International Standard

ISO 18735

Ships and marine technology — High-manganese austenitic steel — Specification for high-manganese austenitic steel castings for cryogenic temperature

Navires et technologie maritime — Acier austénitique à haute teneur en manganèse — Spécification pour les pièces moulées en acier austénitique à haute teneur en manganèse pour température cryogénique

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee TC 8, *Ships and marine technology*, Subcommittee SC 4, *Outfitting and deck machinery*.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

The aim of this document is to provide a set of common requirements for metallic materials used in cryogenic applications, in alignment with the IGC Code[1] and IGF Code[2] adopted by the International Maritime Organization (IMO).

The newly developed, high-manganese austenitic steel is expected to possess mechanical properties including Charpy impact energy values comparable to those materials for cryogenic service listed in both the IGC Code and IGF Code. Consequently, high-manganese steel is intended to satisfy the strength requirements of the structure of cargo tanks, fuel tanks and piping systems.

In addition, upon agreement with a purchaser, this document can be applied to piping systems for liquefied hydrogen.

This document provides a standard specification of high-manganese austenitic steel castings for material suppliers, ship owners, ship yards, manufacturers and shipping companies with regard to producing, purchasing and using such materials.

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Ships and marine technology — High-manganese austenitic steel — Specification for high-manganese austenitic steel castings for cryogenic temperature

1 Scope

This document specifies minimum requirements for high-manganese austenitic steel castings for valves, flanges and other pressure-containing components used at cryogenic temperature.

This document can be applicable to all pressure retaining components and any non-pressure retaining component.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 148-1, *Metallic materials — Charpy pendulum impact test — Part 1: Test method*

ISO 2566-1, *Steel — Conversion of elongation values — Part 1: Carbon and low-alloy steels*

ISO 2566-2, *Steel — Conversion of elongation values — Part 2: Austenitic steels*

ISO 4990, *Steel castings — General technical delivery requirements*

ISO 5173, *Destructive tests on welds in metallic materials — Bend tests*

ISO 5208, *Industrial valves — Pressure testing of metallic valves*

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

ISO 9606-1, *Qualification testing of welders — Fusion welding — Part 1: Steels*

ISO 9712, *Non-destructive testing — Qualification and certification of NDT personnel*

ISO 10474, *Steel and steel products — Inspection documents*

ISO 15614-1, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys*

ASME B31.3, *Process Piping*

ASME Boiler and Pressure Vessel Code, Section V, *Non-Destructive Testing*

ASME Boiler and Pressure Vessel Code, Section VIII, *Rules for Construction of Pressure Vessels Division 1*

ASTM A991/991M, *Standard Test Method for Conducting Temperature Uniformity Surveys of Furnaces Used to Heat Treat Steel Products*

ANSI/MSS SP-55, *Quality Standard for Steel Castings for Valves, Flanges, and Fittings and Other Components - visual method for evaluation of surface irregularities*

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3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
chaplet
metallic support to maintain the space between a core and the mould

3.2
cryogenic service
service environment in which the minimum *design temperature* (3.4) is lower than –104 °C

3.3
DN
diameter nominal
alphanumeric designation of size that is common for components used in piping system, used for reference purposes, comprising the letters “DN” followed by a dimensionless number indirectly related to the physical size of the bore or outside diameter of the end connection as appropriate

Note 1 to entry: The dimensionless number following “DN” does not represent a measurable value and is not for calculation purpose except where specified in ASME B16.34.[3]

3.4
design temperature
minimum temperature for selection of materials at which cargo or fuel can be loaded or transported in the cargo or fuel tanks

3.5
heat
molten metal poured from a single melting furnace or the molten metal from two or more furnaces poured into a single ladle

3.6
high-manganese austenitic steel
steel with a high amount of manganese to retain austenitic as its primary phase at atmospheric and service temperature

3.7
internal chill
metallic device placed in a mould cavity to promote directional solidification by increasing the rate of heat extraction at a specific location

3.8
leak testing
hydrostatic leak test
pneumatic leak test
application of a pressure load, greater than the design load, to demonstrate the integrity of a pressure system to safely withstand the design load

Note 1 to entry: ASME B31.3 uses the terms hydrostatic leak test, pneumatic leak test, or a combination of both methods, such as a hydro-pneumatic test.

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3.9
lot
two or more products having the same chemical composition (i.e. from the same melt), subjected to the same heat treatment in the same furnace cycle, with the same product type and thickness within ±20 % of the maximum thickness in the lot

3.10
manufacturer
organization, including subcontractors, which carries out operations (e.g. casting, heat treatment) that affect the material properties of the finished product

3.11
NPS
nominal pipe size
alphanumeric designation of size that is common for components used in piping system, used for reference purposes, comprising the letters "NPS" followed by a dimensionless number indirectly related to the physical size of the bore or outside diameter of the end connection as appropriate

Note 1 to entry: The dimensionless size identification number following "NPS" does not represent a measurable value and is not for calculation purpose except where specified in ASME B16.34. Prefix NPS usage is applicable to valves bearing class designations.

3.12
pilot casting
casting made and tested as part of the initiation and development of the production method

EXAMPLE The first casting from a new or modified pattern, which is produced using identical foundry practices as the production castings it is intended to represent.

3.13
purchaser
owner or another party acting on their behalf, who is responsible for procuring materials, components or services intended for the design, construction or modification of castings

3.14
set temperature
target-holding temperature for heat treatment

3.15
test coupon
part from which the *test specimens* (3.16) are extracted

3.16
test specimen
part that is subject to mechanical testing

4 Abbreviated terms

For the purposes of this document, the following abbreviated terms are used.

ACCP	ASNT Central Certification Program
AOD	argon-oxygen-decarburization
API	American Petroleum Institute
ASNT	American Society for Non-destructive Testing
BPVC	Boiler and Pressure Vessel code

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