

Founding — Grey cast irons

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British Standard

ICS 77.140.80

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 18, an inside back cover and a back cover.

Amendments issued since publication

Amd. No.	Date	Text affected

ISBN 0 580 28398 4

ICS 77.140.80

Descriptors: Foundry engineering, cast iron, castings, lamellar cast iron, designation, mechanical properties, tensile strength, brinell hardness, tension tests, hardness tests, classifications

English version

Founding — Grey cast irons

Fonderie — Fonte à graphite lamellaire

Gießereiwesen — Gußeisen mit Lamellengraphit

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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of an identical text or by endorsement, at the latest by December 1997, and conflicting national standards shall be withdrawn at the latest by December 1997.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	<i>Founding — Technical conditions of delivery — Part 1: General</i>
EN 1559-3	<i>Founding — Technical conditions of delivery — Part 3: Additional requirements for iron castings</i>
EN 10002-1	<i>Metallic materials — Tensile testing — Part 1: Method of test (at ambient temperature)</i>
EN 10003-1	<i>Metallic materials — Brinell hardness test — Part 1: Test method</i>

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:

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.

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.