UIC CODE 811-2

OR

2nd edition, February 2004

Translation

Technical specification for the supply of axles for tractive and trailing stock - Tolerances

Spécification technique pour la fourniture d'essieux-axes pour matériels roulants moteur et remorqué - Tolérances

Technische Lieferbedingungen - Radsatzwellen für Triebfahrzeuge und Wagen - Toleranzen

UNION INTERNATIONALE DES CHEMINS DE FER
INTERNATIONALER EISENBAHNVERBAND
INTERNATIONAL UNION OF RAILWAYS

Leaflet to be classified in Volumes :

V - Rolling stock

VIII - Technical specifications

Application :

With effect from 1 January 1988
All members of the International Union of Railways

Record of updates

1st edition, January 1988	First edition
2nd edition, February 2004	Retyped in FrameMaker

The person responsible for this leaflet is named in the UIC Code

Contents

Summary

This specification defines the grade of finish, the dimensional characteristics and the surface roughness of axles for tractive and hauled stock. It also lists the particulars to be supplied by the buyer.

It is:

- obligatory for all technical documents produced within the framework of UIC and ORE,
- recommendatory for all technical documents of the Members of the Union.

It is furthermore obligatory for all axle designs for new stock to be built.

1 - Purpose and scope

1.1 - This UIC leaflet contains specifications for:

1. the dimensional characteristics[1] (see Appendix A - page 8) to be attained at the various degrees of finish according to Figures 1 and 2 - page 8 and Table 1 - page 9 of Appendix A,

2. the surface roughness according to Table 2 - page 11 of Appendix A (see also point 5.2 - page 6) for new tractive and trailing stock designs.

1.2 - The quality requirements for axles are as set out in *UIC Leaflet 811-1* (see Bibliography - page 12).

1.3 - The requirements for the dimensions and surface roughness of axles for heavy wagons (i.e. with axle-loads exceeding 22,5 t) or axles for vehicles designed for speeds lower than 100 km/h may be the subject of an agreement between purchaser and manufacturer at the time of inviting offers and ordering.

1. The term "dimensional characteristics" is understood to mean form and alignment tolerances.

2 - References

(see Bibliography - page 12):

- *UIC Leaflet 515-1*, Passenger rolling stock - Trailer bogies - Running gear - General provisions applicable to the components of trailers bogies
- *UIC Leaflet 811-1*, Technical specification for the supply of axles for tractive and trailing stock
- *UIC Leaflet 813*, Technical specification for the supply of wheelsets for tractive and trailing stock - Tolerances and assembly
- *ISO 286*, ISO system of limits and fits - Part I: Bases of tolerances, deviations and fits
- *ISO 468*, Surface roughness - Parameters, their values and general rules for specifying requirements
- *ISO 1101*, Technical drawings - Geometrical tolerancing - Tolerancing of form, orientation, location and run-out - Generalities, definitions, symbols, indications on drawings.

3 - Information to be provided by the purchaser

When inviting offers and awarding contracts, the purchasing Railway must give the following details in respect of the dimensional and roughness characteristics:

1. the number of this technical specification,
2. a design drawing of the product,
3. the speed category,
4. the grade of finish,
5. the dimensional characteristics and roughness values, if different from this technical specification,
6. any optional tests that may be required (see point 6.1 - page 7 and Table 1 - page 9 of Appendix A).

4 - Grade of finish on supply

Axles governed by this technical specification must be supplied with all their parts in a finished condition, except the bearing surfaces which must conform with one of the following two conditions:

4.1 - Finish-machined

The term "finish-machined" defines the state of a bearing surface requiring only a final machining process for assembly (the corresponding tolerances are designated by index 1 of the tables and figures of Appendix A - page 8).

4.2 - Ready to assemble

The term "ready to assemble" defines the state of a bearing surface having undergone all machining processes (the corresponding tolerances are designated by index 2 in the tables and figures of Appendix A).

5 - Characteristics

5.1 - Dimensional characteristics

5.1.1 - The dimensional characteristics are as set out in Table 1 - page 9 of Appendix A.

5.1.2 - Axles, including bearing surfaces, in the "ready to assemble" state must comply with the conditions set out in Table 1 as well as with the conditions specified in points 5.1.2.1 and 5.1.2.2.

5.1.2.1 - The manufacturer must ensure that the tolerances for all geometrical characteristics are maintained so that when the wheels are fitted to the axle, the wheelset tolerances according to *UIC Leaflet 813* (see Bibliography - page 12) are observed without further machining being required.

5.1.2.2 - In special cases and despite the difficulties mentioned in point 6.1 - page 7, specific geometrical tolerances differing from those set out in point 5.1.2.1 may be imposed. These tolerances must be agreed upon when calls for tender are issued and orders placed. In such cases, the tolerances set out in Table 1 shall apply unless otherwise agreed.

5.2 - Surface roughness

Unless otherwise agreed, the average surface roughness Ra of surfaces prepared to the "finish-machined" and "ready to assemble" states must conform with the requirements as set out in Figure 1 - page 8 and Table 2 - page 11.

5.3 - Centering

Centering bores must comply with the conditions of the purchasing order and accompanying documents.

6 - Quality control

6.1 - Dimensional characteristics

The letter "m" in the "Quality Control" column of Table 1 - page 9 indicates that compliance of the corresponding dimension with requirements must be checked obligatorily. Due to the practical difficulty of checking certain dimensions and manufacturing conditions, the dimensional characteristics marked "o" in the "Quality Control" column of Table 1 need to be checked only when this was specified by the purchasing Railway in the purchasing order.

6.2 - Surface roughness

If compliance with the surface roughness requirements must be checked, the number of axles to be inspected as well as all other necessary details shall be specified by the purchasing Railway.

Appendix A - Dimensional characteristics and geometrical tolerances

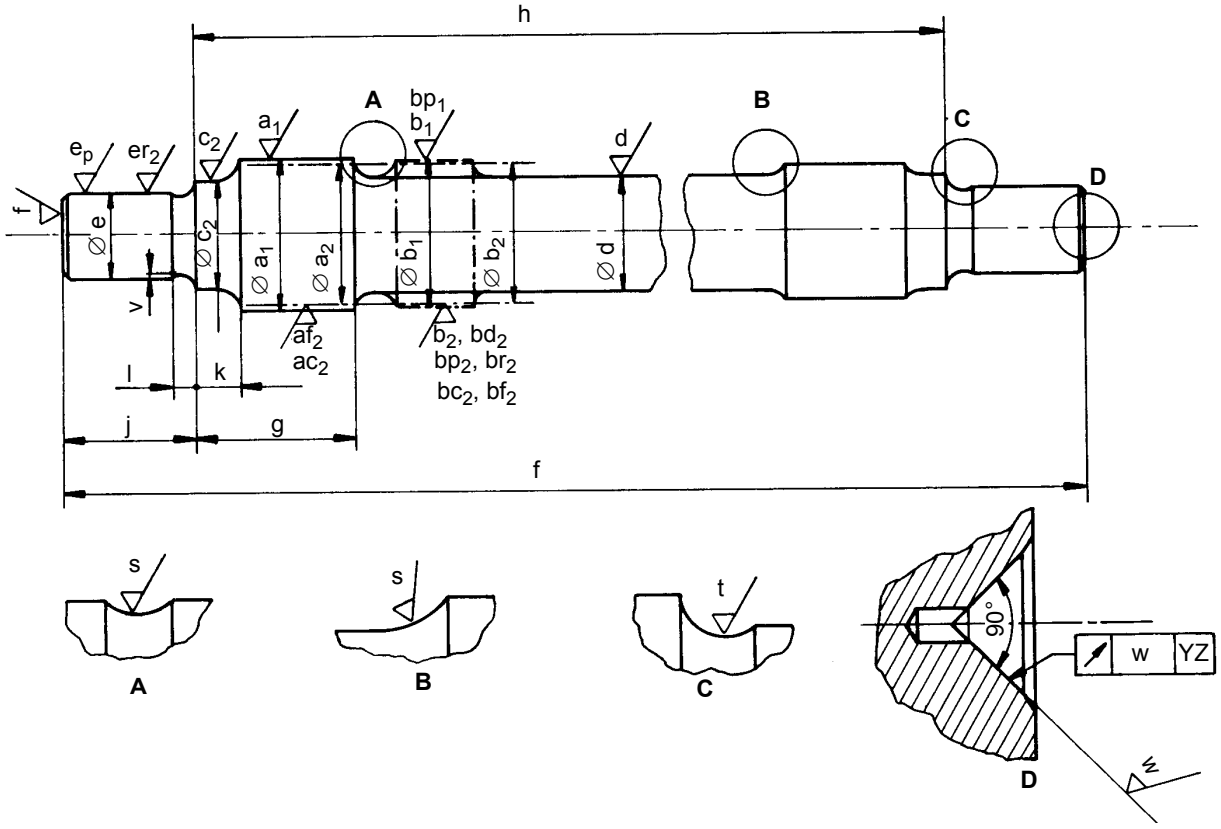

Fig. 1 - Symbols for the dimensional characteristics and surface roughness of "finish-machined" axles and "ready-to-assemble" axles

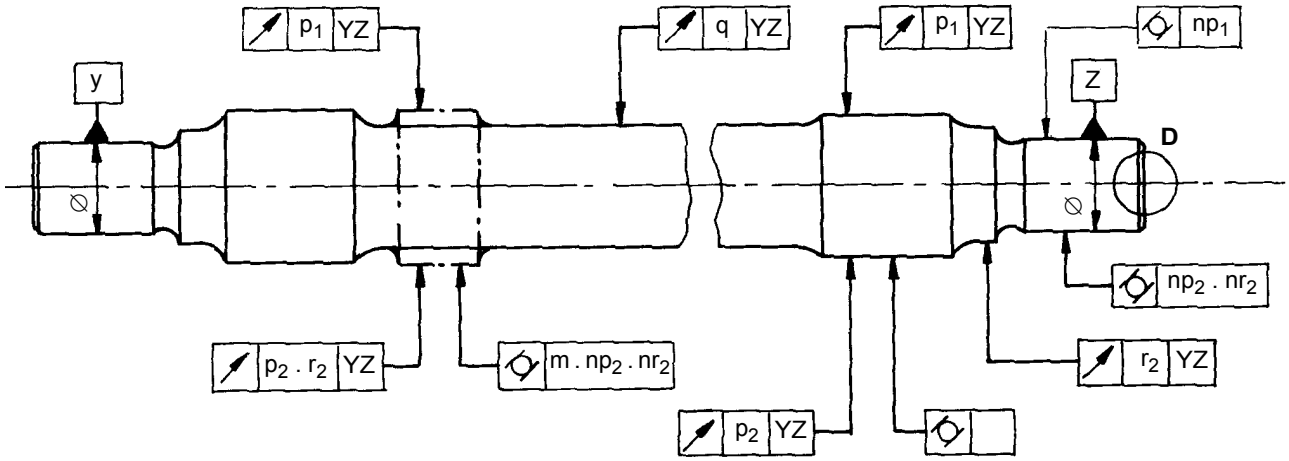

Fig. 2 - Geometrical tolerances relative to reference line YZ of "finish-machined" axles and "ready-to-assemble" axles

Table 1 : Dimensional and geometrical characteristics

Designation	Symbols in Fig. 1 and 2 for tolerances[a]		Tolerances (mm)		Quality Control[b]
	dimen-sional	geome-trical	N Normal speed V ≤ 200 km/h	H[e] High speed V > 200 km/h	
Wheel-seat diameter	a_1		+ 2 0	+ 2 0	m
	a_2		c	c	m
Diameter of seat of gear wheel, brake disc, etc.	b_1		+ 2 0	+ 2 0	m
	b_2		c	c	m
Diameter of seat of seal, spacer, etc.	bd_2		c	c	m
Diameter of plain-bearing seat for motor suspension	bp_1		+ 2 0	-	m
	bp_2		± 0,1	-	m
Diameter of motor-drive roller-bearing seat	br_2		c	c	m
Diameter of collar	c_2		c	c	m
Diameter of axle shaft	d		+ 2 0	+ 2 0	m
Diameter of journal (roller bearing)	er_2		c	c	m
Diameter of journal (plain bearing)	ep_1		c	-	m
	ep_2		± 0,1	-	m
Length of axle	f		± 1	± 1	m
Length of wheel seat (also collar and other seats, e.g. gear wheel, etc.)	g		0 - 1	0 - 1	m
Distance between collar ends	h		± 0,5	± 0,5	m
Length of journal	j		± 0,5	± 0,5	m
Length of collar	k		+ 1 0	+ 1 0	m
Length of transition recess between journal and collar	l		c	c	m
Depth of transition recess between journal and collar	v		c	c	m
Deviation from cylindrical form of seats for wheels, gears, disc brakes, seals, etc.		m_2	0,015[d]	0,015[d]	m

Table 1 : Dimensional and geometrical characteristics

Designation	Symbols in Fig. 1 and 2 for tolerances[a]		Tolerances (mm)		Quality Control[b]
	dimen-sional	geome-trical	N Normal speed V ≤ 200 km/h	H[e] High speed V > 200 km/h	
Deviation from cylindrical form of journal (roller bearing) and roller-bearing seat for motor-drive suspension		nr_2	0,015	0,015	m
Deviation from cylindrical form of journal (plain bearing) and plain-bearing seat for motor-drive suspension		np_1	0,025[e]	-	m
		np_2	0,025	-	m
Off-centre of seats for wheels, gears, disc brakes, etc. and of plain-bearing seat for motor suspension		p_1	1,5	1,5	o
		p_2	0,03	0,03	o
Off-centre of collar, seats for seals, motor drive roller bearings		r_2	0,03	0,03	o
Off-centre of axle shaft		q	0,5	0,3	o
Off-centre of centering bore		w	0,02	0,02	o

a. Indices 1 and 2 are defined in points 4.1 and 4.2 : "finish-machined" = index 1 ; "ready to assemble" = index 2.
b. m : obligatory - o : optional.
c. According to drawing or documents accompanying the order.
d. Any taper within the permitted tolerances must have its smallest diameter at the outer end, i.e. at the entry end of the wheel bore.
e. This tolerance applies only to the journal, being the reference surface.

Table 2 : Surface roughness Ra

Designation	Symbols in Fig. 1[a]	Ra (µm)[b]
Wheel seat	a_1	12,5[c]
- press fitting	af_2	0,4 to 1,6[c]
- shrink fitting	ac_2	1,6[c]
Seat of gear wheel, brake disc, etc.	b_1	12,5[c]
- press fitting	bf_2	0,4 to 1,6[c]
- shrink fitting	bc_2	1,6[c]
Seat of seals, spacer, etc.	bd_2	1,6[c]
Seat of motor-suspension plain bearing	bp_1	12,5[c]
	bp_2	0,8[c]
Seat of motor-drive suspension roller bearing	br_2	0,8[c]
Collar seat	c_2	1,6[c]
Axle shaft	d	3,2[c]
Journal (roller bearing)	er_2	0,8[c]
Journal (plain bearing)	ep_1	0,8[cd]
	ep_2	0,8[c]
End surface of axle and chamfer	f	6,3[e]
Inner transition radius between wheel seat and axle Relief recesses between seats	s	1,6[c]
Relief recess of journal	t	0,8[c]
Centering bore	w	3,2[c]

a. Indices 1 and 2 are defined in points 4.1 and 4.2.
b. If surface roughness Rz is used (see ISO 468), the values must be agreed upon by the parties involved.
c. Measured in the longitudinal direction.
d. Since the journal serves as a reference surface, its roughness value must comply with the "ready-to-assemble" state, even when the axle is supplied in the "finish-machined" state.
e. Measured in the vertical direction.

Bibliography

1. UIC leaflets

International Union of Railways (UIC)
UIC Leaflet 510-1: Wagons - Running gear - Normalisation, 9th edition of 1.1.78 and 14 Amendments

UIC Leaflet 515-1: Passenger rolling stock - Trailer bogies - Running gear - General provisions applicable to the components of trailers bogies, 2nd edition, March 2003

UIC Leaflet 571-1: Standard wagons - Ordinary two-axled wagons - Characteristics, 4th edition of 1.1.83 - Reprint dated 1.1.96

UIC Leaflet 571-2: Standard wagons - Ordinary bogie wagons - Characteristics, 6th edition, February 2001

UIC Leaflet 571-3: Standard wagons - Special-purposes wagons - Characteristics, 5th edition of 1.1.79 - Reprint dated 1.1.96

UIC Leaflet 571-4: , (under preparation)

UIC Leaflet 811-1: Technical specification for the supply of axles for tractive and trailing stock, 4th edition of 1.1.87 with sulphur prints

UIC Leaflet 813: Technical specification for the supply of wheelsets for tractive and trailing stock - Tolerances and assembly, 2nd edition, December 2003

2. Minutes of meetings

International Union of Railways (UIC)
"Tractive and Rolling Stock" Committee (Question 5/SA/FIC - Approval of new Leaflet 811-2 - Technical specification for the supply of axles for tractive and trailing stock - Tolerances), June 1987

3. International standards

International Organization for Standardization (ISO)
ISO 286:1988: ISO system of limits and fits - Part I: Bases of tolerances, deviations and fits, 1988

ISO 468:1982: Surface roughness - Parameters, their values and general rules for specifying requirements, 1982

ISO 1101:1983: Technical drawings - Geometrical tolerancing - Tolerancing of form, orientation, location and run-out - Generalities, definitions, symbols, indications on drawings, 1983

Warning

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