Groove location.

Its location shall take into account the location of point I as specified in EN 13715.

A section of the tread profile is given in Figure C.1 and makes it possible to quantify the alternative locations of point I, for the same wheel diameter, relative to point D_0 depending on the tread profile and reverse slope selected.

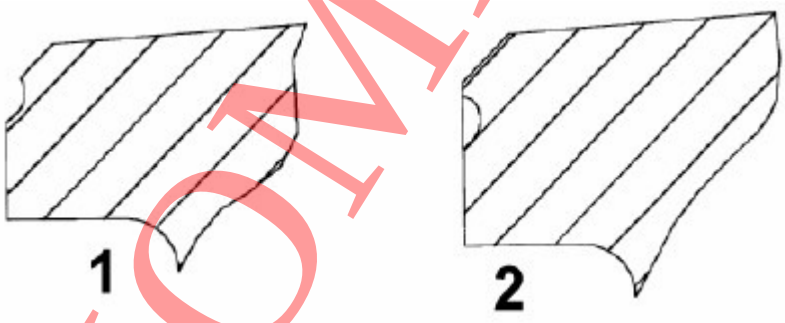
The application of the wear groove as a function of the vehicle is given in Table 5.

Table 5 — Application of the wear groove on the wheels

Vehicle type	Groove on external face of the rim
Coaches	Yes
Wagons	Yes
Locomotives, other vehicles	Depending on the monitoring system[a] used by the undertaking
a Specific measurements of the wheel diameter	

— Use of the wear groove (e.g. visibility, etc.)

The wear groove, when mandatory, shall always be fully visible after reprofiling or in service. The decision criteria are shown in Figure 40.



Key
1 not permitted
2 permitted

Figure 40 — 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:

— wear limit diameter

The wear limit diameter is defined at the wheel design stage.

— last reprofiling diameter

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

6.2.1.9 Chamfer

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

The tolerance on each dimension is ± 2 mm.

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

The nominal rim widths and their tolerances are given in Table 6.

Table 6 — Nominal rim width "*L*" without roll-over and tolerances

Nominal rim width [a]	Tolerance
135	+ 1
140	- 2
[a] Other nominal rim widths may be used for domestic traffic	

Specific values from certain former railways are given in Annex B for domestic service vehicles.

6.2.2 Maintenance decision criteria for in-service wheels

6.2.2.1 Limit lengths of wheel tread defects (e.g. flats, metal build-up, material loss, cavities, spalling, etc.)

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

Table 7 — Limit lengths of wheel tread defects

M		*M* ≤ 18			18 < *M* ≤ 22,5				22,5 < *M*		
V (km/h)		*V* ≤ 160	160 < *V* ≤200	200<*V*	*V* ≤120	120 < *V* ≤160	160 < *V* ≤ 200	200 < *V*	*V* ≤ 100	100 < *V* ≤ 120	120 < *V*
d	1 000 < *d*	80	60	40	80	60	50	35	X	X	X
	840 < *d* ≤ 1 000	60	50	30	60	50	35	25	60	50	30
	630 < *d* ≤ 840	40	30	25	40	30	25	20	40	X	X
	550 < *d* ≤ 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).

X reserved (no application known)

d actual wheel diameter

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 domestic or bilateral traffic 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.

6.2.2.2 Thermal cracks

Thermal cracks (linear defect) are not allowed.

6.2.2.3 Wheel tread corner roll-over

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

6.2.2.4 Defects on the internal face of the rim (FIJ) and flange (Z1)

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

6.2.2.5 Defects on the external face of the rim (FIJ)

There shall be no marks or radial cracks.

6.2.2.6 Circumferential groove on wheel tread

There shall be no sharp-angled circumferential groove on the wheel tread.

6.2.2.7 Flanging brake blocks

Flanging brake blocks are not allowed (no friction between the brake block and the external lateral face of the rim (FEJ)).

6.2.2.8 Tooling marks

Axial or radial sharp-edged marks are not acceptable on the external face of the rim (FEJ). Only marks not considered to be detrimental are acceptable and the tools used shall be qualified.

6.2.2.9 Defects on the flange

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. Defects, sharp edge or burr N° 1, 3 or 4 defined in Figure 25 are not allowed.

6.2.2.10 In-service axial or radial movement of a wheel or of one of the other components

No axial or radial movement of a wheel is tolerated. Movement of other components assembled on the axle shall be dealt with on the basis of service experience.

6.2.2.11 Defects on the web of a monobloc wheel

The webs shall not have any:

— cracks, sharp-edged notches or any other irregularity;

— marks resulting from the removal of defects by means of a non-qualified procedure;

— cracks of mechanical or thermal origin in the zone of any fixing holes. This is the case with any hole on the transmission gear or other devices (silencer) and brake discs mounted on the wheel web.

6.2.2.12 Defects on all types of brake discs

Cracks are only allowed in the central part of the brake zone as determined from service experience and not on the edges of it (1 and 2) as shown in Figure 41. The requirements to be met by the integral disc wheel or brake disc shall be defined in the maintenance plan. For example, among the defects not permitted are cracks from one edge to the other (see Figure 41) and loosening of the disc fastening elements

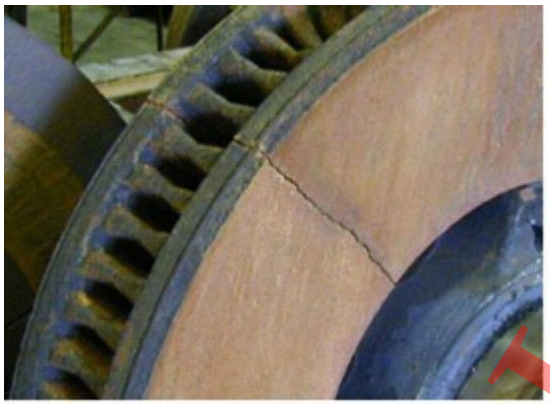


Figure 41 — Braking zone

6.2.2.13 Overheating affecting the wheel rim-web transition

When overheating of the transition zone is established, measures shall be taken to ensure geometric conformity of the wheelset to this standard.

If the geometric conditions are met, a check shall be made for thermal cracks.

For wheels checked by any automatic on-line device or by the detection of burnt thermo-sensitiive paint in the rim/web transition, the following requirements shall apply:

— wheels not conforming to EN 13979-1 shall be reprofiled or be checked for residual stresses as specified in the maintenance plan;

— wheels conforming to EN 13979-1 with white marks on the axle box (see Figure 42) shall be dealt with in line with service experience.

NOTE 1 For ER6 or ER7 monobloc wheels, the current values determined are as follows:

— maximum: 300 MPa for monobloc wheels of unknown toughness;

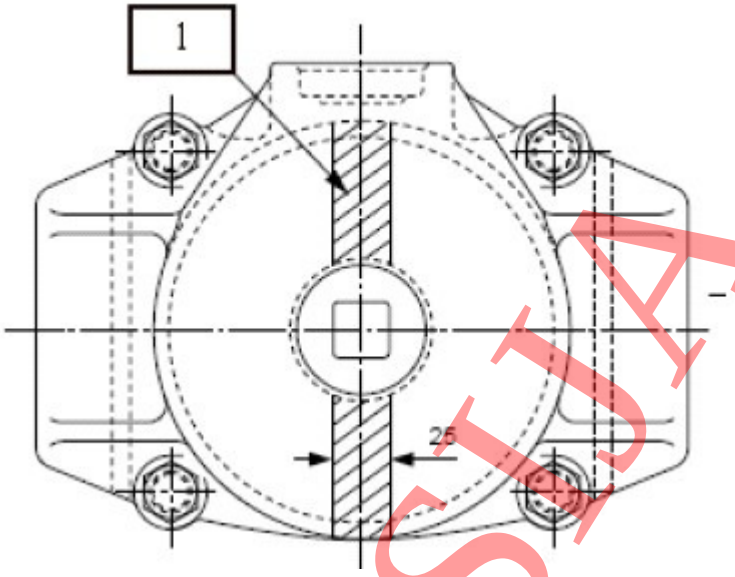
— maximum: 400 MPa for monobloc wheels of toughness as specified in EN 13262.

NOTE 2 The methods for measuring the residual stress of the wheel rims are given in document ERRI B 169/RP6.

6.2.3 Marking of wheelsets with wheels according to EN 13979-1

Axle boxes of freight vehicles with outboard journals and fitted with EN 13979-1 compliant wheels shall be marked with a vertical white line on their outer cover. This marking is shown in Figure 42.

Dimensions in millimetres



Key

1 white mark and width

Figure 42 — White mark on axle box – Wheel marking according to EN 13979-1

6.2.4 Electrical resistance of wheelsets after overhaul

The electrical resistance shall be 0,01 Ω maximum for monobloc wheels.

6.2.5 Tyred wheels

The characteristics and requirements for tyred wheels are specified in informative Annex D.

6.2.6 Operational limit values for axle bodies

6.2.6.1 Damage caused by corrosion

Rust pits that are greater than service experience has shown to be acceptable are not permitted.

6.2.6.2 Notches and impact damage

Sharp-edged notches are not permitted.

Discontinuities that result from authorized repairs during the maintenance process are permitted.

6.2.6.3 Grooves

Sharp-edged grooves are not permitted.

6.2.6.4 Defects in the circumferential direction

Circumferential cracks are not permitted.

6.2.6.5 Defects in the longitudinal direction

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

6.3 Reprofiling operation

If any defect is present in a wheel, a reprofiling operation shall be planned on the basis of service experience so that its dimensions do not exceed those specified in Table 7 of this standard.

Prior to any reprofiling operation, the following data shall be obtained from the technical expert of the undertaking:

— the reprofiling site;

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

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

6.4 Dimensions after reprofiling

6.4.1 Front-to-front dimension "a_2"

The value of the front-to-front dimension is determined according to the in-service performance of the vehicle.

6.4.2 Diameter difference between wheels on the same axle

The maximum allowable differences between diameters of wheels on the same axle are given in Table 8.

Table 8 — Diameter difference between wheels on the same axle

V (km/h)	$V \leq 200$	$200 < V$
$\lvert d_1 - d_2 \rvert$ maximum	0,5	0,3

6.4.3 Limit values of radial run-out as a function of the maximum operating speed authorized for the vehicle

The maximum allowable values of the radial run-out of wheels on the same axle, as a function of the maximum authorized speed of the vehicle, are given in Table 9.

Table 9 — Radial run-out

V (km/h)	$V \leq 120$	$120 < V$
	0,5	0,3

NOTE It is recommended that a maximum value of 0,2 mm run-out be adopted using the loaded axle box rather than the axle machining centre. This recommended value is derived from service experience and is more restrictive than that given in the product standard EN 13260.

6.4.4 Wheel axial run-out as a function of the maximum operating speed authorized for the vehicle

This value shall be applied at 10 mm below the top of the rail (point D_0).

The maximum allowable values of the wheel axial run-out, as a function of the maximum authorized speed of the vehicle, are given in Table 10.

Table 10 — Wheel axial run-out

V (km/h)	$V \leq 120$	$120 < V \leq 160$	$160 < V \leq 200$	$200 < V$
	1	0,8	0,5	0,3

NOTE For the definition of axial run-out, see EN 13260.

6.5 Mandatory operations

6.5.1 Detection of thermal damage on the wheel rim or tyre

The defects shall be sought in the following areas:

— on the external face of the wheel rim;

— on the running surface;

— on the flange tip.

6.5.2 Verification of brake disc integrity

Checks shall be carried out on the discs on the basis of service experience to ensure that they do not have any:

— cracks at the edges of the disc;

— radial failures.

6.5.3 Detection of circularity defects (e.g. flats, metal build-up, cavity, etc.)

The limit values for these circularity defects shall be fixed on the basis of service experience. The location of another reference plane, irrespective of the control reference plane 70 mm from the wheel internal face, may be selected on the basis of the actual position of detected defects.

The criteria for the removal of axle box bearings as a result of defects being detected in the wheel tread shall be defined on the basis of service experience.

If no service experience exists, the values are given in informative Annex I.

6.5.4 Verification of rim integrity – Detection of deep sub-surface tread defects

Non-destructive testing shall be carried out on these components if service experience indicates the need for this to ensure that this type of defect does not exist.

6.5.5 Verification of web integrity

Verification of the web integrity shall be carried out for all the defects specified in this standard.

This verification covers the web, the web hole contours and the mechanical or thermal contact areas.

Particular attention shall be paid to the detection of defects (cracks) in the web holes or in the mechanical or thermal contact areas.

The choice of the inspection method is determined on the basis of accessibility.

6.5.6 Verification of axle integrity

The axle integrity shall be verified by non-destructive testing in compliance with the requirements specified in the maintenance plan. These requirements shall specify the practical arrangements for removal of the defects (e.g. depth, rectification method, etc.).

6.5.7 Non-destructive testing

Non-destructive tests shall be carried out to detect any defects on overhauled parts.

Certain tests may be carried out in-service. The method to be used for carrying out these tests shall be indicated in the maintenance plan.

6.5.8 Verification of residual magnetism

Following magnetic particle testing of parts assembled by induction heating etc., a procedure shall be applied to check for any residual magnetism. If necessary, a demagnetization process shall be used.

6.5.9 Lubrication operation

There are different types of lubrication operations:

— grease charge during overhauls

The type of grease, its quantity and distribution shall meet the requirements given in the drawing or on a specific document during qualification of the bearing. Distribution shall be adjusted on the basis of service experience.

— grease top-ups in service

The quantity and frequency shall be specified and may be adjusted on the basis of service experience

— check of grease loss or leakage

Grease losses or leakage shall be sought on the wheel web.

NOTE It is recommended to have a specific process for operating the flange lubricators in application of EN 15427.

6.5.10 Checking for axle box defects

The welds in the manganese plates shall be checked according to the maintenance plan. The maintenance plan shall consider other key features affecting the integrity of the axle boxes such as:

— the condition of the axle box bore;

— damage that enables water or dust penetration;

— missing or loose locking pieces or mounting bolts;

— critical wear dimensions;

— etc.

These requirements shall be applied on the basis of service experience.

6.5.11 Verification of wheelset electrical resistance after overhauls

The electrical resistance shall be verified. A qualified statistical test method may be used on a representative sample for monobloc wheels.

6.6 Requirements to be met by wheelset maintenance equipment

It is mandatory for the following requirements to be met:

— electrical resistance testing device

The voltage shall be between 1,8 V and 2 V DC

— magnetic particle examination

The magnetic particle examination shall be carried out according to the requirements of EN ISO 9934 Parts 1 to 3

— maximum temperature for the bearing hot shrinkage

The maximum temperature shall not exceed 130 °C unless otherwise defined by a competent technical department

— maximum temperature for hot-shrunk wheels

The maximum temperature for the hot shrinking of the wheels shall be as specified in EN 13260

— assembly of the axle box

Preheating of the axle box is not authorized.

7 In-service wheelset maintenance

7.1 General

The individual operations shall allow the wheelset to be maintained in conformity to:

— the mandatory requirements;

— the mandatory operations

as specified in this standard for in-service wheelset maintenance.

7.2 Maintenance plan

The maintenance plan shall include:

— the periodicity of dimensional checks;

— the periodicity of non-destructive tests;

— the criteria for and periodicities for the mandatory in-service maintenance operations;

— any criteria and periodicities for domestic traffic.

7.3 Wheelset protection during body and bogie cleaning

Specific requirements shall be specified to protect the transmission, the axle box and bearings from cleaning fluid penetration during vehicle and bogie cleaning.

8 Off-vehicle wheelset maintenance

8.1 General

At the end of the maintenance phase, the off-vehicle wheelset shall be free of defects and shall comply with:

— the mandatory requirements;

— the mandatory operations

of this standard for the off-vehicle wheelset part.

8.2 Maintenance plan

The maintenance plan shall specify:

— qualified procedures and periodicities for non-destructive tests;

— any special procedures (e.g. demagnetization of the bearings, etc.);

— cleaning instructions;

— criteria for the rejection of the bearings and their protection after the overhaul;

— approval criteria for different constituant parts (e.g. dimensions, etc.);

— list of work to be carried out to restore the wheelset to comply with the requirements of this standard;

— list of tests to be carried out;

— specific values resulting from service experience.

8.3 Key operations for off-vehicle wheelset maintenance

The key operations are as follows:

— wheelset cleaning with protection of the individual component , if required;

— general inspection;

— complete inspection of the wheelset components (e.g. axle, wheel, bearing, axle box, lubrication, etc.);

— overhaul of the axle boxes (e.g. dimensions, manganese wear plate, etc.);

— reprofiling, if required;

— assembly of wheels, if required, according to EN 13260;

— assembly of bearings, if required: only processes qualified by the technical expert of the owner undertaking shall be used;

— protection against corrosion;

— final check for conformity of the wheelset to the requirements of this standard;

— drafting of an overhaul report to ensure traceability of all the operations and including the wheel assembly press-fit force displacement diagrams (cold assembly) or mechanical resistance test confirmation following shrink fitting (hot assembly).

8.4 Off-vehicle wheelset cleaning

Wherever specified, the cleaning shall be carried out with approved processes, using one of the following methods:

— high-pressure water jet;

— brushing;

— mechanical scouring (e.g. plastic shot blasting, etc.) provided it does not change the fatigue limit characteristics of the components (e.g. axle, etc.) and does not risk concealing any cracks by deforming the component surfaces.

Any other cleaning method shall be duly qualified before it is used.

The axle box protection shall be specified in the maintenance plan.

9 Action to be taken on any wheelset after an incident in service or when not covered by the maintenance plan

9.1 Wheelset bearings subject to water ingress

Any wheelset that has been subject to water ingress shall be removed for overhaul.

9.2 Wheelsets having been subjected to a short circuit current (e.g. from falling overhead line equipment, etc.)

Only the wheelsets of vehicles showing marks (e.g. holes, etc.) resulting from the passage of a short-circuit current shall be considered. The wheelset exchange decision shall be made by the technical expert of the owner undertaking on the basis of its service experience.

9.3 Detection by a trackside facility of a wheel circularity defect

If any wheelset defect is detected in service and its size is greater than an acceptable value based on the calibration of the trackside detection facility, the wheelset shall be inspected as soon as possible by a technical expert who, in order to make a decision, will refer to:

— Table 7 of this standard;

— 6.3 and 6.4 of this standard for any reprofiling.

9.4 Wheelsets loaded over the allowed limit

Any wheelset supporting a load greater than its permissible load limit shall be the subject of an assessment as to whether any special attention is required.

9.5 Hot axle box detection

9.5.1 General

The maintenance procedure to be applied after hot box detection shall be defined in the maintenance plan.

9.5.2 Technical procedure

Each undertaking shall have a detailed technical procedure after detection of a hot axle box in service in order to respond to each case reported:

— in accordance with its own process;

— by an on-board detection system.

The vehicle owner undertaking shall be informed immediately of the circumstances of the incident.

The wheelset shall only be replaced by the owner undertaking or by a competent representative of this undertaking.

Technical investigation and corrective action to the off-vehicle wheelsets shall only be applied by the technical expert of the owner undertaking.

9.5.3 Treatment of the wheelsets with hot axle box in commercial or other service

The wheelset originating the incident shall be sent to the owner undertaking. Only this undertaking is competent to make a complete assessment.

9.6 Derailment

After a derailment, non-acceptable defects shall be identified (e.g. rail/wheel interface dimensions, flange marks, condition of axle boxes, etc.) before releasing the vehicle. The requirements of this standard shall be applied unless a derogation is granted by a competent technical expert

NOTE It is recommended that the wheelset(s) should be removed to be overhauled for inspection of the bearings if the derailment speed is known to have exceeded 10 km/h.

Inspection and the conditions for vehicle transfer to a depot facility shall be specified in accordance with the specific procedures of the applicable infrastructure manager.

9.7 Head-on collision

After a collision, non-acceptable defects shall be identified (e.g. rail/wheel interface dimensions, flange marks, condition of axle boxes, etc.) before releasing the vehicle. The requirements of this standard shall be applied unless a derogation is granted by a competent technical expert.

NOTE It is recommended that the wheelset(s) should be removed to be overhauled for inspection of the bearings if the derailment speed is known to have exceeded 25 km/h.

9.8 Grease leakage or loss

Wheelsets with grease or oil marks on the web shall be examined and if there is other damage, for instance, indications of overheating or abnormal noise, the bearing shall be replaced.

9.9 Brake incident (detection of seized brake or discoloration)

For a wheelset subjected to a seized brake incident, the actions to be undertaken are defined in 6.2.2.13.

9.10 Reporting after detection of a wheelset irregularity outside the maintenance plan

Whenever a wheelset irregularity is detected outside of the maintenance plan, a brief report (e.g. fax, e-mail, etc.) shall be issued on the irregularity detected. The report shall be sent to the competent technical department for information and possible inclusion in the maintenance plan

10 Domestic or bilateral traffic

In order to ensure domestic or bilateral traffic, specific limit values or requirements may be applied (e.g. for tyred wheels, etc.). These shall be formally prescribed.

11 Summary table of requirements

The following table lists the in-service wheelset limits specified in this standard and references to the subclauses in which the dimensions are defined.

Table 11 — Summary of mandatory requirements

Wheelset part	Dimension	Sub-clause	Diameter		Limit values
Flange dimensions	Height		330≤d≤630	31,5	
		6.2.1.2	630≤d≤760	29.5	36
			760≤d≤840	27,5	
	Thickness		330≤d≤760	27,5	
		6.2.1.3	760≤d≤840	25	33
			840≤d≤1500	22	
	qR dimension	6.2.1.4		6,5	Min. values
Wheelset or wheel rim dimensions	Back-to-back		330≤d≤760	1 359	
		6.2.1.5	760≤d≤840	1 358	1 363
			840≤d	1 357	
	Front-to-front		330≤d≤760	1 415	
		6.2.1.6	760≤d≤840	1 412	1 426
			840≤d	1 410	
	Rim width	6.2.1.10		135 140	Tolerance: -2 +1
Wheelset or component defects	Wheel tread defects	6.2.2.1		See Table 7	
	Thermal cracks	6.2.2.2		Not permitted	
	Wheel tread corner roll-over	6.2.2.3		≤5	
	Defects on the internal face of the rim (FIJ) or flange	6.2.2.4		Not permitted radially	
	Defects on the external face of the rim (FEJ)	6.2.2.5		Not permitted radially No brake block–FEJ friction	
	Circumferential groove on wheel tread	6.2.2.6		Not permitted	
	Flanging brake blocks	6.2.2.7		Not permitted	
	Tooling marks	6.2.2.8		See text	
	Defects on the flange	6.2.2.9			
	In-service axial or radial movement of a wheel or of one of the other components	6.2.2.10			
	Defects on the web of a monobloc wheel	6.2.2.11			
	Defects on all types of brake discs	6.2.2.12		Not permitted at the edge	
	Overheating affecting the wheel rim-web transition	6.2.2.13		See text	
	Electrical resistance after overhaul	6.2.4		0,01 Ω max.	

Annex A
(normative)

Freight stock

The mandatory limit value for freight stock with two axles suitable for 22,5 t maximum.

Table A.1

Type of vehicle	a_2 minimum
Freight stock with two axles suitable for 22,5 t/axle maximum	1 418 mm

Annex B
(informative)

Rim width without roll-over for vehicle for domestic use

The various specific nominal rim widths are given in Table B.1.

Table B.1

R	*L*	
1	Minimum	127
	Maximum	148
R former network 1 UK railway network *L* nominal width		

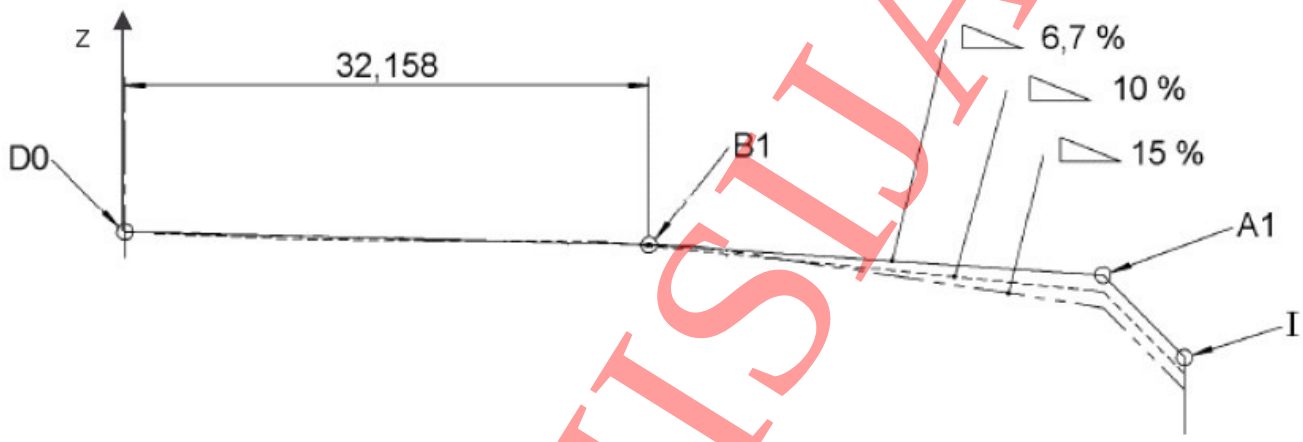
Annex C
(informative)

Position of wear groove and reverse slope

The various positions of point I, for the same wheel diameter, relative to point D_0 as a function of the profile and reverse slope value selected are shown in Figure C.1 for a wheel with nominal rim width of 135 mm.

The ordinates along the Z-axis are given in Table C.1.

Dimensions in millimetres



Key

A1 end of reverse slope
B1 start of reverse slope
D_0 position of wheel tread
I transition point between the tread and the external face of the rim

Figure C.1 — Position of point I

Table C.1 — Ordinates of point I along the Z-axis

% reverse slope	z I		
	S1002	1/4 0	EPS
6,7	-7,636	-7,542	-7,613
10	- 8,564	-8,375	- 8,647
15	- 9,956	- 9,625	-10,197

Annex D
(informative)

Tyred wheels

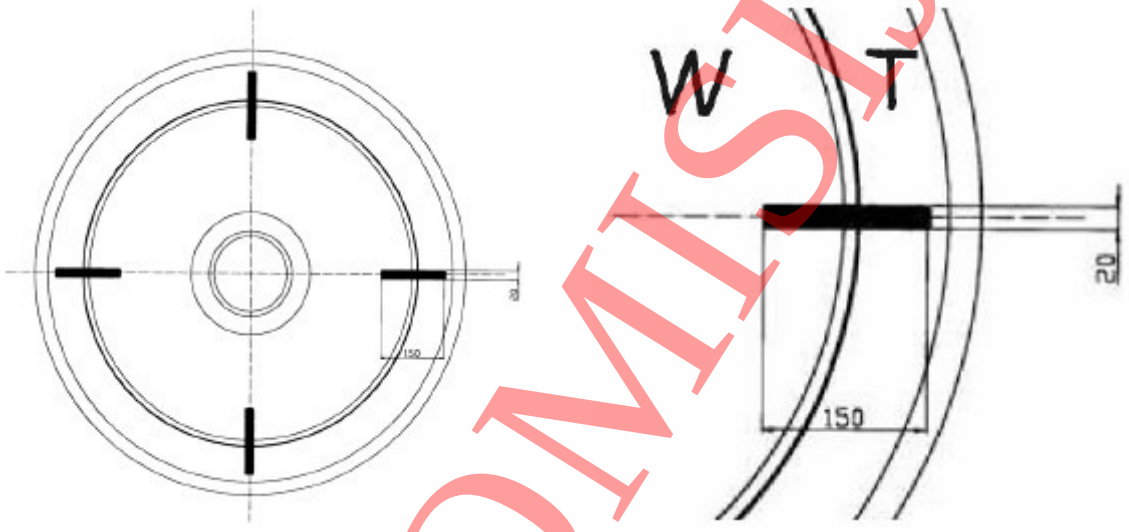
D.1 Marking of tyred wheels

Tyred wheels shall be marked with white lines on the tyre and on the centre of the wheel. Their positions are shown in Figure D.1a).

Tyred wheels shall not have any wear groove.

The dimensions of the white lines are specified in Figure D.1b).

Dimensions in millimetres



a) Position of white lines **b) Definition of white lines on tyred wheel**

Key

W wheel centre
T tyre

Figure D.1

D.2 Tyre thicknesses

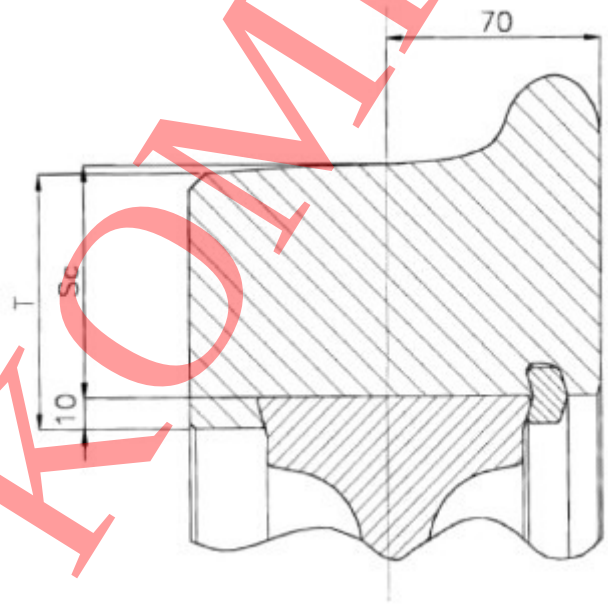
The minimum tyre thicknesses for the type of vehicle are given in Table D.1

Table D.1 — Tyre thicknesses

Type of vehicle	*V* (km/h)	Thickness *Sc* [a]
Coaches	> 160 ≤ 160	Not permitted 35
Wagons	>120 ≤ 120 ≤ 100	Not permitted 35 30 [b]
Locomotives, others	As specified in the maintenance plan	
[a] For definition: see Figure D.2 [b] 120 km/h unladen		

The tyre thickness is specified in Figure D.2.

Dimensions in millimetres



Key

Sc tyre thickness
T tyre

Figure D.2 — Definition of tyre thickness Sc

D.3 Defects specific to tyred wheels

The defects specific to tyred wheels are indicated below:

— loose tyre. This type of defect is characterized by the tyre rotation around the wheel centre (misalignment between the white lines on the centre of the wheel and those on the tyre). It is shown in Figure D 3;

— loose retaining ring, This type of defect is characterized by a clip becoming loose in its housing (possibility of loss);

— overheating of tyre;

— incorrect tyre thickness;

— tyre failure or cracking;

— wheel centre cracking;

— corrosion between tyre and wheel centre.

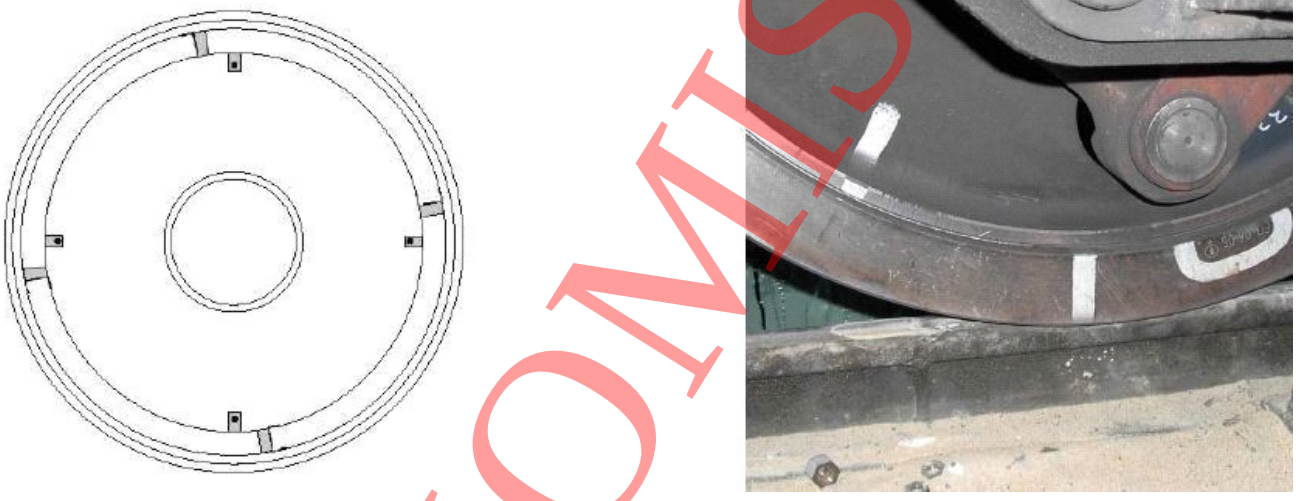


Figure D.3 — Loose tyre

D.4 Specific requirements for tyred wheels

Wheelsets with tyred wheels shall have a specific monitoring plan to verify the proper functioning of the tyre on the wheel centre.

Assembly characteristic (tyre heating temperature):

the tyre heating temperature shall be between 200 °C and 250 °C before being placed on the wheel centre.

The following features are not permitted on wheelsets with tyred wheels:

— cracked or broken tyre;

— thin tyre (see values in Table D.1);

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

— lateral movement of the tyre;

— loose tyre;

— insertion of plate between the wheel centre and the tyre;

— 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 with the dimensions given in Figure D.3;

— does not ring true when tapped;

— loose retaining ring;

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

NOTE 1 The requirements for tyred wheels are specified in UIC 810-1, UIC 810-2, UIC 810-3, UIC 812-1, UIC 812-4, UIC 812-5 and UIC 813.

NOTE 2 The requirements for domestic traffic in the United Kingdom are specified in the following documents BS 5892-2, BS 5892-4, BS 5892-5 and BS 5892-6.

D.5 Incidents arising outside the maintenance plan: loose tyre

If a loose tyre is detected, this shall result in the removal of the wheelset and, following agreement, its dispatch to the owner undertaking.

D.6 Verification of the electrical resistance during overhauls

The electrical resistance of wheelsets with tyred wheels shall be verified for each wheelset.

D.7 Verification of the electrical resistance during removal

The electrical resistance of wheelsets with tyred wheels shall be verified for each wheelset. The maximum resistance value shall be:

— 0,1 Ω for existing tyred wheels;

— 0,01 Ω for new tyred wheels.

Annex E
(informative)

Characteristics of metric gauge wheelsets

This point will be covered in an informative annex when this standard is revised.

Annex F
(informative)

Characteristics of Spanish and Portuguese gauge wheelsets

This point will be covered in an informative annex when this standard is revised.

Annex G
(informative)

Characteristics of Finnish and Baltic country gauge wheelsets

This point will be covered in an informative annex when this standard is revised.

Annex H
(informative)

Plain bearing regeneration

This point will be covered in an informative annex when this standard is revised.

Annex I
(informative)

Permissible circularity defects

Table I.1 — Permissible circularity defects

Wheel diameter Speed range	Permissible circularity defects (Δr)
d> 840 mm	
• $v_{max} \leq 60$ km/h	1,5
• 60 km/h < $v_{max} \leq 160$ km/h	1,0
• 160 km/h < $v_{max} \leq 200$ km/h	0,7
• $v_{max} > 200$ km/h	0,5
380 < d ≤ 840 mm	
• $v_{max} \leq 200$ km/h	0,7
• $v_{max} > 200$ km/h	0,5
d ≤ 380 mm	0,3

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 2008/57/EC[1].

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the clauses of this standard given in Table ZA.1 for High Speed Rolling Stock, Table ZA.2 for Freight Wagons and Table ZA.3 for Locomotives and Passenger Rolling Stock, confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

Table ZA.1 – Correspondence between this European Standard, the HS RST TSI dated June 2006 and published in the Official Journal on 26 March 2008 and Directive 2008/57/EC

Clauses/subclauses of this European Standard	Chapters/subclauses/annexes of the TSI	Corresponding text, articles/subclauses/annexes of Directive2008/57/EC	Comments
The whole standard is applicable	4. Characteristics of the sub-system 4.2 Functional and technical specifications of the sub-system 4.2.3.3.1 Track interaction and gauging. Rolling stock parameters which influence ground based train monitoring systems. Electrical resistance 4.2.3.4 1 Track interaction and gauging. Rolling stock dynamic behaviour. General 4.2.3.4.9.1 Track interaction and gauging. Rolling stock dynamic behaviour. Wheelsets 4.2.10.2 Maintenance. The maintenance file. 4.2.10.3 Maintenance. Management of the maintenance file. Annex M In service limits of the geometric dimensions of wheels and wheelsets	Annex III, Essential requirements 1 General requirements 1.1 Safety 1.1.1, 1.1.2, 1.1.3 1.2 Reliability and availability 1.4 Environmental protection 1.4.4, 1.4.5 1.5 Technical compatibility §1 2 Requirements specific to each sub-system 2.3 Control-command and signalling 2.3.2 Technical compatibility §1 2.4 Rolling stock 2.4.2 Reliability and availability 2.4.3 Technical compatibility §3 2.6 Operation and traffic management 2.6.1 Safety 2.6.2 Reliability and availability	

[1] The Directive 2008/57/EC adopted on 17 June 2008 is a recast of the previous Directive 96/48/EC 'Interoperability of the trans-European high-speed rail system' and 2001/16/EC 'Interoperability of the trans-European conventional rail system' and their revision by Directive 2004/50/EC of the European Parliament and of the Council of 29 April 2004 amending Council Directive 96/48/EC 'Interoperability of the trans-European high-speed rail system' and Directive 2001/16/EC of the European Parliament and of the Council 'Interoperability of the trans-European conventional rail system'

Table ZA.2 – Correspondence between this European Standard, the CR TSI Rolling Stock Freight Wagons dated July 2006 and published in the Official Journal on 8 December 2006 and its intermediate revision published in the Official Journal on 14 February 2009 and Directive 2008/57/EC

Clauses/subclauses of this European Standard	Chapter/subcauses/annexes of the TSI	Corresponding text, articles/subclauses/annexes of Directive2008/57/EC	Comments
The whole standard is applicable	4.Characteristics of the sub-system 4.2 Functional and technical specifications of the sub-system 4.2.3.3.1 Track interaction and gauging. Rolling stock parameters which influence ground based train monitoring systems. Electrical resistance 4.2.3.4 1 Track interaction and gauging. Rolling stock dynamic behaviour. General 4.2.3.4.2.3 Track interaction and gauging. Vehicle dynamic behaviour. Functional and technical specifications. Maintenance rules 4.2.8 Maintenance: Maintenance file 4.3.8 Conventional Rail Noise TSI 5 Interoperability constituents 5.3.2.2 Vehicle track interaction and gauging. Wheelsets 5.4.2.2 Vehicle track interaction and gauging. Wheelsets 6 Assessment of conformity and/or suitability for use of the constituents and verification of the subsystem 6.1.3.2.2 Vehicle track interaction and gauging. Wheelsets Annex E: Vehicle track interaction and gauging. Wheelset dimensions and tolerances for standard gauge Annex K: Vehicle track interaction and gauging. Wheelsets Annex Q: Assessment procedures. Interoperability Constituents Annex Y: Constituents, Bogies and Running Gear	Annex III, Essential requirements 1 General requirements 1.1 Safety 1.1.1, 1.1.2, 1.1.3 1.2 Reliability and availability 1.4 Environmental protection 1.4.4, 1.4.5 1.5 Technical compatibility §1 2 Requirements specific to each subsystem 2.3 Control-command and signalling 2.3.2 Technical compatibility §1 2.4 Rolling stock 2.4.2 Reliability and availability 2.4.3 Technical compatibility §3 2.6 Operation and traffic management 2.6.1 Safety 2.6.2 Reliability and availability	

Table ZA.3 — Correspondence between this European Standard, the Conventional Rail TSI "Locomotives and Passenger RST (Final draft Rev 3.0 dated 3 August 2009) and Directive 2008/57/EC

Clauses/subclauses of this European Standard	Chapters/subclauses/points and annexes of the TSI	Corresponding text, articles/subclauses/annexes of Directive2008/57/EC	Comments
The whole standard is applicable	4.Characteristics of the sub-system 4.2 Functional and technical specifications of the sub-system 4.2.3.3.1.1 Track interaction and gauging. Rolling stock characteristics for compatiblility with train detection system based on track circuits 4.2.3.5.2 Vehicle track interaction and gauging. Wheelsets 4.2.3.5.2.1Mechanical and geometric characteristics of wheelsets 4.2.12.3 Documentation related to maintenance	Annex III, Essential requirements 1 General requirements 1.1 Safety 1.1.1, 1.1.2, 1.1.3 1.2 Reliability and availability 1.4 Environmental protection 1.4.4, 1.4.5 1.5 Technical compatibility §1 2 Requirements specific to each subsystem 2.3 Control-command and signalling 2.3.2 Technical compatibility §1 2.4 Rolling stock 2.4.2 Reliability and availability 2.4.3 Technical compatibility §3 2.6 Operation and traffic management 2.6.1 Safety 2.6.2 Reliability and availability	The Conventional Rail TSI Locomotives and Passenger RST is still at the draft stage and may be modified without prior warning.

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

Bibliography

[1] BS 5892-2, *Specification for forged and rolled wheel centres*

[2] BS 5892-4, *Specification for forged and rolled tyres*

[3] BS 5892-5, *Specification for steel bars for retaining rings for tyred wheels*

[4] BS 5892-6, *Specification for wheelsets for traction and trailing stock*

[5] EN 15427, *Railway applications — Wheel/rail friction management — Flange lubrication*

[6] EN ISO 9001, *Quality management system — Requirements (ISO 9001:2008)*

[7] ERRI B 169 DT 405, *Catalogue of wheel /wheelset /axle defects*[2]

[8] ERRI B 169/RP6, *Standardization of wheelsets, ultrasonic method for the non-destructive determination of residual stresses in monobloc wheel rims*

[9] UIC 510-2, *Trailing stock: wheels and wheelsets — Conditions concerning the use of wheels of various diameters*

[10] UIC 810-1, *Technical specification for the supply of rough rolled non-alloy steel tyres for tractive and trailing stock*

[11] UIC 810-2, *Technical specification for the supply of rough tyres for tractive and trailing stock — Tolerances*

[12] UIC 810-3, *Technical specification for the supply of non-alloy flat and sectional steel for tyre retention springs*

[13] UIC 812-1, *Technical specification for the supply of rolled or forged wheel centres for tyred wheels for trailing stock — Quality requirements*

[14] UIC 812-4, *Technical specification for the supply of tyred wheels for tractive and trailing stock — Type fitting and tolerances*

[15] UIC 812-5, *Technical specification for the supply of rolled or forged steel wheel centres for tractive and trailing stock — Tolerances and surface roughness*

[16] UIC 813, *Technical specification for the supply of wheelsets for tractive and trailing stock — Tolerances and assembly*

[17] EN 12080, *Railway applications — Axle boxes — Rolling bearings*

[18] EN 12081, *Railway applications — Axle boxes — Lubricating greases*

[19] EN 12082, *Railway applications — Axle boxes — Performance testing*

[20] EN 13103, *Railway applications — Wheelsets and bogies — Non-powered axles — Design method*

[2] The UIC and ERRI leaflets can be obtained from Editions Techniques Ferroviaires (ETF): 16 rue Jean Rey, F-75015 Paris, Internet: http://www.uic.asso.fr

[21] EN 13104, *Railway applications — Wheelsets and bogies — Powered axles — Design method*

[22] EN 15085-3, *Railway applications — Weldiing of railway vehicles and components — Part 3: Design requirements*