



INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 1005 / IV

RAILWAY ROLLING STOCK MATERIAL
ROLLED OR FORGED WHEEL CENTRES
FOR TYRED WHEELS FOR TRAILER STOCK

1st EDITION

March 1969

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BRIEF HISTORY

The ISO Recommendation R 1005/IV, *Railway rolling stock material – Rolled or forged wheel centres for tyred wheels for trailer stock*, was drawn up by Technical Committee ISO/TC 17, *Steel*, the Secretariat of which is held by the British Standards Institution (BSI).

Work on this question led, in 1967, to the adoption of a Draft ISO Recommendation based on a corresponding UIC* code.

In January 1968, this Draft ISO Recommendation (No. 1378) was circulated to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Austria	Hungary	Romania
Belgium	India	South Africa, Rep. of
Canada	Israel	Spain
Colombia	Italy	Sweden
Czechoslovakia	Korea, Rep. of	Switzerland
Denmark	Netherlands	Turkey
Finland	New Zealand	U.A.R.
France	Norway	United Kingdom
Germany	Portugal	Yugoslavia

Two Member Bodies opposed the approval of the Draft :

Japan
U.S.A.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in March 1969, to accept it as an ISO RECOMMENDATION.

* Union Internationale des Chemins de fer (International Union of Railways).

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RAILWAY ROLLING STOCK MATERIAL

ROLLED OR FORGED WHEEL CENTRES

FOR TYRED WHEELS FOR TRAILER STOCK

1. SCOPE

This ISO Recommendation applies to the manufacture of rolled or forged wheel centres, without spokes, either as-rolled, or rough-machined, or half-finished or finished*, for trailer stock, and which are to be tyred.

2. CLASSIFICATION

This ISO Recommendation applies to one class of wheel centres only.

3. CHEMICAL COMPOSITION

Wheel centres should be manufactured from non-alloy steel** of the following chemical purity :

phosphorus	≤ 0.06 %
sulphur	≤ 0.06 %
phosphorus + sulphur	≤ 0.10 %

4. MECHANICAL PROPERTIES**4.1 Tensile strength R_m**

The tensile strength should be between 42 and 50 kgf/mm².

4.2 Coefficient of quality C

The coefficient of quality (defined in Table 1 on the next page) should be as follows :

$$C \geq 105$$

* These terms are defined as follows :

- (a) *As-rolled* — A wheel obtained by hot-forging and rolling, and which, having to be subsequently machined, has not yet undergone any machining whatsoever.
- (b) *Rough-machined* — A wheel which has received no final machining, but which has been rough-machined on all or certain portions only, which have to be machined.
- (c) *Half-finished* — A wheel which has received final machining on certain sections which have to be machined.
- (d) *Finished* — A wheel in which all parts having to be machined have undergone their final machining.

** For this steel, the content of elements other than carbon should not exceed the following limits :

manganese	1.20 %	molybdenum	0.05 %
silicon	0.50 %	vanadium	0.05 %
nickel	0.30 %	copper	0.30 %
chromium	0.30 %		

TABLE 1

L_0	C
$8.16\sqrt{S_0}$	$R_m + 2.5 A$
$5.65\sqrt{S_0}^*$	$R_m + 2.2 A$
$4\sqrt{S_0}$	$R_m + 2 A$

* This formula should preferably be adopted.
The other formulae are retained provisionally.

where

L_0 is the gauge length used to measure the elongation after fracture, expressed in millimetres;

S_0 is the cross-sectional area of the gauge length of the test piece, expressed in square millimetres;

R_m is the tensile strength, expressed in kilogrammes-force per square millimetre;

A is the percentage elongation after fracture.

4.3 Resistance to impact

The wheel centre should be able to withstand consecutive blows which cause, without incurring flaws, cracking or breaking, a permanent deflection of the machined surfaces of the wheel boss of at least 10 % of the radial length of the web.

5. PHYSICAL CHARACTERISTICS

5.1 Soundness and appearance

The wheel centres should be sound throughout and show no cracks, blowholes, inclusions, scales, burrs, lack of metal, folds or defects whatsoever liable to impair their use.

The portions remaining black should be perfectly trimmed, without trace of diejoint or other defect liable to impair the appearance or use of the wheel centres.

The surface finish of machined surfaces, if any, should conform to the indications in drawings or to comparison specimens.

5.2 Static balance

(Only on half-finished or finished wheel centres for which only the rough-machined bore remains to be exactly dimensioned.)

The out-of-balance of the wheel centre should not exceed a moment of 250 g acting at a radius of 500 mm.*

The radial position and the value of the residual out-of-balance should be stamped in accordance with the indications given on the standards or drawings.

6. DIMENSIONAL CHARACTERISTICS

The wheel centres should be manufactured in accordance with the information given in the standards or drawings relating to the shape and dimensions and the tolerances on these characteristics.

Unless otherwise indicated, the machining allowances and dimensional tolerances should be those given in Table 2.

* In the case of certain vehicles, the order may specify a maximum out-of-balance for wheel centres less than the value specified above.

TABLE 2

Allowances and tolerances in millimetres

		Unmachined parts			Rough-machined parts	Finished parts
		Machining allowances in the event of subsequent machining on the consignee's premises	Tolerances		Machining allowances (when ready for delivery)	Tolerances
			in the event of subsequent machining on the consignee's premises	when maintained in the black condition		
Rim	External diameter . . .	8	+ 12 + 0	—	4	+ 2 + 0
	Width	8	+ 8 + 0	—	4	± 1
	Internal diameter . . .	6	- 0 - 10	- 0 - 8	—	—
	Out-of-round	—	3	—	—	1
	Buckle	—	3	—	—	1
Hub	External diameter . . .	10	+ 20 + 0	+ 15 + 0	—	—
	Maximum eccentricity .	—	5	5	—	—
	Internal diameter . . .	20	- 0 - 20	—	5	- 0 - 2
	Length	15	+ 10 + 0	—	3	+ 2 + 0
Web	Position of the web . .	—	4	5	—	—
	Thickness at the connection with the rim . . .	8	+ 6 + 0	+ 8 + 0	—	—
	Thickness at the connection with the hub . . .	10	+ 8 + 0	+ 10 + 0	—	—

as shown
on the
drawing

7. IDENTIFYING MARKS

Unless otherwise stated on the order by the purchaser, each wheel centre should be stamped with identifying marks, and in particular with

- the number of the cast,
- the manufacturer's mark,
- if applicable, the number of the wheel centre,
- the number of the month and the last two figures of the year of manufacture.

Example : 835 — XY — 65487 — 2.69

These identifying marks should be hot-stamped, immediately after forging or rolling, at 3 or 4 mm depth, using stamps with blunt edges approximately 12 mm in height, in the position shown on the drawing or order.

If the purchaser is in agreement, however, this branding may be replaced by cold-stamping on one of the machined surfaces of the boss.

Next to the marks, a circular recess 20 mm in diameter should be made to a depth of 2 mm, for the purpose of accommodating the accepting inspector's stamp.

8. STEELMAKING PROCESS

The wheel centres should be made exclusively from steel produced by the open hearth or electric processes. The purchaser may, however, allow other processes which he considers equivalent.

9. MANUFACTURE OF THE WHEEL CENTRES

The wheel centres should be manufactured from cropped ingots.

Individual ingots of special shape and not cropped may only be used with the formal agreement of the purchaser on the order.

The cropping performed on the ingots should be sufficient to remove all defective parts at the top and bottom of the ingot.

Surface flaws observed on the ingot sections should be completely removed; if this is not possible, the defective sections should be discarded.

Ingot sections should be forged, punched and roughed by means of a power hammer or press. They should be finished by forging or rolling.

After forging, rolling, and gauging, if necessary, and stamping of identifying marks, the wheel centres should be

- in general, left to cool to ambient temperature, sheltered from draughts, preferably in a covered pit or under a cover;
- if specified in the order or if required by the manufacturer, normalized* after having been allowed to cool without special precautions being taken.

In general, all these operations should be carried out with the greatest possible care and in such a way as to ensure the uniformity of the structure of the different points of the same wheel centre and that of the wheel centres of the same cast.

10. REMOVAL OF SURFACE DEFECTS

Surface defects may be eliminated by removing metal with either a machine tool or grinding wheel, provided the dimensional and balancing tolerances are maintained.

A blowpipe should not be used for removing these defects under any circumstances.

Any treatment which is carried out with the object of hiding a defect should be strictly forbidden and should result in the rejection of the complete order.

11. SUBMISSION FOR ACCEPTANCE

11.1 During manufacture

The accepting inspector should be provided with the charts of correctly calibrated recording pyrometers in order to verify the temperature of the furnaces used for the heat treatment.

The purchaser may dispense with the temperature verifications specified above, if he thinks this advisable.

11.2 Wheel centres ready for delivery

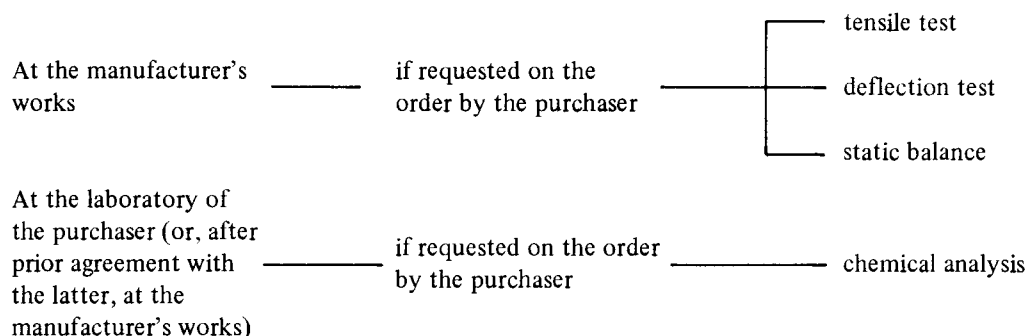
The wheel centres should be submitted for acceptance grouped according to their cast; each cast may contain wheel centres of different types.

Wheel centres originating from the same cast and forming the subject of the same presentation form a batch.

* Normalizing should be understood to mean leaving the wheel centres to cool until they have reached ambient temperature, then heating them uniformly to a temperature above that of the transformation point, and maintaining them at that temperature for a sufficiently long period, before leaving them to cool in still air sheltered from draughts.

12. TYPES AND NUMBERS OF TESTS

The wheel centres should be subject to the following inspections and tests :



The tensile and deflection tests and the verification of static balancing should be performed on the number of wheel centres given in Table 3.

TABLE 3

Number of wheel centres in the batch	Number of wheel centres to be tested	Number of wheel centres of which the static balancing is verified
≤ 250	1	10 % of the batch rounded to the next unit above unless otherwise specified in the order
> 250	2	

The chemical analysis should be carried out on one wheel centre per cast taken from those indicated for the tests by the above table.

13. INTERPRETATION OF TESTS – ADDITIONAL TESTS

Any characteristic which does not comply with the specified requirements should result in the rejection of the corresponding batch.

If the purchaser agrees to additional tests, the number of wheel centres to be submitted to these tests should be defined by special agreement between the supplier and the purchaser.

14. SELECTION AND PREPARATION OF SAMPLES AND TEST PIECES

14.1 Selection of sample

From each batch submitted, the accepting inspector should designate the wheel centre or centres intended for testing and stamp them.

He should mark on the wheel centres intended for destructive testing a sample section limited by two radial planes from which the test pieces are taken.

The sample section should be cut off after the deflection test where this is specified.