



SLOVENSKI STANDARD
SIST EN 1561:1998
01-avgust-1998

Livarstvo - Siva litina (z lamelastim grafitom)

Founding - Grey cast irons

Gießereiwesen - Gußeisen mit Lamellengraphit

Fonderie - Fonte a graphite lamellaire

Ta slovenski standard je istoveten z: EN 1561:1997

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ICS:

77.140.80 Železni in jekleni ulitki Iron and steel castings

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EUROPEAN STANDARD

EN 1561

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English version

Founding - Grey cast irons

Fonderie - Fonte à graphite lamellaire **STANDARD PREVIEW** Gießereiwesen - Gußeisen mit Lamellengraphit

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 190 "Foundry technology", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 1997, and conflicting national standards shall be withdrawn at the latest by December 1997.

Within its programme of work, Technical Committee CEN/TC 190 requested CEN/TC 190/WG 2.10 "Grey cast iron" to prepare the following standard:

EN 1561

Founding – Grey cast irons

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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Introduction

Grey cast iron is a casting alloy, iron and carbon based, the latter element being present mainly in the form of lamellar graphite particles.

The properties of grey cast iron depend on the form and distribution of the graphite and the structure of the matrix.

This European Standard deals with the classification of grey cast iron in accordance with the mechanical properties of the material, either tensile strength or hardness.

Further technical data on grey cast irons are given in annexes A to C.

Annex A (informative) contains "Additional information on mechanical and physical properties in addition to tables 1 and 2".

Annex B (informative) contains "Additional information on the relationship between hardness and tensile strength".

Annex C (informative) contains "Additional information on the relationship between tensile strength, hardness and section thickness of grey iron castings".

NOTE: This standard does not cover technical delivery conditions for grey iron castings. Reference should be made to EN 1559-1 and EN 1559-3.

1 Scope

This European Standard specifies the properties of unalloyed and low-alloyed grey cast iron used for castings, which have been manufactured in sand moulds or in moulds with comparable thermal behaviour.

This standard specifies the characterizing properties of grey cast iron by either

- a) the tensile strength of separately cast samples, or if agreed by the manufacturer and the purchaser by the time of acceptance of the order, of cast-on samples or samples cut from a casting (see table 1);

or

- b) if agreed by the manufacturer and the purchaser by the time of acceptance of the order, the hardness of the material measured on castings (see table 2) or on a cast-on knob.

This European Standard does not apply to grey cast iron used for pipes and fittings according to prEN 877-1.

This European Standard specifies six grey cast irons according to the tensile strength (see table 1) and six grey cast irons according to the Brinell hardness (see table 2).

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 1559-1

Founding – Technical conditions of delivery – Part 1: General

EN 1559-3

Founding – Technical conditions of delivery – Part 3: Additional requirements for iron castings

EN 10002-1

Metallic materials – Tensile testing – Part 1: Method of test (at ambient temperature)

EN 10003-1

Metallic materials – Brinell hardness test – Part 1: Test method

NOTE: Informative references used in the preparation of this standard, and cited at the appropriate places in the text, are listed in a bibliography, see annex D.

3 Definitions

For the purposes of this standard, the following definitions apply:

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3.1 grey cast iron

Iron-carbon cast material in which the free carbon is present as graphite, mainly in lamellar form (flake graphite).

NOTE: Graphite form and distribution are specified in EN ISO 945.

3.2 relative hardness

Quotient of measured hardness to the hardness calculated from the measured tensile strength by means of an empirical relationship (also referred to as RH).

NOTE: RH is influenced mainly by the raw materials, the melting process and the metallurgical working method and usually varies between 0,8 and 1,2.

3.3 relevant wall thickness

Wall thickness for which the mechanical properties apply.

NOTE: The relevant wall thickness is twice the modulus or twice the volume/surface area ratio.

4 Designation

The material shall be designated either by symbol or by number as given in either table 1 or table 2.

5 Order information

The following information shall be supplied by the purchaser:

- a) the number of this European Standard (EN 1561);
- b) the designation of the material;
- c) any special requirements which have to be agreed by the time of acceptance of the order (see EN 1559-1 and EN 1559-3).

6 Manufacture

The method of manufacturing of grey cast iron and its chemical composition shall be left to the discretion of the manufacturer, who shall ensure that the requirements defined in this standard are met for the material grade specified in the order.

NOTE: For grey cast iron to be used in special applications, the chemical composition and heat treatment may be the subject of an agreement between the manufacturer and the purchaser by the time of acceptance of the order.

7 Requirements

7.1 Mechanical properties

In addition to EN 1559-1 and EN 1559-3 the order should specify in an unambiguous manner as to whether the tensile strength measured on separately cast samples or the Brinell hardness measured on the casting is the characterizing property. If it does not do so, then the manufacturer shall characterize the material according to tensile strength.

The characterizing property shall be checked only when this has been agreed by the time of acceptance of the order.

7.2 Tensile properties

7.2.1 Test pieces machined from separately cast samples

The tensile properties of the six grey cast irons defined by tensile strength when measured in accordance with 9.1 using test pieces machined from separately cast samples shall be in accordance with the requirements of table 1.

7.2.2 Test pieces machined from cast-on samples

The tensile properties of test pieces machined from cast-on samples for the six grey cast irons defined by tensile strength shall be in accordance with the requirements of table 1.

7.2.3 Test pieces cut from a casting

If applicable, the tensile properties of test pieces cut from a casting for the six grey cast irons defined by tensile strength shall be agreed between the manufacturer and the purchaser by the time of acceptance of the order and these tensile properties shall be in accordance with the requirements in the agreement.

Table 1: Tensile strength of grey cast irons

Material designation		Relevant wall thickness ¹⁾		Tensile strength R_m ²⁾ mandatory values		Tensile strength R_m ⁴⁾ anticipated values in casting ⁵⁾
Symbol	Number	mm		in separately cast sample ³⁾	in cast-on sample	N/mm ²
		over	up to and including	N/mm ²	N/mm ²	
				min.		min.
EN-GJL-100	EN-JL1010	5 ⁶⁾	40	100 to 200 ⁷⁾	—	—
EN-GJL-150	EN-JL1020	2,5 ⁶⁾	5	150 to 250 ⁷⁾	—	180
		5	10		—	155
		10	20		—	130
		20	40		120	110
		40	80		110	95
		80	150		100	80
EN-GJL-200	EN-JL1030	2,5 ⁶⁾	5	200 to 300 ⁷⁾	—	230
		5	10		—	205
		10	20		—	180
		20	40		170	155
		40	80		150	130
		80	150		140	115
EN-GJL-250	EN-JL1040	5 ⁶⁾	10	250 to 350 ⁷⁾	—	250
		10	20		210	225
		20	40		190	195
		40	80		170	170
		80	150		160 ⁵⁾	155
		150	300		160 ⁵⁾	—
EN-GJL-300	EN-JL1050	10 ⁶⁾	20	300 to 400 ⁷⁾	—	270
		20	40		250	240
		40	80		220	210
		80	150		210	195
		150	300		190 ⁵⁾	—
EN-GJL-350	EN-JL1060	10 ⁶⁾	20	350 to 450 ⁷⁾	—	315
		20	40		290	280
		40	80		260	250
		80	150		230	225
		150	300		210 ⁵⁾	—

¹⁾ If a cast-on sample is to be used the relevant wall thickness of the casting shall be agreed upon by the time of acceptance of the order.

²⁾ If by the time of acceptance of the order proving of the tensile strength has been agreed, the type of the sample is also to be stated on the order (see 8.2). If there is lack of agreement the type of sample is left to the discretion of the manufacturer.

³⁾ For the purpose of acceptance the tensile strength of a given grade shall be between its nominal value n (position 5 of the material symbol) and $(n + 100)$ N/mm².

⁴⁾ This column gives guidance to the likely variation in tensile strength for different casting wall thicknesses when a casting of simple shape and uniform wall thickness is cast in a given grey cast iron material. For castings of non-uniform wall thickness or castings containing cored holes, the table values are only an approximate guide to the likely tensile strength in different sections, and casting design should be based on the measured tensile strength in critical parts of the casting.

⁵⁾ These values are guide-line values. They are not mandatory.

⁶⁾ This value is included as the lower limit of the relevant wall thickness range.

⁷⁾ The values relate to samples with an as-cast casting diameter of 30 mm, this corresponds to a relevant wall thickness of 15 mm.

NOTE 1: 1 N/mm² is equivalent to 1 MPa.

NOTE 2: For high damping capacity and thermal conductivity, EN-GJL-100 (EN-JL1010) is the most suitable material.

NOTE 3: The material designation is in accordance with EN 1560.

NOTE 4: The figures given in bold indicate the minimum tensile strength to which the symbol of the grade is related.

7.3 Hardness properties

The Brinell hardness values of the six grey cast irons defined by hardness when measured in accordance with 9.2 shall be as given in table 2.

If it is not possible to use the Brinell test method in accordance with EN 10003-1 alternative test methods may be used, which shall have correlated values with Brinell hardness.

If a casting is ordered on the basis of hardness, the relevant wall thickness and the position of the test shall be agreed upon by the time of the acceptance of the order. The values given for wall thicknesses over 40 mm and up to and including 80 mm in table 2 against the various grades shall be mandatory hardness values for that wall thickness range.

NOTE 1: This subclause establishes hardness grades for grey cast iron.

NOTE 2: This classification is applicable principally where machinability or wear resistance are of importance.

NOTE 3: The hardness values given for smaller thickness ranges ≤ 40 mm are anticipated values only.

NOTE 4: For a relevant wall thickness above 80 mm, grades are not classified by hardness.

Table 2: Brinell hardness of castings of grey cast iron, mandatory and anticipated values at the agreed test position

Material designation		Relevant wall thickness mm		Brinell hardness ^{1), 2)} HB 30	
Symbol	Number	over	up to and including	min.	max.
EN-GJL-HB155	EN-JL2010	40 ³⁾	80	—	155
		20	40	—	160
		10	20	—	170
		5	10	—	185
		2,5	5	—	210
EN-GJL-HB175	EN-JL2020	40 ³⁾	80	100	175
		20	40	110	185
		10	20	125	205
		5	10	140	225
		2,5	5	170	260
EN-GJL-HB195	EN-JL2030	40 ³⁾	80	120	195
		20	40	135	210
		10	20	150	230
		5	10	170	260
		4	5	190	275
EN-GJL-HB215	EN-JL2040	40 ³⁾	80	145	215
		20	40	160	235
		10	20	180	255
		5	10	200	275
EN-GJL-HB235	EN-JL2050	40 ³⁾	80	165	235
		20	40	180	255
		10	20	200	275
EN-GJL-HB255	EN-JL2060	40 ³⁾	80	185	255
		20	40	200	275

¹⁾ For each grade, Brinell hardness decreases with increasing wall thickness.

²⁾ By agreement between the manufacturer and the purchaser a narrower hardness range may be adopted at the agreed position on the casting, provided that this is not less than 40 Brinell hardness units. An example of such a circumstance could be castings for long series production.

³⁾ Reference relevant wall thickness for the grade

NOTE 1: Information on the relationship between Brinell hardness and tensile strength is indicated in figure B.1 and the relationship between Brinell hardness and relevant wall thickness in figure C.2 of annexes B and C respectively.

NOTE 2: The material designation is in accordance with EN 1560.

NOTE 3: The figures given in bold indicate the minimum and maximum Brinell hardness, to which the symbol of the grade is related and the corresponding reference relevant wall thickness range limits.

8 Sampling

8.1 General

Samples shall be supplied in order to characterize the grade of the material.

If heat treatment is used to modify the properties of the material, then the samples shall be heat treated in the same way as the castings they represent.

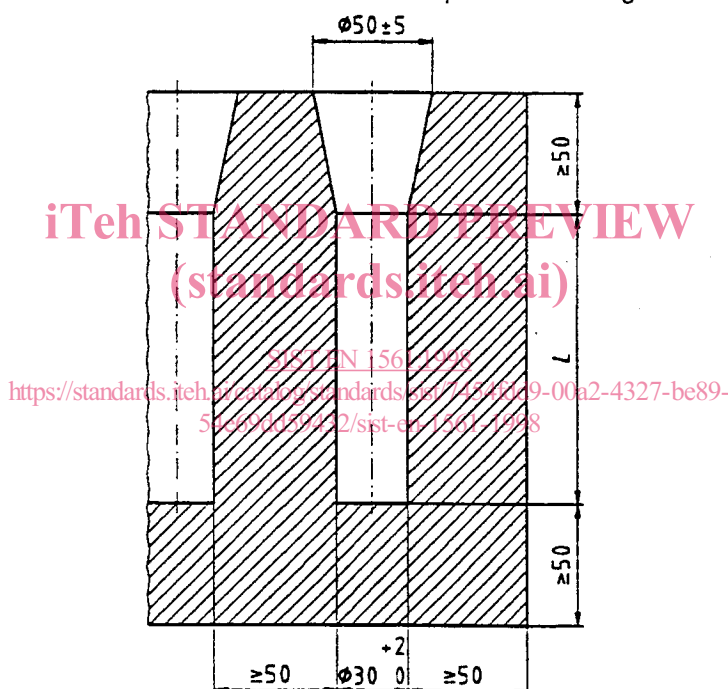
8.2 Tensile test

8.2.1 Separately cast samples

The separately cast samples to establish the material grade shall be cast vertically (see figure 1). The moulds shall be either sand moulds or moulds with comparable thermal diffusivity. The moulds may be made for casting several samples simultaneously.

The length L shall be determined according to the length of the test piece A or B (see 9.1) and the clamping device used.

Other dimensions of the mould shall meet the dimensional requirements of figure 1.



All dimensions are given in millimetres

Figure 1: Separately cast samples

Samples of other dimensions and using other casting procedures may be agreed between the manufacturer and the purchaser for the purpose of representing the properties of particular castings (an indication of the likely values of tensile strength is given in figure C.1).

Samples shall be made from the metal used to produce the castings which they represent and during the same period as when the castings are made.

The frequency of casting the separately cast samples shall be in accordance with the in-process quality assurance procedures adopted by the manufacturer.

The samples shall be stripped from the mould at a temperature not exceeding 500 °C.

NOTE: However, the samples may by agreement between the manufacturer and the purchaser be taken from their moulds at a temperature in excess of 500 °C, if the castings are also to be removed at this temperature.