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Ships and marine technology — High-manganese austenitic steel — Specification for plates, sheets and coils below 6,0 mm for cryogenic temperature

Navires et technologie maritime — Acier austénitique à haute teneur en manganèse — Spécifications applicables aux tôles, feuilles et bobines d'épaisseur inférieure à 6,0 mm pour service à température cryogénique

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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.

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

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Introduction

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[1] and IGF Code.[2] 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 plate, sheet, strip and coil for material manufacturers, ship owners, ship yards 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 plates, sheets and coils below 6,0 mm for cryogenic temperature

1 Scope

This document specifies the delivery conditions for high-manganese austenitic steel in the form of hot rolled or cold rolled plates, sheets, and coils for low temperature purposes.

This document covers all product types with a thickness below 6,0 mm. Refer to ISO 23430 for specifications on high manganese-austenitic steel thin strips.

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

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

ISO 16160, *Hot-rolled steel sheet products — Dimensional and shape tolerances*

ISO 16162, *Cold-rolled steel sheet products — Dimensional and shape tolerances*

EN 10048, *Hot rolled narrow steel strip — Tolerances on dimensions and shape*

EN 10140, *Cold rolled narrow steel strip — Tolerances on dimensions and shape*

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
coil
long continuous *sheet* (3.5) of steel that has been coiled into a coil form

3.2
design temperature
minimum temperature for the selection of materials at which cargo or fuel can be loaded or transported in the cargo or fuel tanks

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3.3
high-manganese austenitic steel
steel with 22,5 % to 25,5 % amount of manganese to retain austenite as its primary phase at atmospheric or service temperature

3.4
lot
specified quantity of steel *sheet* (3.5) of the same grade, rolled to the same thickness and under the same condition

3.5
sheet
product obtained by rolling heated steel through a continuous-type or reversing-type wide strip-mill to the required thickness

3.6
strip
flat-rolled steel product of small thickness and width, typically cut from steel *coils* (3.1) or *sheets* (3.5)

Note 1 to entry: In this document, strip refers exclusively to steel strip. It is typically produced by slitting wide coils into narrower forms and is available in various widths and thicknesses.

4 Manufacture

4.1 Steel-making practice

Steel shall be manufactured by basic oxygen, electric furnace processes or by other processes.

Steel shall be fully-killed during de-oxidation practice.

Any other residual elements such as As, Sb, Sn, Pb, Bi, B shall not be added intentionally.

4.2 Rolled product

A rolled product shall be produced by hot rolling. After rolling, cooling shall be at a rate sufficient to prevent the formation of grain boundary carbides within the temperature range from 800 °C to 500 °C.

To avoid formation of carbide precipitation, rapid cooling should be performed, with a cooling rate of at least 10 °C/s.

4.3 Chemical composition

The chemical composition (%) of samples taken from each ladle of each cast of the steel shall meet the requirements of Table 1.

Table 1 — Chemical composition of high-manganese austenitic steel

Dimensions in per cent (%) (mass fraction)

C	Mn	Si	P	S	Cr	Cu	B	N
0,35 to 0,55	22,50 to 25,50	max. 0,50	max. 0,030	max. 0,010	3,00 to 4,00	0,30 to 0,70	max. 0,005 0	max. 0,050
NOTE 1 Aluminium content applies when there is a total aluminium of 0,03 % or more.								
NOTE 2 Modification or addition of other elements can be permitted upon agreement between the manufacturer and the purchaser.								

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