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Wheelsets for railway rolling stock — Quality requirements

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Land, Infrastructure and Transport through deliberations at the Japanese Industrial Standards Committee, as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Association of Rolling Stock Industries (JARI)/Japanese Standards Association (JSA), with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14. Consequently **JIS E 4504:2000** is replaced with this Standard.

In order to conform to the corresponding International Standard, the previous revision entirely employed **ISO 1005-7:1982** *Railway rolling stock material — Part 7: Wheelsets for tractive and trailing stock — Quality requirements*. At the same time, however, in order to avoid confusion due to wide alteration of the former Standard (**JIS E 4504:1989**) that the users had utilized for several decades, the items and contents of the former **JIS** were left in minimum range, to make the choice of alternatives wide. However, the comparison table of **JIS** and corresponding International Standard was not provided and the degree of corresponding with International Standard was not correctly expressed.

This version is revised to make clear the degree of corresponding with International Standard compiling the corresponding table, and to consider the lately actual working circumstances.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

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the original JIS is to be the final authority.

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Wheelsets for railway rolling stock — Quality requirements

Introduction This Japanese Industrial Standard has been prepared based on the first edition of **ISO 1005-7** *Railway rolling stock material — Part 7: Wheelsets for tractive and trailing stock — Quality requirements* published in 1982 with some modification of the technical contents.

The portions given sidelines or dotted underlines are the matters modified from the original International Standard. A list of modifications with the explanations is given in annex (informative).

1 Scope and field of application

1.1 This Standard specifies the requirements for the assembly by press fitting, shrink fitting or hydraulic-pressure 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 purchaser into complete wheelsets⁽¹⁾. It also specifies the shape, dimensions and tolerances of the completed assembly and the conditions of inspection and supply.

Note ⁽¹⁾ 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.

Through this Standard the word, "axle", describes axle of wheel fit, gear seat, disc seat, etc. and, "hole", describes shaft hole for wheel, gear and disc.

Further, "wheel-related components" is a generic term for solid wheels, wheel centres and wheel centres complete with tyres.

Information : 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 various components are, for the sake of clarity, covered in greater detail in the relevant JIS.

1.2 This Standard includes requirements for both tractive and trailing wheelsets for all railway applications and applies to wheelsets having the following types of wheelset components :

a) Type of axle :

Position of journals (axle box bearings): Outside or inside journal bearings (see figure 2)

Shape of wheel seat: Cylindrical (or conical) ⁽²⁾

Mounting seat of the axle between wheels: Plain-axle body or with seats for gear wheels, traction motor bearing (traction motor suspension), dynamo pulleys, chain wheels, brake discs or any other axle-mounted component

b) Type of wheel :

Solid wheels: Solid-rolled, forged or cast

Tyred wheels: Tyred with rolled, forged disc wheel centres (or cast disc wheel centres or spoked-wheel centres) ⁽²⁾

Note ⁽²⁾ Wheelsets with the characteristics given in brackets are rare. If such wheelsets are ordered, deviations from or additions to the requirements of this Standard may be necessary. Such deviations and additions should be given in the order or its appended documents.

c) Type of axle box bearing : Roller or plain

d) Type of traction motor (or drive unit) bearing : Roller or plain

1.3 In addition to this Standard, the requirements of **ISO 404:1992** are applicable.

Remarks: The International Standard(s) corresponding to this Standard is as follows.

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are **IDT** (identical), **MOD** (modified), and **NEQ** (not equivalent) according to **ISO/IEC Guide 21**.

IEC 1005-7:1982 *Railway rolling stock material — Part 7: Wheelsets for tractive and trailing stock — Quality requirements* (MOD)

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. If the indication of the year of publication is given to these referred standards, only the edition of the indicated year constitutes the provision of this Standard but the revision and amendment made thereafter do not apply. The normative references without the indication of the year of coming into effect apply only to the most recent edition (including amendments).

JIS B 0621 *Definitions and designations of geometrical deviations*

NOTE : **ISO 1101:1983** *Technical drawings — Geometrical tolerancing — Tolerancing of form, orientation, location and run-out — Generalities, definitions, symbols, indications on drawings* is equivalent to the said standard.

JIS E 4502-1 *Axles for railway rolling stock — Quality requirements*

NOTE : **ISO 1005-3** *Railway rolling stock material — Part 3: Axles for tractive and trailing stock — Quality requirements* is equivalent to the said standard.

JIS E 4502-2 *Axles for railway rolling stock — Dimensional requirements*

NOTE : **ISO 1005-9** *Railway rolling stock material — Part 9: Axles for tractive and trailing stock — Dimensional requirements* is equivalent to the said standard.

JIS E 5401-1 *Carbon steel tyres for railway rolling stock — Quality requirements*

NOTE : **ISO 1005-1** *Railway rolling stock material — Part 1: Rough-rolled tyres for tractive and trailing stock — Technical delivery condition* is equivalent to the said standard.

JIS E 5401-2 *Carbon steel tyres for railway rolling stock — Wheel centres and tyred wheels — Dimensional, balancing and assembly requirements*

NOTE : **ISO 1005-2** *Railway rolling stock material — Part 2: Tyres, wheel centres and tyred wheels for tractive and trailing stock — Dimensional, blanching and assembly requirements* is equivalent to the said standard.

JIS E 5402-1 *Railway rolling stock — Solid wheel — Quality requirements*

NOTE : **ISO 1005-6** *Railway rolling stock material — Part 6: Solid wheels for tractive and trailing stock — Technical delivery conditions* is equivalent to the said standard.

JIS E 5402-2 *Railway rolling stock — Solid steel wheel — Dimensional and balancing requirements*

NOTE : **ISO 1005-8** *Railway rolling stock material — Part 8: Solid wheels for tractive and trailing stock — Dimensional and balancing requirements* is equivalent to the said standard.

JIS Q 9001 *Quality management systems — Requirements*

NOTE : **ISO 9001** *Quality management systems — Requirements* is identical with the said standard.

ISO/R286:1962 *ISO system of limits and fits — Part 1: General, tolerances and deviations*

ISO 404:1992 *Steel and steel products — General technical delivery requirements*

ISO 1005-4:1986 *Railway rolling stock material — Part 4: Rolled or forged wheel centres for tyred wheels for tractive and trailing stock — Quality requirements*

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 tables 3 and 3A).

3.1.1 Use of wheelsets Use of wheelsets shall be the following:

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

3.1.2 Range of the maximum operating speed of the car installing the wheelset

$$\begin{aligned}v &\leq 100 \text{ km/h} \\100 \text{ km/h} &< v \leq 120 \text{ km/h} \\120 \text{ km/h} &< v \leq 160 \text{ km/h} \\160 \text{ km/h} &< v \leq 200 \text{ km/h} \\200 \text{ km/h} &< v\end{aligned}$$

3.1.3 Tolerance categories (see 4.2.4) For the tolerance category, if designated in the order, category Y to Z in table 3 shall be applied and the details shall be subject to the agreement between the purchaser and the supplier. If not designated, category J in table 3A shall be applied.

Remarks : Usual applications of different tolerance categories applied, which are specified in 1.1 of JIS E 5402-1, are given in the following information.

Information : Usual application of wheels of the testing categories A, B, C and D and those of tolerance categories, J, Y and Z are as follows:

- the combination of “testing category A with tolerance category Y” and “testing category D with tolerance category J”, on railway systems where frequent and high-speed passenger operation is predominant;
- the combination of “testing category B with tolerance category Z” and “testing category C with tolerance category J”, on railway systems where freight operation is predominant.

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⁽³⁾ of the axle is required, specifying which parts of the axle are to be cold-rolled, i.e. wheel seat, gearwheel seat, etc. Cold-rolling of any part of the axle should be restricted to steels A0 and A1 of JIS E 4502-1 table 1.1.

3.4 Whether burnishing⁽³⁾ of plain bearing journals is required for either the axle box bearings, or traction motor bearings.

Note ⁽³⁾ ISO standards related to cold-rolling and burnishing are under preparation.

3.5 The method to be used for assembly of the “wheel-related components”, 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 (see 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 .

3.5.2.2 Whether the proving thrust test may be waived totally or partially [see note ⁽²²⁾ 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 various 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 or 3A (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 all the performances necessary for safe service behaviour of the wheelsets. The requirements to ensure these performances shall be specified as far as possible by reference to the relevant **JIS** and **ISO** given in table 1.

Table 1 Requirements for the components of the wheelset

Component	Quality requirements	Dimensional requirements for "ready for assembly" condition
Axles	JIS E 4502-1	JIS E 4502-2
Solid wheels	JIS E 5402-1	JIS E 5402-2
Wheel centres	ISO 1005-4	} JIS E 5401-1
Tyres	JIS E 5401-1	
Tyred wheels	JIS E 5401-2	
Retaining rings	In the absence of JIS for these components, the requirements shall be agreed upon between the purchaser and the manufacturer at the time of enquiry and order.	
Gear wheels		
Brake discs		
Dynamo pulleys		
Bearings		

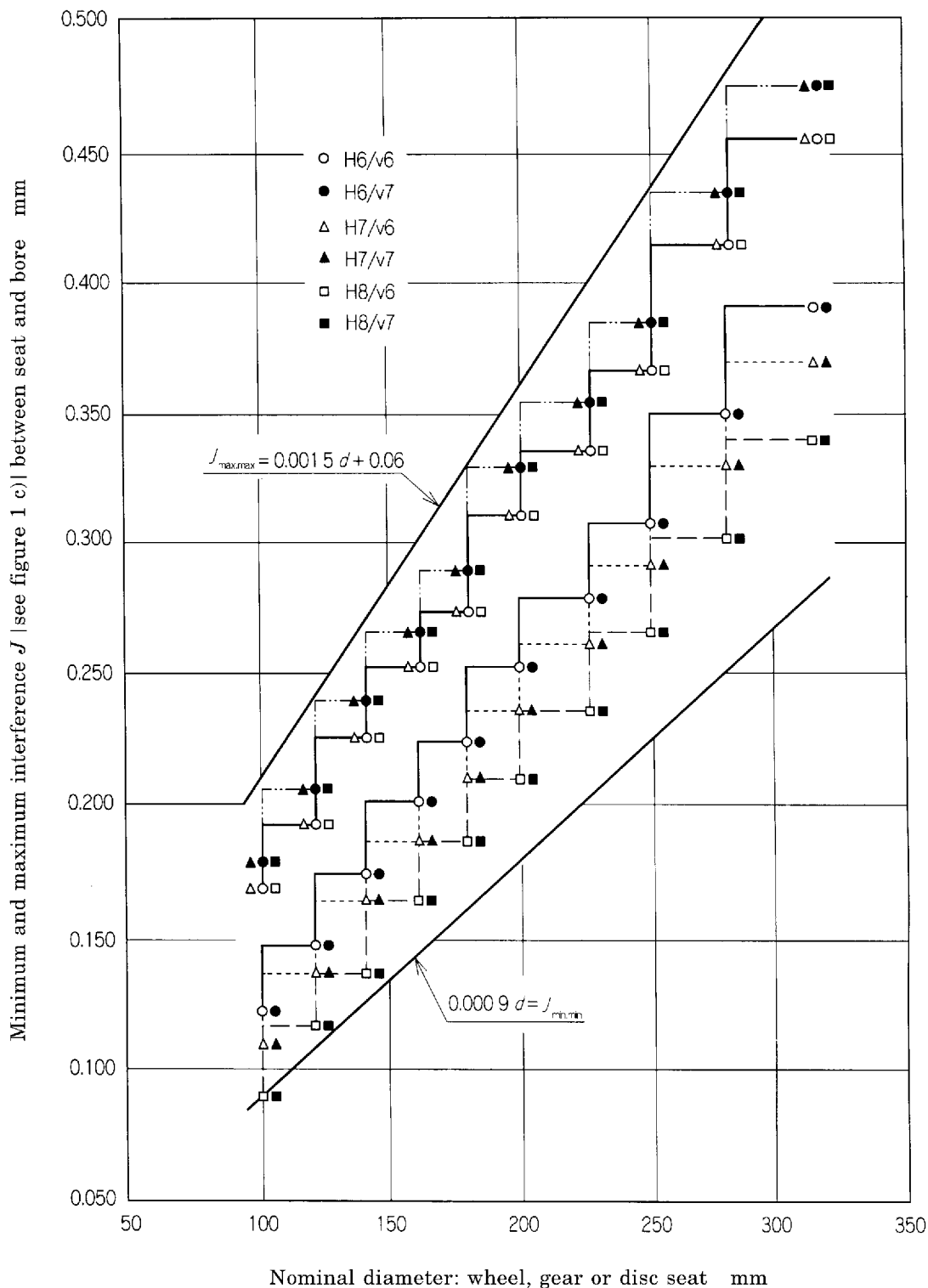
4.1.2 Interference between seats and bores For the interference ⁽⁴⁾ between seats and bores, a range of values shall be in **4.1.2A** if specified by the purchaser and in **4.1.2B** if otherwise.

Note ⁽⁴⁾ Interference shows the difference between the average diameter of wheel seat of axle and the average diameter of bores of “wheel-related components” in case of finishing the machining of contact surface.

4.1.2A The range of the interference value between seats and bores shall be agreed upon between the purchaser and manufacturer when the purchaser specified. Unless otherwise agreed, the range of its value shall conform to the proving thrust test (see **4.2.1**, **6.4.3.1** and table 4) and shall be between upper limit and lower limit in figure 1 a) and figure 1 b) under assembly conditions in **5.2**.

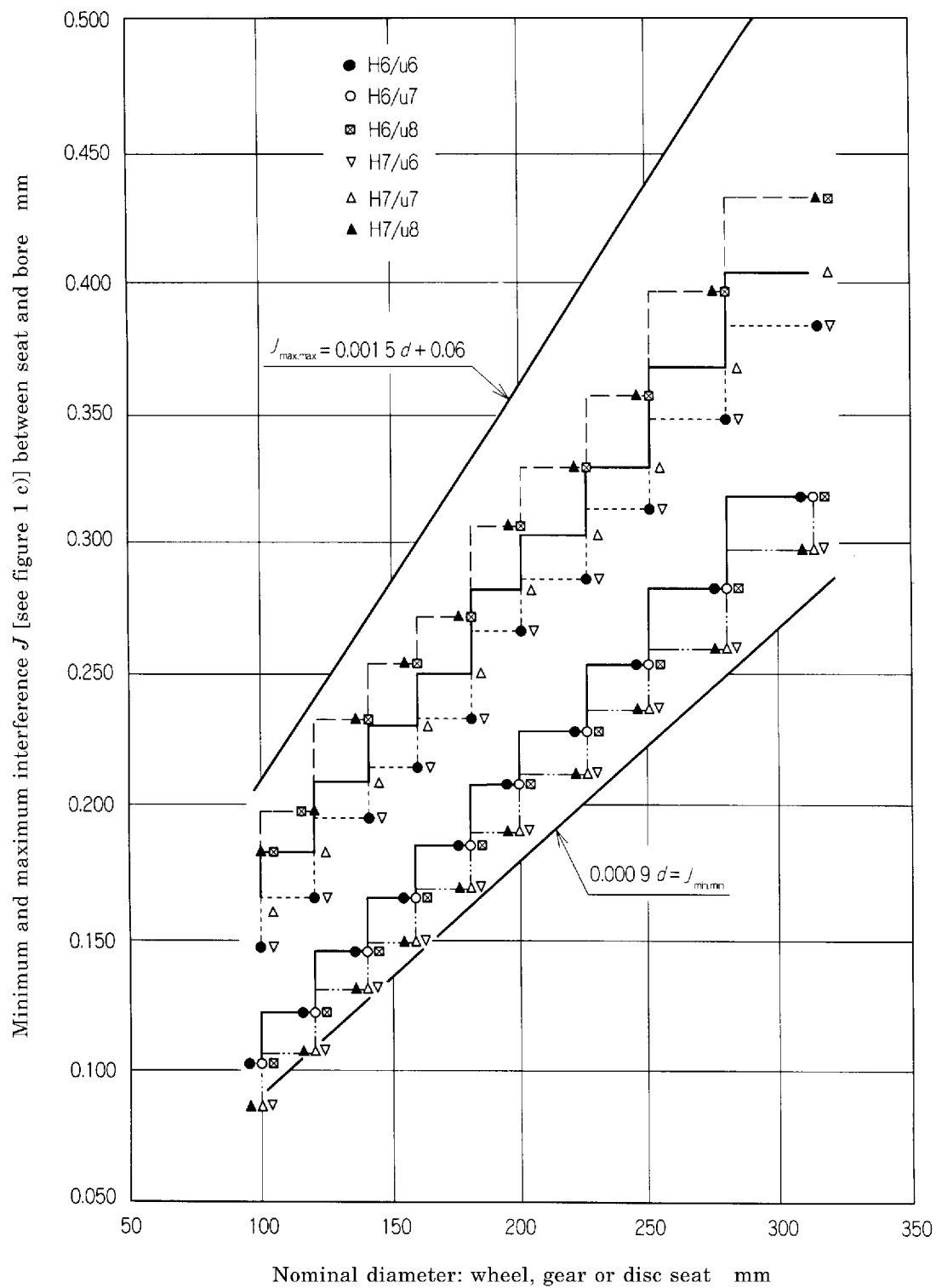
Remarks 1 Figure 1 a) and figure 1 b) show interference tolerance given in **ISO** which can meet to conditions in **4.1.2A**. Also, the values are shown in table 2.

2 In range of figure 1 a) and figure 1 b), the suitable interference which can meet to the specification of pressing-on force depends on range of elasticity of two materials interfered, lubricant, design of contact surface, roughness of contact surface and pressing-on speed. Therefore, there is the possibility that the assembly becomes difficult if both of interference and pressing-on force are specified within narrow range.



- a) Interference between seats and bores of 100 to 300 mm diameter and corresponding tolerance grades for deviation grade v as given in **ISO/R 286** [see 4.1.2 and figure 1 c)]

Figure 1 Relation of interference between seats and bores



- b) Interference between seats and bores of 100 mm to 300 mm diameter and corresponding tolerance grades for deviation grade u as given in **ISO/R 286** [see 4.1.2 and figure 1 c)]

Figure 1 (continued)