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Carbon steel tyres for railway
rolling stock—Wheel centres
and tyred wheels—
Dimensional, balancing
and assembly requirements

ICS 45.060

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of International Trade and Industry and Minister of Transportation through deliberations at Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law.

This Standard, for the purpose of conformity to International Standard, has been prepared based on **ISO 1005-2 : 1994** *Railway rolling stock material—Part 2 : Tyres, wheel centres and tyred wheels for tractive and trailing stock—Dimensional, balancing and assembly requirements*.

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Carbon steel tyres for railway rolling stock—Wheel centres and tyred wheels—Dimensional, balancing and assembly requirements

Introduction This Japanese Industrial Standard fully employs ISO 1005-2 : 1994, *Railway rolling stock material—Part 2 : Tyres, wheel centres and tyred wheels for tractive and trailing stock—Dimensional, balancing and assembly requirements*, as well as, in a necessary and minimum range of full and wide revision of JIS E 5401 : 1989 *Carbon steel tyres for railway rolling stock*, the provisions of the former Japanese Industrial Standard have been appended in addition.

In the former JIS E 5401 : 1989, the quality requirements and the requirements of shapes and dimensions have been arranged into one standard, since the corresponding International Standards have been divided into two standards of ISO 1005-1 : 1994, *Railway rolling stock material—Part 1 : Rough-rolled tyres for tractive and trailing stock—Technical delivery conditions* and ISO 1005-2 : 1994, in the results of proceeding of conformance on the basis of the style and system of International Standards, instead of the former JIS E 5401 : 1989, JIS E 5401-1 *Carbon steel tyres for railway rolling stock—Quality requirements* and JIS E 5401-2 *Carbon steel tyres for railway rolling stock—Wheel centres and tyred wheels—Dimensional, balancing and assembly requirements* have been established.

At present, tyres are in the tendency to be used for repairing, solid wheels are used for new wheels.

1 Scope

1.1 In this Standard, the dimensional requirements¹⁾, surface roughness and permissible residual unbalance relating to tyres, wheel centres and tyred wheels in the various degrees of finish are specified, and in addition the manufacturing requirements of tyred wheels. However, the tyred special wheels which have used rubber and the like (special structure wheels of sound isolation wheels, elastic wheels) shall be excluded.

Note ¹⁾ The term of "dimensional requirements" shall mean the machining allowance, dimensional tolerances, shapes and positional tolerances.

1.2 The quality requirements for the tyres shall be as given in JIS E 5401-1, and the quality requirements for the wheel centres shall be as given in ISO 1005-4.

1.3 In addition to the quality requirements of this Standards, ISO 404 apply.

2 Normative references

JIS E 4504 *Wheel sets for railway rolling stock*

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

JIS E 5402-1 *Carbon steel tyres for railway rolling stock—wheel centres and tyred wheels—Dimensional, balancing and assembly requirements*

- JIS Z 9901 *Quality systems—Model for quality assurance in design, development, production, installation and servicing*
- JIS Z 9902 *Quality systems—Model for quality assurance in production, installation and servicing*
- ISO 404 : 1992 *Steel and steel products—General technical delivery requirements*
- ISO 468 : 1982 *Surface roughness—Parameters, their values and general rules for specifying 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*
- ISO 1005-7 : 1986 *Railway rolling stock material—Part 7 : Wheelsets for tractive and trailing stock—Quality requirements*
- ISO 1101 : 1983 *Technical drawings—Geometrical tolerancing—Tolerancing of form, orientation, location and run-out—Generalities, definitions, symbols, indications on drawings*

3 Designated items by purchaser The purchaser shall designate the following items at the time of enquiry and order.

- a) the number of this Standard
- b) a dimensioned drawing of product
- c) the degree of finish (see 4)
- d) the speed regime in which the finished wheel is operated, i.e. normal speed or high speed (see Tables 7, 8 and 9).
- e) where required, the dimensional requirements of tires and wheel centres to be delivered in the condition of "rough machined" and for rough machine portions of tyres and wheel centres delivered in the half fished condition (see 5.2.1.2).
- f) the dimensional requirements and the values of surface roughness if they deviate from this Standard (see Tables 5-1, 5-2, 6, 7, 8 and 5.1.1, 5.2.1, 5.2.2, 5.3.1.1, 5.3.1.2, 5.3.2 and 5.3.3).
- g) if R_y is to be used, the roughness values (see 5.2.2, 5.3.1.2 and 5.3.3.1).
- h) if, for wheel centres of tyred wheels for trailer stock other than freight stock, a maximum static unbalance is required (see 5.2.3.1 and 5.3.4.1).
- j) if, for the wheel centres and tyred wheels for tractive stock, a maximum static unbalance is required (see 5.2.3.2 and 5.3.4.2) also the values which shall apply;
- k) if the position and amount of unbalance is required to be marked on the wheel centre or tyred wheel.
- m) the details of the method of assembling the tyre on the wheel centre, if the requirements deviate from the provisions of this Standard (see 5.3).
- n) the value of x for the interference fit of tyre wheel centre (see 5.3.1.2).

- p) the shape of retaining ring, if not specified on the drawing (see 5.3.1.3).
- q) if specific geometrical tolerances are required to be verified.
- r) if a surface quality standard is required for surfaces which the purchaser permits to be left unmachined in the "finished" and "ready for assembly" conditions.
- s) if an additional inspection is required (see 6.3.7.4 and Tables 6 to 9).
- t) when the inspection on surface roughness conditions have been specified, the number of tyres, wheel centres and tyred wheels to be inspected.
- u) if special inspection is required (see 6.3.1).
- v) the method of protection against corrosion (see 7.1).
- w) the conditions of guarantee (see 8).

4 Definition of terms for degree of finish The terms of degree of finish at various conditions and manufacturing steps of wheel centres and tyred wheels mentioned in this Standard shall be mentioned in 4.1 to 4.3.

4.1 Tyres

4.1.1 Unmachined "Unmachined" for the rolled tyres shall indicate the "surface as forged" tyres not accompanying machining at all, other machining process than the spontaneously processed in order to satisfy the requirements of the tyres by the manufacturer.

4.1.2 Rough machined "Rough machined" shall indicate the condition of the tyre roughly machined entirely or only on necessary portions, without being machined finally, in accordance with JIS E 5401-1.

4.1.3 Half finished "Half finished" shall indicate the condition where the tyre, in accordance with JIS E 5401-1, has been processed the final finish only on the particular place required finishing, or other places have not been machined or has been rough machined.

4.1.4 Finish and ready for assembly The tyre may be assembled by shrink fitting on to the wheel centre, in this case, only the fitting surface (inner diameter face) is to be finished or other face is also partly finished or finished perfectly shall be in accordance with the manufacturing method. Therefore, the explanation of the "finish" and "ready for assembly" shall be mentioned in the clauses of the assembling of tyre onto the wheel centre (see 5.3.1), dimensional tolerances requirements (3.2.1) and the clause of requirements of surface roughness of tyred wheels (5.3.2 and 5.3.3).

Remarks : As to the terms of degree of finish, the definitions to be used customarily in our country, the "rough machined" and "half machined" mentioned herein, to the material to be used customarily, the "finished" to the "half finished", and "for assembling" to the "finished" corresponds respectively. The comparative table of these shall be given in Annex A (informative).

4.2 Wheel centres

4.2.1 Unmachined As to the wheel centres of forged, rolled or cast, “unmachined” means the condition of the “surface as forged” on which no machining has been processed at all, other than the machining process to be (spontaneously) executed by the manufacturer in order to satisfy the requirements of the wheel centre.

4.2.2 Rough machined In accordance with ISO 1005-4, “rough machined” shall indicate the condition in which the wheel centre has been roughly machined on the whole body or the necessary portions only, without final machining.

4.2.3 Half finished In accordance with ISO 1005-4, “half finish” shall mean the condition where only the particular place to be finished of the wheel centre has been processed with the final finish, and other places have not been machined, or rough machined.

4.2.4 Finished In accordance with ISO 1005-4, “finished” shall mean that conditions where all of the places required by the order sheet or drawing have been machine processed. However, the process to be carried out by the manufacturer immediately before assembling the wheel centre to the wheel axis, namely, the rim finishing process when the tyre is inserted, after the final finishing process of the shaft hole and press fitting of wheel shaft into the wheel centre shall be exempted from this process.

4.2.5 Ready for assembly “Ready for assembly” shall mean the condition of the wheel centre where all of the necessary processing operations have been finished.

In this Standard, it has been classified as given in the following:

- a) The wheel centre of which assembling preparation of tyre has been finished.
- b) The wheel centre of which assembling (mounting) preparation to the wheel shaft has been finished.

Remarks : The terms of the degree of finish shall be given in Annex A (informative).

4.3 Tyred wheels

4.3.1 Finished “Finished” shall mean all of places required in the order sheet or drawing of the tyred wheel have been machined. However, the machining to be processed usually immediately before assembling the tyred wheel on to the wheel shaft by the manufacturer, i.e. the final finishing work of shaft hole shall be indicated in Table 7 relating to the required items of rough finish shaft hole, in accordance with this definition, and relating to the required items shall be stated in Table 8.

4.3.2 Ready for assembly “Ready for assembly” shall mean the conditions of the tyred wheel where all of the machining operations have been carried out.

Remarks : As to the terms of the degree of finish, there are definitions being used customary at the time of inquiry and ordering, and the finished mentioned herein, the finish customary being used corresponds to the half finished and the ready for assembly to the finished respectively. The comparative table thereof shall be given in Annex A (informative).

5 Requirements

5.1 Tyres The tyres shall satisfy the shapes, dimensions and physical requirements designated in the drawings of purchaser being attached at the inquiry and order. When the dimensions and surface roughness have not been stated in the order sheet or drawing, 5.1.1 apply.

5.1.1 Dimensional requirements

5.1.1.1 The dimensions relating to unmachined conditions (see 4.1.1) shall be given in Table 5-1.

5.1.1.2 The dimensions relating to rough machining and half finished conditions (see 4.1.2 and 4.1.3) shall be given in Table 5-2.

5.1.1.3 The dimensions and surface roughnesses relating to finish and assembling conditions (see 4.1.4) shall be given in 5.3.1.2, 5.3.2 and 5.3.3.

5.2 Wheel centres The wheel centres shall satisfy the shape, dimensions and physical requirements designated in the purchaser's drawing submitted with the inquiry and order. When the dimensions, surface roughness and permissible residual unbalances have not been stated in the order sheet and drawing, the provisions of 5.2.1 to 5.2.4 apply.

5.2.1 Dimensional requirements

5.2.1.1 For the unmachined conditions (see 4.2.1) and the surface as forged portions of wheel centre the dimensions shall be as given in Table 6 [see also foot note 4) of Table 7].

5.2.1.2 For the rough machined conditions (see 4.2.2) and the rough machined portion of the wheel centre, the dimensional requirements shall, where appropriate, be agreed between the parties concerned.

5.2.1.3 For the finished (see 4.2.4) and finished part of wheel centre the dimensions shall be as given in Table 7. As to the bore and the rim in respect to assembling (see 4.2.5.1 and 4.2.5.2), the dimensions of Table 8 shall apply (see 5.3.1.1).

5.2.1.4 For the wheel centres, when the tolerances thereof have been satisfied during manufacturing process, machining is not required.

5.2.2 Surface roughness Unless otherwise agreed between the parties concerned, the arithmetic mean roughness R_a' of the machined surface of the finished and the condition for assembly shall be as given in Table 1.

Table 1 Surface roughness of wheel centres

Part	Condition	Arithmetic mean roughness ¹⁾ R_a (μm)
Bore	Finished	≤ 12.5
	Ready for assembly to axle	1.6 to 3.2
Rim	Finished	≤ 12.5
	Ready for assembly to tyre	≤ 3.2
Rim faces ²⁾	Finished	≤ 12.5
	Ready for assembly to tyre	≤ 3.2
Other parts	Finished or ready for assembly	≤ 12.5

Notes ¹⁾ If the maximum height of the profile R_y (ISO 468) is used, the values shall be agreed between the parties concerned.

²⁾ The requirement ready for assembly is applicable to wheel centres where the tyres are to be secured with retaining rings.

5.2.3 Residual static unbalance

5.2.3.1 If the maximum static unbalance is required, unless otherwise agreed between the parties concerned, the static unbalance for the wheel centres of the additional rolling stocks other than freight stock shall, in the finished and ready for assembly conditions, not exceed the values given in type A in Table 2. If agreed particularly, the values of type B may also be applicable.

Table 2 Static unbalance for wheel centres

Operating speed v (km/h)	Maximum static unbalance (g·m)	
	Type A	Type B
$v \leq 100$	250	—
$100 < v \leq 120$		100
$120 < v \leq 200$		60

5.2.3.2 If required for the wheel centres for tractive stock, the values of static unbalance shall be agreed between the parties concerned at the time of inquiry and order.

5.2.3.3 The correction of unbalance, if required, shall be carried out in accordance with ISO 1005-4. If specified in the order sheet or its appended document, the position and amount of unbalance shall be suitably marked (see ISO 1005-4) or be marked with the round mark of 10 mm in diameter on the position of the heavier one of unbalance. The marking method shall be agreed between the parties concerned.