SLOVENSKI STANDARD
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SIST EN 1562:1998
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Livarstvo - Temprana litina

Founding - Malleable cast irons

Gießereiwesen - Temperguss

Fonderie - Fonte malléable

Ta slovenski standard je istoveten z: **EN 1562:2012**

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77.140.80 Železni in jekleni ulitki Iron and steel castings

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EUROPEAN STANDARD

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Founding - Malleable cast irons

Fonderie - Fontes malléables

Gießereiwesen - Temperguss

This European Standard was approved by CEN on 14 January 2012.

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Foreword

This document (EN 1562:2012) 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of an identical text or by endorsement, at the latest by September 2012, and conflicting national standards shall be withdrawn at the latest by September 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1562:1997.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

Within its programme of work, Technical Committee CEN/TC 190 requested CEN/TC 190/WG 6 “Malleable cast iron” to revise EN 1562:1997.

Annex C provides details of significant technical changes between this European Standard and the previous edition.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This European Standard classifies malleable cast irons into two groups. The first group is concerned with decarburized irons referred to as whiteheart malleable cast iron. The second group is non-decarburized irons referred to as blackheart malleable cast iron. Both groups, except completely decarburized whiteheart malleable cast iron, contain free carbon as graphite, called temper carbon. Both groups have grades with structures that can range from ferrite to pearlite and/or other transformation products of austenite.

Materials are designated in terms of tensile strength and percentage elongation.

Weldablility is an important property of malleable cast irons.

Malleable cast irons have good impact resistance and ductility at low temperatures.

In this standard, a new designation system by number, as established in EN 1560 [1], is given.

NOTE This designation system by number is based on the principles and the structure as set out in EN 10027-2 [2] and so corresponds with the European numbering system for steel and other materials.

Some malleable cast iron grades can be used for pressure equipment.

The permitted material grades of malleable cast iron for pressure applications and the conditions for their use are given in specific product or application standards.

For the design of pressure equipment, specific design rules apply.

Annex ZA gives information relating to the conformance of permitted malleable cast iron grades to the Pressure Equipment Directive 97/23/EC.

1 Scope

This European Standard defines grades and the corresponding requirements for malleable cast irons.

This European standard specifies five grades of whiteheart malleable cast iron and nine grades of blackheart malleable cast iron, based on mechanical properties measured on cast samples (which are test pieces).

This European Standard specifies Brinell hardness values determined only when these values are requested by the purchaser.

This European Standard does not cover technical delivery conditions for malleable cast iron castings. Reference should be made to EN 1559-1 [3] and EN 1559-3 [4].

This European Standard does not cover chemical composition, except phosphorous (see Clause 6).

Grade EN-GJMB-300-6 (5.4100) malleable cast iron shall not be used for any pressure application, e. g. also pressure applications not covered by the Pressure Equipment Directive 97/23/EC.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 764-5:2002, *Pressure equipment — Part 5: Compliance and inspection — Documentation of materials*

EN 10204:2004, *Metallic products — Types of inspection documents*

EN ISO 148-1:2010, *Metallic materials — Charpy pendulum impact test — Part 1: Test method (ISO 148-1:2009)*

EN ISO 6506-1, *Metallic materials — Brinell hardness test — Part 1: Test method (ISO 6506-1)*

EN ISO 6892-1:2009, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature (ISO 6892-1:2009)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
malleable cast iron
cast material, mainly iron and carbon based, which solidifies in the as-cast condition with a graphite-free (white) structure and achieves its final properties after a heat treatment

3.2
whiteheart malleable cast iron
cast material, mainly iron and carbon based, which is cast white and then given a heat treatment in a decarburizing atmosphere to produce a material which is partially or entirely decarburized. Any remaining graphite is in the form of temper carbon

3.3
blackheart malleable cast iron
cast material, mainly iron and carbon based, which is cast white and then given a non-decarburizing heat treatment, to produce a material in which all graphite is in the form of temper carbon

3.4
primary graphite
graphite which precipitates in the flake form during solidification

Note 1 to entry: Primary graphite is more correctly referred to as eutectic graphite.

3.5
cast sample
quantity of material cast to represent the cast material, including separately cast sample and side-by-side cast sample

3.6
separately cast sample
sample cast in a separate sand mould under representative manufacturing conditions and material grade

3.7
side-by-side cast sample
sample cast in the mould alongside the casting, with a joint running system

3.8
relevant wall thickness
wall thickness representative of the casting, defined for the determination of the size of the cast samples to which the mechanical properties apply

4 Designation

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

NOTE Comparison of EN 1562 grade designations to the grades from ISO 5922:2005 [5], is given in Annex A.

5 Order information

The following information shall be supplied by the purchaser:

a) the number of this European Standard;

b) the designation of the material;

c) the relevant wall thickness of the casting;

d) any special requirements.

All requirements shall be agreed between the manufacturer and the purchaser by the time of acceptance of the order e.g. technical delivery conditions according to EN 1559-1 and EN 1559-3.

6 Manufacture

The method of manufacture of malleable cast iron as well as its chemical composition and heat treatment shall be left to the discretion of the manufacturer, who shall ensure compliance with the property requirements given in this European Standard for the material ordered.

NOTE To produce structures such as ferrite, pearlite or other transformation products of austenite, both material types (groups) depend upon either the malleablising heat treatment or the subsequent additional heat treatment and/or additions of alloying elements.

For castings intended to be given additional treatment (such as galvanizing) and/or in the case of castings for use at low temperatures to optimize the impact energy of the material, the phosphorous content should not exceed 0,10 %.

For malleable cast iron materials to be used in special applications, the chemical composition and any special 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 General

The property values apply to malleable cast irons cast in sand moulds or moulds of comparable thermal behaviour. Subject to amendments to be agreed upon in the order, they can apply to castings obtained by alternative methods, when agreed between the manufacturer and purchaser by the time of acceptance of the order.

The material designation is based on the minimum mechanical properties obtained in cast samples with a diameter of 12 mm.

Mechanical properties are wall thickness dependent as shown in Tables 1, 2 and 3.

7.2 Tensile strength and elongation

When tested in accordance with 9.1, the values of tensile strength and percentage elongation after fracture (hereafter referred to as elongation) shall be in accordance with the requirements specified in Tables 1, 2 and 3.

7.3 0,2 % Proof strength

When requested by the purchaser and agreed at the time of acceptance of the order, 0,2 % proof strength shall be determined in accordance with 9.2 and the values shall be in accordance with the requirements specified in Tables 1, 2 and 3.

7.4 Brinell hardness

Brinell hardness and its range values shall only be specified when agreed between the manufacturer and the purchaser by the time of acceptance of the order. Guidance values for Brinell hardness are listed in Tables 1, 2 and 3.

The method of testing and sampling shall be agreed in accordance with the method specified in 9.3.

7.5 Impact energy

The minimum impact energy values measured on V-notched test pieces machined from cast samples given in Table 3 at room temperature, if applicable, shall only be determined if specified by the purchaser by the time of acceptance of the order.

Impact energy testing is normally requested for EN-GJMB-350-10 only.

The method of testing shall be in accordance with 9.4.

NOTE If the purchaser requires impact testing to be performed on whiteheart malleable cast iron or other grades of blackheart malleable cast irons, then the Charpy un-notched test should be used (see informative Annex B).

Table 1 — Mechanical properties of whiteheart malleable cast irons

Material designation		Relevant wall thickness	Nominal diameter of test piece	Tensile strength	Elongation	0,2 % proof strength	Brinell hardness (for information only)
		t	d	R_m	$A_{3,4}$	$R_{p0,2}$	
		mm	mm	MPa	%	MPa	HBW
Symbol	Number			min.	min.	min.	max.
EN-GJMW-**350-4**	5.4200	$t \leq 3$	6	270	10	— [a]	230
		$3 < t \leq 5$	9	310	5	—	
		$5 < t \leq 7$	**12**	**350**	**4**	—	
		$t > 7$	15	360	3	—	
EN-GJMW-**360-12** [b]	5.4201	$t \leq 3$	6	280	16	— [a]	200
		$3 < t \leq 5$	9	320	15	170	
		$5 < t \leq 7$	**12**	**360**	**12**	**190**	
		$t > 7$	15	370	7	200	
EN-GJMW-**400-5**	5.4202	$t \leq 3$	6	300	12	— [a]	220
		$3 < t \leq 5$	9	360	8	200	
		$5 < t \leq 7$	**12**	**400**	**5**	**220**	
		$t > 7$	15	420	4	230	
EN-GJMW-**450-7**	5.4203	$t \leq 3$	6	330	12	— [a]	220
		$3 < t \leq 5$	9	400	10	230	
		$5 < t \leq 7$	**12**	**450**	**7**	**260**	
		$t > 7$	15	480	4	280	
EN-GJMW-**550-4**	5.4204	$t \leq 3$	6	—	—	— [a]	250
		$3 < t \leq 5$	9	490	5	310	
		$5 < t \leq 7$	**12**	**550**	**4**	**340**	
		$t > 7$	15	570	3	350	

NOTE The figures given in bold indicate the minimum tensile strength, proof strength and minimum elongation $A_{3,4}$ to which the material designation of the grade is related and the preferred nominal diameter of the test piece.

[a] Because of the difficulty in determining the proof strength of small test pieces the values and the method of measurement shall be agreed between the manufacturer and the purchaser by the time of acceptance of the order.

[b] Material most suitable for welding.

Table 2 — Mechanical properties of blackheart malleable cast irons grades without specified minimum impact energy

Material designation		Nominal diameter of test piece [a]	Tensile strength	Elongation	0,2 % proof strength	Brinell hardness (for information only)
		d	R_m	$A_{3,4}$	$R_{p0,2}$	
		mm	MPa	%	MPa	HBW
Symbol	Number		min.	min.	min.	
EN-GJMB-300-6[b]	5.4100	12 or 15	300	6	—	max. 150
EN-GJMB-500-5	5.4206	12 or 15	500	5	300	165 to 215
EN-GJMB-550-4	5.4207	12 or 15	550	4	340	180 to 230
EN-GJMB-600-3	5.4208	12 or 15	600	3	390	195 to 245
EN-GJMB-700-2 [c, d]	5.4301	12 or 15	700	2	530	240 to 290
EN-GJMB-800-1 [c]	5.4302	12 or 15	800	1	600	270 to 320

a Where a 6 mm or 9 mm diameter test piece is representative of the relevant wall thickness of a casting, this size of the test piece may be used by agreement between the manufacturer and the purchaser by the time of acceptance of the order. The minimum properties given in this table shall apply.

b Grade EN-GJMB-300-6 (5.4100) malleable cast iron shall not be used for any pressure application, e. g. also pressure applications not covered by the Pressure Equipment Directive 97/23/EC.

c Oil quenched and subsequently tempered.

d If this grade is air quenched, the 0,2 % proof strength shall be at least 430 MPa.