

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 942

WHITEHEART MALLEABLE CAST IRON
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ISO/R 942:1969

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BRIEF HISTORY

The ISO Recommendation R 942, *Whiteheart malleable cast iron*, was drawn up by Technical Committee ISO/TC 25, *Cast iron*, the Secretariat of which is held by the British Standards Institution (BSI).

Detailed work on this question by the Technical Committee led, in 1966, to the adoption of a Draft ISO Recommendation.

In February 1967, this Draft ISO Recommendation (No. 1193) was circulated to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Argentina	Germany	Romania
Australia	Greece	South Africa, Rep. of
Belgium	India	Sweden
Brazil	Israel	Switzerland
Canada	Korea, Rep. of	Thailand
Chile	Netherlands	Turkey
Czechoslovakia	New Zealand	U.A.R.
Finland	Norway	United Kingdom
France	Portugal	Yugoslavia

One Member Body opposed the approval of the Draft :

Italy

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in January 1969, to accept it as an ISO RECOMMENDATION.

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WHITEHEART MALLEABLE CAST IRON

1. SCOPE

This ISO Recommendation refers to the characteristics of whiteheart malleable cast iron and its classification by mechanical properties. Details are also included on testing conditions, dimensions of test bars and sampling.

2. GENERAL

- 2.1 Malleable cast iron is a heat-treated iron-carbon alloy, which solidifies in the as-cast condition with a graphite-free structure, i.e. the total carbon content at the moment of solidification is present in the dissolved form and in the combined form as cementite (Fe₃C).
- 2.2 Three groups of malleable cast iron are specified, differentiated by the temperature and time cycle of the annealing process, by the annealing atmosphere and by the properties resulting therefrom, as follows :
- whiteheart malleable cast iron (covered by this ISO Recommendation);
 - blackheart malleable cast iron (see ISO Recommendation R 943);
 - pearlitic malleable cast iron (see ISO Recommendation R 944).
- 2.3 Whiteheart malleable cast iron is annealed in a decarburizing atmosphere.

3. CHARACTERISTICS OF WHITEHEART MALLEABLE CAST IRON

3.1 Fracture appearance

Surface zone : silvery-grey.

Core zone : dark-grey to black.

3.2 Microstructure

The microstructure is dependent on section size, as follows :

- (a) small section size : ferrite (+ pearlite);
- (b) large section size :
 - core zone : pearlite (+ ferrite) + temper carbon,
 - intermediate zone : pearlite + ferrite + temper carbon,
 - surface zone : ferrite.

The microstructure should not contain primary or flake graphite.

4. MECHANICAL PROPERTIES

4.1 Tensile strength, proof stress, elongation

The minimum tensile strength, proof stress and elongation of grades A and B should be in accordance with the values included in Table 1.

TABLE 1 – Minimum mechanical properties of whiteheart malleable cast iron

Grade	Diameter of test bar *	Tensile strength		0.5 % proof stress **		0.2 % proof stress **		Elongation ($L_0 = 3d$)
	mm	kgf/mm ²	tonf/in ²	kgf/mm ²	tonf/in ²	kgf/mm ²	tonf/in ²	%
A	9	36	22.9	20	12.7	18	11.4	10
	12	40	25.4	24	15.2	22	14.0	6
	15	42	26.7	26	16.5	23	14.6	4
B	9	28	17.8	—	—	—	—	7
	12	32	20.3	—	—	—	—	4
	15	35	22.2	—	—	—	—	3

* For whiteheart malleable cast iron, the test bar diameter should have the closest possible relationship to the section thickness of the casting. The test bar diameter should be agreed between the purchaser and the manufacturer.

** In cases of dispute regarding the proof stress values, the value for the 0.5 % proof stress should be binding.

4.2 Brinell hardness (for information only)

The Brinell hardness, measured at an agreed point on the casting, should not exceed the values, which are given for information only, in Table 2.

TABLE 2 – Brinell hardness of whiteheart malleable cast iron

Grade	Brinell hardness, HB max.
A	220
B	220

5. TESTING CONDITIONS

5.1 Tensile test

For the tensile test (tensile strength, proof stress, elongation), test bars in accordance with section 6 should be used.

5.2 Brinell hardness test

The Brinell hardness test should be carried out in accordance with ISO Recommendation R 184, *Brinell hardness test for grey cast iron*.

6. TEST BAR DIMENSIONS

Test bars used for the tensile test (see Figure and Table 3) should be separately cast and should be unmachined.

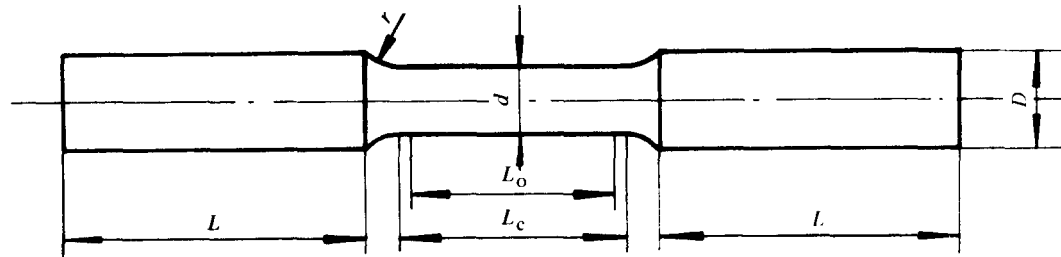


FIGURE – Tensile test bar

TABLE 3 – Dimensions of tensile test bar

Diameter d	Tolerances on diameter d	Nominal sectional area S_o	Shank dimensions *		Gauge length $L_o = 3d$	Minimum parallel length L_c	Radius at shoulder r
			Diameter D	Length L^{**}			
mm	mm	mm ²	mm	mm	mm	mm	mm
9	+0.6 0	63.6	13	40	27	30	6
12	+0.7 0	113.1	16	50	36	40	8
15	+0.7 0	176.7	19	60	45	50	8

* If necessary the shanks may be modified to suit the grips of the testing machine available.

** The minimum length L should fit the full length of the grips of the testing machine available.

7. SAMPLING

- 7.1 The minimum number of test bars to be provided should be one set of test bars representing each two hours of pouring, and sufficient test bars should be heat-treated to ensure adequate quality control.
- 7.2 By agreement between the purchaser and the manufacturer, if small batches of castings are being produced, one tensile test bar should be tested from every heat or every cast of metal.
- 7.3 Two further tensile test bars should be available for purposes of retest if necessary.

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