# 60004 [410M4] Malleable Cast Iron Casting Material

## Introduction

ASTM A220/A220M Grade 60004 [410M4] is a pearlitic malleable iron casting grade. Its matrix contains ferrite, pearlite and tempered transformation products, with distributed temper carbon. Tensile acceptance uses separately cast test bars.

## Manufacturing Process

Sand Casting
Shell Molding Casting
Lost Foam Casting

## Equivalent Materials

Not Available

## Reference Standards

| Standard | Standard Title | Edition | Specification |
|---|---|---|---|
| ASTM A220/A220M | Pearlitic Malleable Iron | 99 | 60004 [410M4] |

## Physical Properties

| Property | Value | Applicable Conditions |
|---|---|---|
| Matrix Structure | Uniformly distributed temper carbon nodules in a matrix of ferrite, pearlite and tempered transformation products of austenite. | |

Sources: ASTM A220/A220M:99

## Chemical Composition

No specified chemical composition limits in ASTM A220/A220M

## Heat Treatment

If reheat treatment is needed after initial tensile testing — If the initial test indicates that reheat treatment is needed, the entire casting lot and the representative test specimens must undergo reheat treatment together.

Surface condition after heat treatment (when agreed) — When agreed by the purchaser and producer, a maximum decarburization limit may be set in writing for any as-cast surface after heat treatment. Evaluate depletion of combined carbon after polishing and nital etching at 100×.

Typical manufacturing practice (informative) — Heat treatment is inherent in manufacturing pearlitic malleable iron. The standard gives no general temperature, holding time or cooling schedule.

When specified hardness is not met — Castings outside the required hardness range may be reheat treated and retested.

Where subsequent hardening is intended (L prefix) — Use sufficient combined carbon to respond to properly applied hardening and keep free ferrite as low as is consistent with other properties. The standard recommends an L prefix and a minimum hardness of 197 HB.

Typical manufacturing practice (informative): Informative values; not mandatory acceptance limits.

Sources: ASTM A220/A220M:99

## Mechanical Properties

### Primary Mechanical Properties

#### ASTM A220/A220M — 99

| Property | Requirement |
|---|---|
| Tensile Strength | >= 80000 psi [550 MPa] |
| Yield Strength | >= 60000 psi [410 MPa] |
| Elongation | >= 4 % |

Separately cast test bar

Separately cast bars from the same lot are heat treated with the castings in the same production furnace and cycles.

Tensile Strength [Inch-pound]; Yield Strength [Inch-pound]; Elongation [Inch-pound]: Standard gauge length 2.00 ± 0.01 in. Mean diameter of cast bars at least 19/32 in.

Yield Strength: 0.2% offset in referee testing.

Elongation gauge length: 2 in. [50 mm]

Tensile Strength [SI]; Yield Strength [SI]; Elongation [SI]: Standard gauge length 50.0 ± 0.3 mm. Mean diameter of cast bars at least 15 mm.

#### ASTM A220/A220M — 99

Condition: Typical Brinell hardness

Informative

| Property | Value |
|---|---|
| Brinell Hardness | 197–241 HB |

Typical indentation diameter 3.9–4.3 mm. ASTM E10 with a 0.39 in. [10 mm] ball and 6600 lbf [3000 kgf] load.

Informative reference value

not an acceptance requirement

#### ASTM A220/A220M — 99

Condition: Where subsequent hardening is intended (L prefix)

Informative

| Property | Value |
|---|---|
| Brinell Hardness | >= 197 HB |

The L prefix is recommended. Sufficient combined carbon is required. Free ferrite must be as low as consistent with other properties.

Informative reference value

not an acceptance requirement

## Welding Conditions

### ASTM A220/A220M — 99 · Clause X1.4; §11.2 / informative

| Property | Value |
|---|---|
| Post-weld Heat Treatment | For welded castings, Appendix X1.4 recommends appropriate post-weld heat treatment under strict metallurgical control. |

Repair by plugging or welding requires prior written purchaser permission per §11.2.

## Applications

Pearlitic malleable iron ASTM A220/A220M Grade 60004 [410M4] is part of a material family used for transmission components and compressor crankshafts. A component design requires its own evaluation of section size and the loads at critical locations.

CASTING QUALITY

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# Casting Quality Industrial

As a professional manufacturer in China, We Casting Quality focus on Metal Parts OEM industry, and provide solutions and services in Metal Casting field as following:

Sand Casting

Investment Casting, Lost Wax process

Shell Casting

Lost Form Casting

Permanent Mold Casting

CNC Machining

CAD Design

Tools/Mold Design

## Material Supplied

Cast Iron Castings (Grey Iron, Malleable Iron, Ductile Iron)

Carbon Steel and Alloy Steel Castings

Stainless Steel and Duplex Stainless Steel Castings

Aluminum Castings

Bronze and Brass Castings

Titanium and Cobalt Alloy Castings

## What We Can Do

**Design Ability**

Our engineers will help you to improve the designs based on casting technology, then The simulation software will be processed to verify the casting pouring system. Pro/E, Solidworks, AutoCAD and ProCast are available in Casting Quality Industrial.

**Saving Cost**

Some manufacture processes may lead high cost. We will analyses the designs and advise the suitable methods to our customers. The best solution will be adopted.

**Quality Control**

From the raw material selecting to bulk production processing, all procedures will follow PPAP program if necessary. The certificates will be provided including chemistry, hardness, mechanical property or NDT testing.

**Production Capacity**

The max iron/steel castings can reach 30tons in weight, meanwhile the minus casting is around 1gram only.

We also have prototyping and 3D scanning ability for sample plan.

**Logistic Service**

The products will be delivered directly to customer’s workshop, which will save plenty of work for clients.

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