INTERNATIONAL STANDARD

ISO 1005-1

> Third edition 1994-08-01

Railway rolling stock material —

Part 1: Rough-rolled tyres for tractive and trailing stock — Technical delivery conditions (standards.iteh.ai)

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<u>ISO 1005-1:1994</u> https://standards.iteh.ai/catalog/standards/sist/ef68a2b2-1733-4b09-848b-2995284964b9/iso-1005-1-1994

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International Organization for Standardization

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The Standard requires approval by at least 75% of the member bodies casting a vote.

International Standard SO 1005-1 was prepared by Technical Committee ISO/TC 17, Steel, Subcommittee SC 13, Railway rolling stock material.

https://standards.ite(ISO a1005-111982); of which it constitutes a technical revision.

ISO 1005 consists of the following parts, under the general title *Railway rolling stock material*:

- Part 1: Rough-rolled tyres for tractive and trailing stock Technical delivery conditions
- Part 2: Tyres, wheel centres and tyred wheels for tractive and trailing stock — Dimensional, balancing and assembly requirements
- Part 3: Axles for tractive and trailing stock Quality requirements
- Part 4: Rolled or forged wheel centres for tyred wheels for tractive and trailing stock — Quality requirements
- Part 6: Solid wheels for tractive and trailing stock Technical delivery conditions
- Part 7: Wheelsets for tractive and trailing stock Quality requirements
- Part 8: Solid wheels for tractive and trailing stock Dimensional and balancing requirements
- Part 9: Axles for tractive and trailing stock Dimensional requirements

Annex A of this part of ISO 1005 is for information only.

Introduction

At present, tyres are preferably used for repairs while new wheels are mainly manufactured as solid wheels. An important market for tyres seems to exist only in Asia and parts of Africa. However, this tendency is decreasing.

This will therefore be the last edition of ISO 1005-1 and it was decided not to include an alignment of tyre grades given in this part of ISO 1005 with the grades of solid wheels in ISO 1005-6.

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<u>ISO 1005-1:1994</u> https://standards.iteh.ai/catalog/standards/sist/ef68a2b2-1733-4b09-848b-2995284964b9/iso-1005-1-1994

Railway rolling stock material —

Part 1:

Rough-rolled tyres for tractive and trailing stock — Technical delivery conditions

1 Scope

1.1 This part of ISO 1005 specifies requirements for tractive and trailing stock — Dimensional, balancing and assembly requirements. The manufacture and supply of rough-rolled tyres for tractive and trailing stock of unalloyed steels in accordance with table 1 and clause 4.

1.2 In addition to this part of ISO 1005-1:1994 ments of ISO 404 are applicable. 2995284964b9/iso-1005-1994

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 1005. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 1005 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 83:1976, Steel — Charpy impact test (U-notch).

ISO 377-1:1989, Selection and preparation of samples and test pieces of wrought steels — Part 1: Samples and test pieces for mechanical test.

ISO 377-2:1989, Selection and preparation of samples and test pieces of wrought steels — Part 2: Samples for the determination of the chemical composition.

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

ISO 6892:1984, Metallic materials — Tensile testing.

ISO 1005-2:1986, Railway rolling stock material ---

Part 2: Tyres, wheel centres and tyred wheels for

ISO 10474:1991, Steel and steel products — Inspection documents.

3 Information to be supplied by the purchaser

The purchaser shall supply the following information in his enquiry and order:

- a) the number of this part of ISO 1005;
- b) the grade of steel (see 4.1 and table 1);
- c) the type of heat treatment (see 4.2 and 6.5);
- d) the dimensions of the tyre (see 5.4);
- e) if microstructure examination is required (see 5.2.2.1 and table 2);
- f) whether the chemical composition may be verified by cast analysis (see 5.1);

- g) if macroscopic and macrographic tests are required (see 5.2.2.2 and 5.2.2.3 and table 2);
- h) if ultrasonic acceptance tests are required (see 5.2.2.4 and table 2);
- i) if a restricted Brinell hardness range is required (see 5.2.3 and table 2);
- j) if any special marking is required (see 5.5);
- k) if a special production process is required (see clause 6);
- I) if special inspection is required (see clause 7);
- m) if special preparation and sampling of test pieces is required (see 7.7.2 and 7.7.3.1);
- n) if any protection against corrosion is required (see clause 8);
- o) if the conditions of guarantee are to be agreed upon (see clause 9).

4 Classification

Standardsentitive of the railway authority shall be informative of the precautions taken. The tyres shall be specified in the order or its ap- of the precautions taken. pended documents according to the grade of steel <u>SO 1005-1:1994</u> used, the heat-treatment condition of delivery and any <u>grand</u> **43**/sis **Degree of finish**-848boptional tests or inspection required (see table 2,000-4964b9/iso-1005-1-1994 umns 2 and 3). The degree of finish on delivery is rough rolled.

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4.1 Steel grades

This part of ISO 1005 specifies the following grades of steel in accordance with the properties given in table 1:

ISO

C 46 GT-N, C 55 GT-N, C 57 GT-N and -E, C 67 GT-N and -E, C 77 GT-E.

4.2 Types of heat-treatment condition on delivery

The tyres shall be supplied

- a) normalized or normalized and tempered (symbol N) grades C 46 GT-N, C 55 GT-N, C 57 GT-N and C 67 GT-N; or
- b) immersion quenched and tempered (symbol E) — grades C 57 GT-E, C 67 GT-E, and C 77 GT-E.

Irrespective of the heat-treatment condition ordered, where no effective degassing has been carried out, suitable precautions, which may include for example slow cooling, shall be taken to avoid the formation of flakes (hydrogen cracking). If so requested, the representative of the railway authority shall be informed of the precautions taken.

2

Steel desiç	jnation	Ċ	emical ((p	compos roduct a	ition ^{1) 2)} t analysis) ⁴	vy cast an % (<i>m/m</i>)	alysis	Heat treatment in delivery condition ³⁾		Mechanical pr	roperties ⁴⁾		
New	PIO	с ^{тах.}	Si max.	Mn max.	P max.	s max.	Others ⁵⁾		R _{eH} or R _{60,2} 6) N/mm ² min.	R _m N/mm²	A % min.	KU J min. ⁸⁾	HB ⁷⁾
C 46 GT-N	B1	0,46 (0,48)	0,38 (0,40)	1,15 (1,20)	0,035 (0,040)	0,035 (0,040)		Z	iT	600 to 720	18	15	
C 55 GT-N	82	0,55 (0,58)	0,38 (0,40)	0,86 (0,90)	0,035 (0,040)	0,035 (0,040)		z	eh :	700 to 820	14	10	
C 57 GT-N	B3	0,57 (0,60)	0,38 (0,40)	1,05 (1,10)	0,035 (0,040)	0,035 (0,040)	299	(sta z	For documen-	750 to 880	12	10	
C 57 GT-E	B5	0,57 (0,60)	0,38 (0,40)	0,76 (0,80)	0,035 (0,040)	0,035 (0,040)	952849	und ^{un} <u>IS</u> catalog	tary purposes	800 to 920	14	15	
C 67 GT-N	2	0,67	0,38	0,86	0,035	0,035	64b9	ar z	DA	800 to 940	10	10	
C 67 GT-E	04	(0,70)	(0,40)	(06'0)	(0,040)	(0,040))/iso-	d ш 05- lard	R	940 to 1 090	11	10	
C 77 GT-E		0,77 (0,80)	0,38 (0,40)	0,86 (0,90)	0,035 (0,040)	0,035 (0,040)	-1005-1	.ite ш <u>:1994</u> s/sist/eff	D I	1 050 to 1 200	10	8	
1) When s slip. In cast to thermal c and wear re of ISO 100f and wear re of ISO 100f 2) Unless (a coording t($L_0 = 5,65_V$) N = nor 4) $R_{eh} = L$ 4) $R_{eh} = L$ 4) $R_{eh} = L$ 5) $Cr \leq 0$; $Cr < 0$;	electing a electing a electing a electing a racking tl ssistance. 5. 5. 6. Conterwise o product rmalized c rmalized c rmalized c $\left< S_{0} \right>$; KU shall be vielle be neasured (elesured thr election of thr	i steel fri ated bra han stee Where agreed, analysis i norma d stress = impa 0,30 %) 5 % to 3,5 % to 3,5 % to 3,6 %	om table king at i specific: given i given i given i specified specified specified specified specified	e 1, an ii relatively a lower ations h ations h in brack d tempe gth for 1 0,28 % or all gra jation pi jation pi	mportant f / high sper carbon col ave been (ave been (ets) shall t ers) shall t ared; E = proof stre SO U-notc (≤ 0,30 % ades. roof stress ividual ress	actor may actor may developed teveloped termical be the deci immersion th test piec b); $Mo \leq 0$ b); $Mo \leq 0$ th variation of ults may be	be the risk irchaser sh ever, it shu primarily tc analysis sh ding criteri quenched oportional :e at 23 °C. ,08 % (≤ (,08 % (≤ 1 ; steel is n of Brinell h	of thermal de puld be noted by the noted of the verified all be verified and tempere elongation); <i>I</i> 1 N/mm ² = 3,08 %); Ni ≤ 0,08 %); Ni ≤ archess shall n the minimu	inde that steels with that steels with that steels with isistance, they musistance, they musistance arises are with the steels of the musistance are steel to the steel to the steel of the musistance are steel to the steel	m the use of brake vith a high carbon o a higher carbon co ay differ considera However, in case: ngth; A = percent %); V≤ 0,05 % a,5 may be given ir B.	ss on the th content wil ntent have bly in appr s of disput iage elong (≤ 0,05 % stead of <i>k</i>	read or fror read or fror a greater oach from e the comp et he comp at it is not lo	n wheel ensitive strength this part ositions n of sss than
70 % of this	s minimur	m value.											

Table 1 — Grade of steel, chemical composition, heat treatment in delivery condition and mechanical properties

-	-	2	3	4	5	9	7	œ
Test and	d checks	Test and cl heat-tr condit	hecks in the eatment tion ^{1) 2)}	Remarks ^{3) 4)}	Test unit ⁵⁾	Number of subjected to checks, per	tyres to be the tests and test unit of	Number of tests per tyre
		z	Ш	ł		≤ 100 tyres	> 100 tyres	
Chemical analysis	Cast analysis ⁶⁾	E	٤	ttps://	ÿ	-	1	-
	Product analysis ⁶⁾	ο	0	stand	ſel	-	2	-
Machanical tasts	Tensile test	٤	ε	ard s .i	ч У	-	2	-
	Impact test	٤	ε	ehfai/ 299		-	2	e
Microstructure		1	0	<u> </u> ca ta lo 95284	بر ف	-	2	1
Macroscopic — Ma	crographic	0	0	<u>SO 1</u> g/stai 9641	Ď	-	2	-
Brinell hardness (un	iformity)	0	ε	005-1: 1dafds/ 9/iso-1	Ŕ	10 %	(N)	-
				<u>:199</u> /sist 100	D	100 9	% (E)	-
Ultrasonic flaw dete	ction tests	0	0	9 <u>4</u> /ef 6 8; 5-1-1	P	100	%	-
Dimensional checks		ε	ε	1202- 994	RĔ	100	%	-
1) N = normalized	or normalized and ter	npered; E = imi	mersion quenche	and tempered.	V			
 2) m = mandatory 3) Unless otherwis 	test; o = optional tes ie agreed (see 7.1), th	t i.e. needs only e checks or tes	/ to be carried outs, excluding the	ut if specified in th cast analysis, shal	e order or its ap I be carried out	pended documer	nts. inspection by th	e manufacturar's
qualified departmen	it (see ISO 404).)	848	V			
4) $h = The test shi$	all not be carried out t	before the spec	ified heat treatm	ent. f =The accep	tance tests shal	l be carried out i	in the final delive	ery condition.
5) $c = Tyres from c$	the same cast. c, h =	Tyres from the	same cast and t	the same heat trea	itment cycle. t =	The tyre is the	test unit.	
 When no production analysis. 	ct analysis is ordered,	at the time of 1	first submission 1	for inspection, the	manufacturer sh	nall provide a cei	rtificate for the r	esults of his cast

Table 2 — Type and number of tests

Requirements 5

5.1 Chemical composition

5.1.1 The chemical composition of the tyres shall comply with the requirements given in table 1.

5.1.2 Unless otherwise agreed, the requirements for the results of the product analysis shall be considered to be complied with when the results of the cast analysis are in accordance with the relevant specification in table 1.

5.2 Physical properties

5.2.1 Appearance

The tyres shall be free from burr and flash. The surface shall not show any mark other than in the positions specified in the order or its appended documents. Brinell hardness testing impressions may, however, be left on the surface of the rim.

grade of steel of similar dimensions, coming from the same batch, shall be as specified in table 1.

5.3 Mechanical properties

The mechanical properties of the tyres shall be as specified in table 1.

5.4 Dimensional characteristics

5.4.1 The dimensions of the tyres shall be given in the order or its appended documents.

5.4.2 Tolerances on dimensions and shape, and the permitted machining allowances, shall be as specified in ISO 1005-2.

Marking 5.5

The marks with their specified dimensions shall be stamped in the positions given in national standards, the order or its appended documents.

iTeh STANDARI 5.2.2 Soundness Unless otherwise specified, each tyre shall receive The tyres shall be sound throughout and without any s. i the following marks:

defects detrimental to their use.

<u>ISO 1005-1:1994</u> manufacturer's mark;

5.2.2.1 Microstructure^{https://standards.iteh.ai/catalog/standards/sist/af68a2b2-1733_4h09-848b-2995284964b9/iso-1005-1-1994}

If an examination of the microstructure for quenched and tempered tyres is agreed upon at the time of enquiry and order, then the requirements for the structure shall also be agreed upon (see 7.7.3.5).

5.2.2.2 Macroscopic appearance

After polishing, examination of the surface shall reveal no discontinuity.

5.2.2.3 Macrographic appearance

The sulfur print shall not reveal any faults worse than those shown in the prints contained in the album in annex A.

5.2.2.4 Ultrasonic flaw detection test

When ultrasonic flaw detection tests are ordered, the acceptance standard specified in ISO 5948 shall apply.

5.2.3 Uniformity of hardness

If stated in the order, the difference between the extreme hardness values obtained on tyres of the same

- c) grade of steel and heat-treatment condition (see 4.2):
- d) date of manufacture (month and last two figures of the year of manufacture);
- e) the inspector's mark.

Unless otherwise specified, the marks shall be hotstamped immediately after rolling, with a height of 8 mm to 10 mm and a depth of approximately 4 mm, on the plane face situated on the side opposite the flange of the tyre and in such a way as to remain after successive re-turning of the tread. Stamps with acute-angled character forms shall not be used (see 6.4).

6 Manufacture

6.1 Steelmaking process

The tyres shall be made from steel produced by open hearth, electric arc or basic oxygen processes; other processes may be used, by agreement between the manufacturer and the purchaser.

The steel shall be killed in the furnace or in the ladle, and shall be bottom-poured or continuously cast, unless otherwise agreed.

6.2 Manufacturing process

At the manufacturer's option, the tyres are produced either

- from cropped ingots capable of producing two or more tyres; or
- from cropped blooms.

Special individual ingots may only be used with the prior agreement of the purchaser.

Cropping shall be sufficient to eliminate defective sections of the ingot. Any surface defects shall be completely removed before or during manufacture, if this is not possible, the defective sections shall be discarded (see 6.3). The sections of ingots or blooms shall be forged and punched with a forging hammer DA6.6.1 Authorized repairs or a press; they shall be rough shaped by means of a forging hammer, press or roughing mill and finally arguitace defects may be eliminated by removal of shaped by rolling, supplemented by sizing if necessary. The finished rolled tyres shall comply with 5.4. **ISO 10**

The amount of the punched-out portion shall be sutficient for the removal of serious segregations. If these operations leave burrs, which may adversely affect the further manufacture or the use of the tyre, these burrs shall be removed before rolling, unless allowances are made to ensure removal at a later stage in processing.

Suitable precautions shall be taken during hot working to ensure that material is not damaged by excessive temperatures (over-heating) or by grain growth due to cessation of work at high temperatures. Generally, forging should not be done at temperatures above 1 260 °C and should terminate between 850 °C and 1 000 °C. After forging or rolling, sizing where applicable and stamping of identification marks, the tyres shall be left to cool in still air. If the steel has not been degassed, suitable precautions shall be taken to avoid the formation of flakes (see 4.2).

6.3 Removal of defective sections

Defective sections which do not comply with the soundness characteristics specified in 5.2.1 and 5.2.2 shall be removed before or during the manufacture.

6.4 Identification of the tyres during manufacture

All ingots, sections and tyres shall be suitably marked at each stage of manufacture so that before delivery each tyre can be identified as specified in 5.5. Where punched identification marks differ from the final identification marks defined in 5.5, they shall be sufficiently shallow not to remain visible on the finished tyre.

6.5 Heat treatment

After forming and marking, the tyres shall undergo, where applicable, the heat treatment specified in the order or its appended documents. As a general rule, the different heat-treatment operations shall be carried out in such a way as to ensure uniformity of structure of comparable parts of the same tyre and of tyres from the same batch (see 4.2).

6.6 Removal of surface defects

metal by chipping or machining or by soft grinding. provided that no heat cracking is produced and that standahle/dimensional tolerancestate maintained.

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After forming and heat treatment of tyres, any ovality which does not exceed 6 mm may be corrected by cold-forming operations without renewal of the heat treatment. If the ovality exceeds 6 mm, hot rectification shall be carried out and all such tyres shall be subjected to a second heat treatment identical to the first.

6.6.2 Unauthorized repairs

Any welding, gas-torch treatment, heating, electric burns, filling by metallization, electrolytic or chemical deposits, etc., and any retouching with the object of concealing a defect, are not permitted and shall result in the rejection of the complete heat-treatment cycle.

7 Inspection

7.1 **Responsibilities and type of inspection**

7.1.1 The purchaser shall specify in the order whether inspection to ensure compliance with manufacturing methods (see clause 6) and with the quality requirements (see clause 5) is to be carried out either

- a) under delegated inspection by the qualified department of the manufacturer (see note 1); or
- b) in the presence of the purchaser, his representative or a body designated by him.

Unless otherwise specified in the order, the provisions of 7.1.1a) shall apply. The inspection of quality requirements shall be as shown in table 2, columns 2 and 3.

NOTE 1 The term "qualified department" means testing and certification department of the manufacturer independent from his manufacturing departments, which is authorized to issue inspection certificates of type 3.1.B in accordance with ISO 10474.

7.1.2 Delegation of inspection by the purchaser to the qualified department of the manufacturer does not remove the right of the purchaser to monitor the effectiveness of the manufacturing controls and of the testing and inspection methods.

In this respect, he shall be allowed to witness any of the tests made under the responsibility of the manufacturer and to inspect the recorded results. NDARD

7.3.2 Test units

For each type of test, table 2, column 5 specifies the relevant composition of the test unit.

For specific inspection of the mechanical properties, each test unit shall be formed of tyres produced from the same cast and having undergone the same heat treatment. It may include tyres of different dimensions.

7.3.3 Condition of the tyres when submitted for inspection

When submitted for inspection, the condition of the tyres shall comply with the requirements of table 2, column 4.

7.4 Submission for inspection by the purchaser

The purchaser [see 7.1.1 b)] shall be notified in writing (see 7.5.2) of the date of submission for inspection, stating the order reference number and the 7.2 Inspection of manufacture (standards.i number of tyres per type in each test unit formed for testing the mechanical properties.

7.2.1 Whether the inspection of the manufacture is 5-1:1994 the responsibility of the manufacturer's qualified detards/sist/ef68a2b2-1733-4b09-848bpartment or of the purchaser, the following shall 4apriso-1007.5 [9 Certification ply.

7.2.1.1 The manufacturer shall advise the purchaser of the principal process which will be used in completing the order, and shall advise the purchaser of any subsequent fundamental changes which he proposes to introduce and which may affect the quality of the tyres, and seek his agreement. If the inspection remains the responsibility of the purchaser, his representative shall be allowed to inspect the manufacturing processes used, in order to ensure compliance with the requirements of this part of ISO 1005 and the prior agreement.

7.2.1.2 The manufacturer shall, at the time of submission for acceptance, certify that the manufacturing requirements of this part of ISO 1005 have been complied with (see 7.5).

7.3 Inspection of the characteristics of the tyres

7.3.1 Types of test

Table 2 specified the types of test to be carried out and whether they are mandatory or optional.

7.5.1 Whether the inspection of manufacture is the responsibility of the manufacturer's qualified department or of the purchaser, the manufacturer shall certify that the manufacturing requirements of this part of ISO 1005 have been complied with. The final inspection certificate, in accordance with ISO 10474, shall also include the results of the following tests:

- chemical analysis;
- tensile test:
- impact test.

7.5.2 The manufacturer shall provide the relevant certificates for those tests and checks for which he is responsible, at the following times:

- a) at the time of delivery, if he has the delegated responsibility for all tests; or
- b) at the time of the first submission for inspection (see 7.4), if for that part of the testing he has the delegated responsibility.