AS 24132:2025

Ships and marine technology — Design and testing of marine transfer arms for liquefied hydrogen (ISO 24132:2024, MOD)

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Preface

This Standard was prepared by the Standards Australia Committee ME-093, Hydrogen Technologies.

The objective of this document is to specify the design, minimum safety requirements, and inspection and testing procedures for liquefied hydrogen (LH2) marine transfer arms intended for use at onshore LH2 terminals handling LH2 carriers. It also covers the minimum requirements for safe LH2 transfer between ship and shore.

This document is an adoption with national modifications and has been reproduced from ISO 24132:2024, *Ships and marine technology — Design and testing of marine transfer arms for liquefied hydrogen*.

The modifications are additional requirements and are set out in Appendix ZZ, which has been added at the end of the source text.

Appendix ZZ lists the modifications to ISO 24132:2024 for the application of this document in Australia.

As this document has been reproduced from an international document, a full point substitutes for a comma when referring to a decimal marker.

Australian or Australian/New Zealand Standards that are identical adoptions of international normative references may be used interchangeably. Refer to the online catalogue for information on specific Standards.

The terms “normative” and “informative” are used in Standards to define the application of the appendices or annexes to which they apply. A “normative” appendix or annex is an integral part of a Standard, whereas an “informative” appendix or annex is only for information and guidance. Other information which may need to be included

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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 documents 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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 ISO/TC 8, *Ships and marine technology,* Subcommittee SC 2, *Marine environment protection.*

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.

Introduction

The twenty-first session of the Conference of the Parties (COP21) of the United Nations Framework Convention on Climate Change (UNFCCC) was held in Paris, France in December 2015 and finally adopted an agreement for the prevention of global warming, the Paris Agreement. The Agreement requires Parties' efforts to achieve zero net anthropogenic greenhouse gas (GHG) emissions during the second half of the 21st century. The International Maritime Organization (IMO) adopted a strategic plan to reduce GHG emissions from the maritime sector by 50 % in 2050 and finally to zero level within this century. Since the required reduction of GHG emissions is not attainable by a simple improvement in efficiency, the substitution of alternative fuels, including hydrogen, ammonia, and biofuels, for present fossil energies must be considered. Among them, hydrogen is one of the most present energy carriers, not only as fuel, but also as storage and transportation media.

A massive and long-distance transport of hydrogen by ships from production areas to consumption areas would be necessary because production plants are often constructed far from consumption areas, which are typically cities and industrial areas where hydrogen would be used in gas/steam turbine power plants and transportation systems such as railways, automobiles and ships.

In the marine transportation system of liquefied hydrogen, transfer from shore to ship would take place using transfer arms. A number of transfer arms are currently used for the loading and unloading of liquefied natural gas (LNG) at marine terminals. However, the temperature difference between LNG (−162 °C) and liquefied hydrogen (−253 °C) is critical and requires a significant change in the design of the transfer arms. Transfer systems minimize heat loss by applying high performance heat insulation technology. Liquid oxygen (−183 °C) formation on the outer surface of the system should be strictly prevented because some materials can detonate unpredictably from sources of ignition such as flames, sparks or impact from light blows if soaked in liquefied oxygen (LO2). Leakage should also be prevented because the hydrogen molecule is small in size and hydrogen gas is flammable over a wide range of concentrations.

To ensure the safe and smooth transportation of liquefied hydrogen, well-qualified transfer arms that are compatible with the on-board equipment of hydrogen carriers should be installed at each terminal. This document is, therefore, developed to provide technical guidance and safety requirements for liquefied hydrogen marine transfer arms.

NOTES

Australian Standard®

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1 Scope

This document specifies the design, minimum safety requirements, and inspection and testing procedures for liquefied hydrogen (LH2) marine transfer arms intended for use at onshore LH2 terminals handling LH2 carriers. It also covers the minimum requirements for safe LH2 transfer between ship and shore.

Although the requirements for power/control systems are covered, this document does not include all of the details for the design and fabrication of standard parts and fittings associated with transfer arms. This document is mainly focused on hard pipe type transfer systems; hose type transfer systems are not described in detail in the general description of this document. However, hose type transfer systems can also be considered as reasonable vacuum insulated technology for the design of transfer arms for liquefied hydrogen.

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 3452-1, *Non-destructive testing — Penetrant testing — Part 1: General principles*

ISO 4406, *Hydraulic fluid power — Fluids — Method for coding the level of contamination by solid particles*

ISO 9934-1, *Non-destructive testing — Magnetic particle testing — Part 1: General principles*

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

ISO 10497, *Testing of valves — Fire type-testing requirements*

ISO 16904, *Petroleum and natural gas industries — Design and testing of LNG marine transfer arms for conventional onshore terminals*

ISO 17636-1, *Non-destructive testing of welds — Radiographic testing — Part 1: X- and gamma-ray techniques with film*

ISO 17636-2, *Non-destructive testing of welds — Radiographic testing — Part 2: X- and gamma-ray techniques with digital detectors*

IEC 60079-10-1, *Explosive atmospheres — Part 10-1: Classification of areas — Explosive gas atmospheres*

IEC 60079-0, *Explosive atmospheres — Part 0: Equipment — General requirements*

IEC 60079-1, *Explosive atmospheres — Part 1: Equipment protection by flameproof enclosures "d"*

IEC 60079-2, *Explosive atmospheres — Part 2: Equipment protection by pressurized enclosure "p"*

IEC 60079-5, *Explosive atmospheres — Part 5: Equipment protection by powder filling "q"*

IEC 60079-6, *Explosive atmospheres — Part 6: Equipment protection by liquid immersion "o"*

IEC 60079-7, *Explosive atmospheres — Part 7: Equipment protection by increased safety "e"*

IEC 60079-11, *Explosive atmospheres — Part 11: Equipment protection by intrinsic safety "i"*

IEC 60079-14, *Explosive atmospheres — Part 14: Electrical installations design, selection and erection*