

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

Matériel roulant de chemin de fer —

*Partie 1: Bandages bruts laminés pour matériel moteur et pour matériel
remorqué — Conditions techniques de livraison*



Contents

	Page
1 Scope	1
2 Normative references	1
3 Information to be supplied by the purchaser	1
4 Classification	2
5 Requirements	5
6 Manufacture	5
7 Inspection	6
8 Delivery	11
9 Guarantee	11

Annex

A Examples of prints (see 7.8.6)	12
--	----

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

This third edition cancels and replaces the second edition (ISO 1005-1:1982), 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.

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 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, the requirements of ISO 404 are applicable.

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 1005-2:1986, *Railway rolling stock material — Part 2: Tyres, wheel centres and tyred wheels for tractive and trailing stock — Dimensional, balancing and assembly requirements*.

ISO 5948:1994, *Railway rolling stock material — Ultrasonic acceptance testing*.

ISO 6506:1981, *Metallic materials — Hardness test — Brinell test*.

ISO 6892:1984, *Metallic materials — Tensile testing*.

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);
- l) 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

The tyres shall be specified in the order or its appended documents according to the grade of steel used, the heat-treatment condition of delivery and any optional tests or inspection required (see table 2, columns 2 and 3).

4.1 Steel grades

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

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.

4.3 Degree of finish

The degree of finish on delivery is rough rolled.

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

Steel designation		Chemical composition ^{1) 2)} by cast analysis (product analysis) % (m/m)							Heat treatment in delivery condition ³⁾	Mechanical properties ⁴⁾				
New	Old	C max.	Si max.	Mn max.	P max.	S max.	Others ⁵⁾		R_{eH} or $R_{p0.2}$ ⁶⁾ N/mm ² min.	R_m N/mm ²	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)		N		600 to 720	18	15		
C 55 GT-N	B2	0,55 (0,58)	0,38 (0,40)	0,86 (0,90)	0,035 (0,040)	0,035 (0,040)		N		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)		N	For documen- tary purposes	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)		E		800 to 920	14	15		
C 67 GT-N	B4	0,67 (0,70)	0,38 (0,40)	0,86 (0,90)	0,035 (0,040)	0,035 (0,040)		N		800 to 940	10	10		
C 67 GT-E								E		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)		E		1 050 to 1 200	10	8		

1) When selecting a steel from table 1, an important factor may be the risk of thermal damage arising from the use of brakes on the tread or from wheel slip. In cases of repeated braking at relatively high speeds, the purchaser should bear in mind that steels with a high carbon content will be more sensitive to thermal cracking than steels with a lower carbon content. However, it should be noted that steels with a higher carbon content have a greater strength and wear resistance. Where specifications have been developed primarily to give wear resistance, they may differ considerably in approach from this part of ISO 1005.

2) Unless otherwise agreed, the requirements for the chemical analysis shall be verified by cast analysis. However, in cases of dispute the compositions according to product analysis (given in brackets) shall be the deciding criteria.

3) N = normalized or normalized and tempered; E = immersion quenched and tempered.

4) R_{eH} = upper yield stress; $R_{p0.2}$ = 0,2 % proof stress (non-proportional elongation); R_m = tensile strength; A = percentage elongation after fracture ($L_0 = 5,65\sqrt{S_0}$) ; KU = impact strength for ISO U-notch test piece at 23 °C. 1 N/mm² = 1 MPa.

5) Cr ≤ 0,28 % (≤ 0,30 %); Cu ≤ 0,28 % (≤ 0,30 %); Mo ≤ 0,08 % (≤ 0,30 %); Ni ≤ 0,08 % (≤ 0,08 %); V ≤ 0,05 % (≤ 0,05 %); the sum of Cr + Mo + Ni shall be max. 0,60 % for all grades.

6) If the measured 0,5 % total elongation proof stress $R_{0.5}$ of the steel is not greater than 600 N/mm², $R_{0.5}$ may be given instead of R_{eH} or $R_{p0.2}$.

7) Hardness values are not specified; but the range of variation of Brinell hardness shall not exceed 30 HB.

8) Mean value of three tests; one of the individual results may be lower than the minimum value as specified in this table, provided that it is not less than 70 % of this minimum value.

1) When selecting a steel from table 1, an important factor may be the risk of thermal damage arising from the use of brakes on the tread or from wheel slip. In cases of repeated braking at relatively high speeds, the purchaser should bear in mind that steels with a high carbon content will be more sensitive to thermal cracking than steels with a lower carbon content. However, it should be noted that steels with a higher carbon content have a greater strength and wear resistance. Where specifications have been developed primarily to give wear resistance, they may differ considerably in approach from this part of ISO 1005.

2) Unless otherwise agreed, the requirements for the chemical analysis shall be verified by cast analysis. However, in cases of dispute the compositions according to product analysis (given in brackets) shall be the deciding criteria.

3) N = normalized or tempered; E = immersion quenched and tempered.

4) R_{eH} = upper yield stress; $R_{p0,2}$ = 0,2 % proof stress (non-proportional elongation); R_m = tensile strength; A = percentage elongation after fracture ($L_0 = 5,65\sqrt{S_0}$); KU = impact strength for ISO U-notch test piece at 23 °C. 1 N/mm² = 1 MPa.

5) Cr ≤ 0,28 % (≤ 0,30 %); Cu ≤ 0,28 % (≤ 0,30 %); Mo ≤ 0,08 % (≤ 0,08 %); Ni ≤ 0,28 % (≤ 0,30 %); V ≤ 0,05 % (≤ 0,05 %); the sum of Cr + Mo + Ni shall be max. 0,60 % for all grades.

6) If the measured 0,5 % total elongation proof stress $R_{0,5}$ of the steel is not greater than 600 N/mm², $R_{0,5}$ may be given instead of R_{eH} or $R_{p0,2}$.

7) Hardness values are not specified; but the range of variation of Brinell hardness shall not exceed 30 HB.

8) Mean value of three tests; one of the individual results may be lower than the minimum value as specified in this table, provided that it is not less than 70 % of this minimum value.

Table 2 — Type and number of tests

1	2	3	4	5	6	7	8
Test and checks	Test and checks in the heat-treatment condition ^{1) 2)}		Remarks ^{3) 4)}	Test unit ⁵⁾	Number of tyres to be subjected to the tests and checks, per test unit of		Number of tests per tyre
	N	E			≤ 100 tyres	> 100 tyres	
Chemical analysis	Cast analysis ⁶⁾	m	—	c	1	1	1
	Product analysis ⁶⁾	o	—	c	1	2	1
Mechanical tests	Tensile test	m	h	c, h	1	2	1
	Impact test	m	h	c, h	1	2	3
Microstructure	—	o	h	c, h	1	2	1
Macroscopic — Macrographic	o	o	—	c	1	2	1
Brinell hardness (uniformity)	o	m	h	c, h	10 % (N) 100 % (E)		1 1
Ultrasonic flaw detection tests	o	o	h	t	100 %		1
Dimensional checks	m	m	f	t	100 %		1

1) N = normalized or tempered; E = immersion quenched and tempered.

2) m = mandatory test; o = optional test i.e. needs only to be carried out if specified in the order or its appended documents.

3) Unless otherwise agreed (see 7.1), the checks or tests, excluding the cast analysis, shall be carried out under delegated inspection by the manufacturer's qualified department (see ISO 404).

4) h = The test shall not be carried out before the specified heat treatment. f = The acceptance tests shall be carried out in the final delivery condition.

5) c = Tyres from the same cast. c, h = Tyres from the same cast and the same heat treatment cycle. t = The tyre is the test unit.

6) When no product analysis is ordered, at the time of first submission for inspection, the manufacturer shall provide a certificate for the results of his cast analysis.