
International Standard



1005/7

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Railway rolling stock material — Part 7 : Wheelsets for tractive and trailing stock — Quality requirements

*Matériel roulant de chemin de fer — Partie 7 : Essieux montés pour le matériel moteur et pour le matériel remorqué —
Prescriptions de qualité*

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 1005/7 was developed by Technical Committee ISO/TC 17, *Steel*, and was circulated to the member bodies in May 1981.

It has been approved by the member bodies of the following countries :

Austria	Italy	Sweden
Belgium	Japan	Switzerland
China	Korea, Dem. P. Rep. of	Tanzania
Czechoslovakia	Korea, Rep. of	Turkey
Egypt, Arab Rep. of	Netherlands	United Kingdom
Germany, F.R.	Poland	USSR
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The member bodies of the following countries expressed disapproval of the document on technical grounds :

Canada
France
USA

Railway rolling stock material — Part 7 : Wheelsets for tractive and trailing stock — Quality requirements

1 Scope and field of application

1.1 This part of ISO 1005 specifies the requirements for the assembly by press fitting or shrink fitting onto axles of solid wheels, wheel centres, wheel centres complete with tyres, axle-mounted brake discs, dynamo pulleys, gear wheels, chain wheels and any other components specified by the purchaser¹⁾ into complete wheelsets.²⁾

It also specifies the dimensions and tolerances of the completed assembly and the conditions of inspection and supply.

NOTE — In many cases, the operations by which the components are made ready for assembly, such as the final machining operations of the wheel seats of the axles and of the bores of the wheels and the mounting of the tyres on the wheel centres, are carried out by the wheelset manufacturer and are consequently to be regarded as a part of the manufacture of the wheelset. However, the specifications for these operations and for the condition “ready for assembly” of the different components are, for the sake of clarity, covered in greater detail in the relevant International Standards.

1.2 This part of ISO 1005 includes requirements for both tractive and trailing wheel sets for all railway applications and applies to wheelsets of the following types of wheelset components :

Type of axle :

Outside or inside journal bearings
Cylindrical (or conical)³⁾ wheel seats
Plain-axle body or with seats for gear wheels, traction motor suspension, dynamo pulleys, chain wheels, brake discs or any other axle-mounted component

Type of wheel :

Solid — rolled, forged or cast
Tyred with rolled, forged (or cast)³⁾ disc wheel centres, or with (cast) spoked-wheel centres³⁾

Type of axle box bearing :

Plain or roller

Type of traction motor (or final drive) bearing :

Plain or roller

1.3 In addition to this part of ISO 1005, the requirements of ISO 404 are applicable.

2 References

ISO/R 286, *ISO system of limits and fits — Part 1 : General, tolerances and deviations*.

ISO 404, *Steel and steel products — General technical delivery requirements*.

ISO 1005/1, *Railway rolling stock material — Part 1 : Rough-rolled tyres for tractive and trailing stock — Quality requirements*.

ISO 1005/2, *Railway rolling stock material — Part 2 : Rough tyres for trailing stock — Dimensions and tolerances*.⁴⁾

ISO 1005/3, *Railway rolling stock material — Part 3 : Axles for tractive and trailing stock — Quality requirements*.

ISO 1005/4, *Railway rolling stock material — Part 4 : Rolled or forged wheel centres for tyred wheels for trailer stock*.⁵⁾

ISO 1005/6, *Railway rolling stock material — Part 6 : Solid wheels for tractive and trailing stock — Quality requirements*.

1) Here and throughout the text of this part of ISO 1005, the “Purchaser” is understood to mean the “Railway Administration or its nominated representative”.

2) For the purposes of this document, a wheelset is defined as the complete unit constituted by the assembly of an axle and two complete wheels together with any gear-wheels, dynamo pulleys, brake discs or bearings, etc., which may be specified by the purchaser.

3) Wheelsets with the characteristics given in brackets are rare. If such wheelsets are ordered, deviations from or additions to the requirements of this part of ISO 1005 may be necessary. Such deviations and additions should be given in the order or its appended documents.

4) At present at the stage of draft. (Revision of ISO/R 1005/2-1969).

5) At present at the stage of draft. (Revision of ISO/R 1005/4-1969.)

ISO 1101/1, *Technical drawings — Geometrical tolerancing — Tolerances of form and of position — Part 1 : Generalities, definitions, symbols, indications on drawings.*¹⁾

NOTE — Pending publication of the above-mentioned revisions as International Standards, it will be necessary for the relevant requirements contained therein to be agreed by the manufacturer and the purchaser.

3 Information to be supplied by the purchaser

The following information shall be supplied by the purchaser, in his enquiry and order, which shall be accompanied by the relevant drawings :

3.1 Which category the wheelset falls into relative to dimensional characteristics (see 4.2.4 and table 3) :

3.1.1 Whether required for

- a) tractive wheelset;
- b) trailing wheelset — passenger stock;
- c) trailing wheelset — freight stock.

3.1.2 Which range the wheelset maximum operating speed falls into

- $v \leq 100 \text{ km/h}$
- $100 \text{ km/h} < v \leq 120 \text{ km/h}$
- $120 \text{ km/h} < v \leq 160 \text{ km/h}$
- $160 \text{ km/h} < v \leq 200 \text{ km/h}$
- $200 \text{ km/h} < v$

3.1.3 Whether tolerance category Y or Z of table 3 shall apply (observe 4.2.4).

3.2 What other axle mounted components are to be assembled (see 1.2 and 4.1.1) and the methods and/or specifications to be used.

3.3 If cold-rolling of the axle is required, specifying which parts of the axle are to be cold-rolled, i.e. wheel seat, gear-wheel seat, etc.²⁾ Cold-rolling of any part of the axle should be restricted to steels A0 and A1 of ISO 1005/3.

3.4 Whether burnishing of plain bearing journals is required for either the axle box bearings, or traction motor bearings, or final drive bearings.²⁾

3.5 The method to be used for assembly of the wheels, wheel centres, or assembled wheel centres and tyres, onto the axle (see 5.2.3.2).

3.5.1 If press fitting is specified :

3.5.1.1 The range of interference between seats and bores (see 4.1.2) and the range of pressing-on force P_f (5.2.3.3.5).

3.5.1.2 Whether or not the interference values shall be recorded (see 6.3.1).

3.5.2 If shrink fitting is specified :

3.5.2.1 The range of interference between seats and bores (see 4.1.2) and value of proving thrust P_p (see 6.4.3.1).

3.5.2.2 Whether the proving thrust test may be waived totally or partially (see footnote 4 in table 4).

3.6 Whether or not machining of the treads is required (see 5.4).

3.7 Which identification marks are to be applied [see 4.2.5.1 a), e) and f)] and where these shall be positioned (see 4.2.5.2).

3.8 Responsibility for the different inspections (see 6.1 and table 4, column 5).

3.9 Whether the electrical resistance is to be measured (see 4.2.2 and table 4) and, if so, whether it is to be recorded.

3.10 If balancing is required (see 4.2.3 and table 4), specifying the type of balancing and, where necessary, the admissible unbalance (see 4.2.3.2 and 4.2.3.3).

3.11 Any additional or alternative tolerances to those given in table 3 (see 4.2.4).

3.12 If final painting or other permanent protection against corrosion is required, specifying details (see 5.8).

4 Requirements

4.1 Components

4.1.1 General

The components shall possess in the "ready for assembly" condition [see ISO 1005/23]) all the characteristics necessary for safe service behaviour of the wheelsets. The requirements to ensure these characteristics shall be specified as far as possible by reference to the relevant International Standards given in table 1.

1) At present at the stage of draft. (Revision of ISO/R 1101/1.)

2) An International Standard dealing with cold-rolling and burnishing is in preparation.

3) Other International Standards dealing with this condition are in preparation.

4.1.2 Interference between seats and bores

For the interference between seats and bores, a range of values shall be agreed between purchaser and manufacturer. Unless otherwise agreed, this shall be such that, under the conditions for assembly given in 5.2, the requirements for the proving thrust test (see 4.2.1, table 4, and 6.4.3.1) are complied with and that the selected range lies within the upper and lower limiting curves given in figures 1a) and 1b).

NOTES

1 Figures 1a) and 1b) give some deviation and tolerance grades in accordance with ISO/R 286, which meet the requirements of 4.1.2. The values are also tabulated in table 2.

2 The choice of an appropriate interference value from the ranges in figures 1a) and 1b), to meet the conditions for the pressing-on force, is partly dependent on the range of elasticity of the two materials fitted together, on the lubricant used, on the design of the fitted parts, on the roughness of the fitted surfaces, on the press-fitting speed, etc. Therefore, specification of close tolerance ranges for both interference and pressing-on force may cause assembly difficulties.

4.2 Wheelset

4.2.1 Mechanical characteristics

When the proving thrust test is applied (see 6.4.3.1 and table 4), the wheels shall not show any displacement on the axle.

4.2.2 Electrical resistance

The electrical resistance of each wheelset shall not exceed 0,01 Ω when tested in accordance with 6.4.3.2.

4.2.3 Balancing

4.2.3.1 When balancing is required (see 3.10) the dynamic unbalance for trailing wheelsets for passenger stock shall, unless otherwise specified at the time of enquiry and order, not exceed the following values when tested in accordance with 6.4.3.3.

Maximum operating speed v	Maximum dynamic unbalance ¹⁾
km/h	gm
$v \leq 100$	—
$100 < v \leq 120$	125
$120 < v \leq 200$	75
$v > 200$	50

1) Per wheel measured at the tread.

4.2.3.2 For tractive wheelsets and trailing wheelsets for freight, values of dynamic unbalance may be agreed at the time of enquiry and order.

4.2.3.3 If in special cases (see table 4, footnote 7) static unbalance tests are required, the values to be complied with are to be agreed at the time of enquiry and order.

4.2.4 Dimensional characteristics

The dimensional characteristics of the wheelset shall be as specified in the order and its appended documents.

The tolerances for the dimensional requirements shall, as far as appropriate, be specified by reference to one of the tolerance categories given in table 3, taking into consideration the information given in the following note.

NOTE — The compilation of an International Standard for material, testing and dimensional requirements of assembled wheel sets and of wheelset components is difficult because of the different ways in which railways have developed, in both the commercial and the operating sense, in various parts of the world. These different forms of development are characterized, for example, by railway systems in which freight services are integrated with intensive and perhaps high-speed passenger services and systems largely dedicated to the haulage of freight. The infrastructures of these two systems are normally different and this and commercial policy can determine the practice adopted by them in wheelset design both in terms of materials and dimensional characteristics.

The relevant parts of ISO 1005 acknowledge, or will in a future revision acknowledge, these differences by providing in the relevant clauses two categories of material and related quality testing requirements designated as testing categories A and B and two tolerance categories for dimensional requirements designated as Y and Z.

Category A corresponds to the material and quality testing requirements given in the present editions of ISO 1005/3 and ISO 1005/6. Category B will be considered in the revision of ISO 1005/6 and perhaps also in ISO 1005/3. The most obvious difference between these categories A and B is for solid wheels that the mechanical properties are specified

- in the case of category A, on the basis of tensile and impact tests;
- in the case of category B, on the basis of hardness tests.

The differences between the values of the tolerance categories Y and Z are given

- for wheelsets in this International Standard (see especially table 3);
- for solid wheels in ISO 1005/8.

Until now, it was impossible to clarify in detail the conditions under which the one or the other testing and tolerance category is preferable. As a general guide it shall, however, be noted

- that the combination of testing category A with tolerance category Y is principally applied on railway systems where frequent or high-speed passenger operation is predominant or where freight and passenger services are intensively integrated and
- that the combination of testing category B and tolerance category Z is principally applied on railways systems where freight operation is predominant and where freight and passenger services are less integrated.

The final choice of the combination of categories is at the discretion of the purchaser.

4.2.5 Identifying marks

4.2.5.1 The components parts of the wheelsets shall bear the identifying marks indicated in the particular specifications for the individual components. In addition to this, the wheelsets shall be cold stamped with blunt edged stamps (avoiding

character forms with acute angles) with characters of a height of 5 to 10 mm in order to identify :

- a) The serial number.

The purchaser may indicate the type of serial number to be used and allocate groups of numbers.

- b) The date of final inspection (acceptance).

Two figures for the month (e.g. February = 02) and the last two figures of the year of acceptance shall be stamped on. Stamping of the date of acceptance may, however, be omitted if the month and year of acceptance are the same as the month and year of the manufacture of the axle indicated on its end face.

- c) The inspection stamp.
- d) The brand of the particular workshop or factory which carried out the assembly of the wheelset. In addition, if so specified :
- e) A symbol or number of the type of wheelset.
- f) The purchaser's identifying mark.

4.2.5.2 Unless otherwise agreed, the marks shall be stamped on the same end face of the axle as that which carries the axle manufacturer's marks.

When there is insufficient space on the end face of the axle (for example in the case of roller-bearing axles), the marks may with the purchaser's agreement be stamped in an alternative position or on a metal sheet collar placed around the body of the axle, the ends of the collar being riveted or welded together.

5 Manufacture

5.1 General

The manufacturer shall advise the purchaser of the principal processes which will be used in completing the order. He shall advise the purchaser of any subsequent fundamental changes which he proposes to introduce and which may affect the quality of the wheelsets and seek his agreement (see 6.6.2).

5.2 Assembly of the wheelset components onto the axle

5.2.1 Preparatory work

Before assembly, the components shall have been prepared and inspected in accordance with the requirements of 6.2.

5.2.2 Assembly of accessory components

Before the wheels or wheel centres are assembled onto the axle, those components such as bearings, gear wheels, brake discs, dynamo pulleys, etc., which are to be fitted onto the axle in a position between the wheels, shall be assembled in accordance with the specifications in the order and the appended documents.

Unless otherwise specified by the purchaser of the wheelsets or the manufacturer of such accessory components, the conditions for assembling the accessory components other than bearings, shall be identical to those given in 5.2.3 for solid or tyred wheels or wheel centres with the same form of hub bore.

5.2.3 Assembly of wheels or wheel centres

5.2.3.1 Position of the unbalance

In the case of wheels or wheel centres with marks for the position of the unbalance the two wheels or wheel centres provided for a wheelset shall be mounted such that their unbalance is situated in the same diametrical plane on the same side of the axle and, in the case of wheelsets with brake discs, opposite the unbalance of the brake disc.

5.2.3.2 Methods of assembly

Alternative methods of assembling the wheelset components onto the axle may be permitted at the purchaser's option (see 5.2.3.4.1). Assembly by press fitting (see 5.2.3.3) and assembly by shrink fitting (see 5.2.3.4) are specified in this International Standard. Other methods, e.g. assembly by use of oil injection or use of conical wheel seats, are possible and may be specified by agreement between the purchaser and the manufacturer; in these cases, the procedure to be adopted shall also be specified by the purchaser.

5.2.3.3 Press fitting

Where press fitting is specified in the order (see 3.5), or unless otherwise agreed, the press fitting assembly of the wheels, wheel centres or assembled wheel centres and tyres shall be carried out as follows :

5.2.3.3.1 The wheels, wheel centres, or assembled wheel centres and tyres shall, at the time of assembly, be at the same ambient temperature as the axle.

5.2.3.3.2 The wheel or wheel centre bore and the wheel seat on the axle shall be coated with a thin film of lubricant over their whole contact surface. The lubricant shall preferably be one of the following :

- a) pure tallow;
- b) vegetable oil (linseed, rape, colza);
- c) vegetable oil + tallow;
- d) vegetable oil + white lead;
- e) vegetable oil + zinc oxide;
- f) molybdenum disulphide.

The type of lubricant may be specified by the purchaser; if not, the lubricant used shall be stated by the manufacturer.

NOTE — The use of white lead and of zinc oxide is, for health reasons, not permitted in certain countries.