

ICS 47.020.50
CCS U 47



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 47544-2026

Marine LNG reliquefaction units

船用液化天然气再液化装置

Issued on: April 30, 2026

Implemented on: November 1, 2026

**Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC**

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part

1. Structure and Drafting Rules of Standardization Documents". Drafting. Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents. This document was proposed and is under the jurisdiction of the National Technical Committee on Standardization of Marine Machinery (SAC/TC137). This document was drafted by: China Classification Society, 711 Research Institute of China Shipbuilding Industry Corporation, and Chongqing Jiangzeng Heavy Industry Co., Ltd. Technical Institute of Physics and Chemistry, Chinese Academy of Sciences. The main drafters of this document are: Chen Gang, Zhang Ling, Song Hebin, Yang Zhiqiang, Shen Teng, Diao Zhongyang, Wang Jinzhen, Wang Lei, Guo Hao, Gong Maoqiong, and Liu Yu. Feng Jingya, Xia Menghan, Zhang Xinyuan, Wu Jihao, Li Shengjun, Wang Xiaowu, Zhao Yanchun, Feng Huihua, Wu Tong, Dan Guangju, Ding Mingze. Marine liquefied natural gas reliquefaction unit

1. Scope This document specifies the types, specifications, requirements, and inspection procedures for marine liquefied natural gas reliquefaction units (hereinafter referred to as "reliquefaction units"). The rules, marking, packaging, transportation and storage, and the corresponding test methods are described. This document applies to the design, manufacture, and testing of reliquefaction units for ships carrying liquefied natural gas.

4.1 Type

4.1.1 Classification by cooling object.

- a) Direct liquefaction type. directly cools and liquefies the BOG generated in the liquid cargo tank;
- b) Indirect liquefaction type. BOG in the liquefied cargo tank is indirectly cooled by subcooled LNG.

4.1.2 Classification by refrigeration principle.

- a) Throttling refrigeration type. generates a refrigeration effect through a throttling device, cooling and liquefying BOG;
- b) Expansion refrigeration type. The refrigeration effect is generated through an expansion device to cool and liquefy BOG.

4.2 Specifications The specifications of the reliquefaction unit are shown in Table 1.

4.3 Model Identification The model designation method for reliquefaction units is shown in Figure 1.

5.1 Environmental adaptability

5.1.1 The reliquefaction unit shall be able to operate normally under the following conditions.

- a) Lateral tilt $\pm 15^\circ$, longitudinal tilt $\pm 5^\circ$;
- b) Roll $\pm 22.5^\circ$, Pitch $\pm 7.5^\circ$;
- c) Operating ambient temperature. $0^\circ\text{C}\sim 45^\circ\text{C}$; absolute atmospheric pressure. 0.1MPa; relative humidity. 60%;
- d) Seawater temperature. $0^\circ\text{C}\sim 32^\circ\text{C}$;
- e) Vibrations and shocks generated during normal ship operation;
- f) Humid air, salt spray, oil mist, and mold.

5.1.2 The refrigerants used in the reliquefaction unit, if multiple refrigerants are used and may come into contact with each other, shall be compatible with each other.

5.2 Materials

5.2.1 The selection of materials for reliquefaction units should take into account the corrosiveness of the contact medium and be compatible with its design pressure and temperature.

5.2.2 Materials in contact with cryogenic media shall meet the requirements of Chapter 6 of the Specification for Construction and Equipment of Ships Carrying Liquefied Gases in Bulk.

5.3 Safety

5.3.1 The explosion-proof rating of the electrical equipment of the reliquefaction unit shall comply with the provisions of GB/T 22189.

5.3.2 Safety valves shall be installed in the pressure vessels and other closed components of the reliquefaction unit that may accumulate pressure.

5.3.3 If the cold box or other areas of the reliquefaction unit have independent enclosed spaces, combustible gas detectors should be installed.

5.3.4 The design pressure of the reliquefaction circulation system should be greater than or equal to

1.25 times the working pressure.

5.3.5 The control system, safety system, and alarm system of the reliquefaction unit should be designed as independent systems. If one or more of these systems fail, the system will be disabled. When one system fails, it should not affect the normal operation of other systems.

5.4 Environmental Protection

5.4.1 The reliquefaction unit shall be equipped with exhaust gas containing methane during pressure-controlled operation and within the design conditions. interface.

5.4.2 The refrigerant should be an environmentally friendly medium with an ozone depletion potential (ODP) of 0, conforming to the International Convention for the Prevention of Pollution from Ships. Require.

5.5 Appearance The reliquefaction unit must meet at least the following appearance requirements.

- a) The welded surfaces on the outer surface of the device should be clean, free of rust, scale, and welding slag;
- b) The outer surface of the device shall be painted, and the surface shall be flat, smooth, and uniform in color;
- c) The connections of the equipment should be neat and orderly, and the main pipelines should be marked with the medium and the direction of medium flow.

5.6 Main Components

5.6.1 General Requirements Pipeline welding should undergo welding procedure qualification, and non-destructive testing should be performed after welding in accordance with the requirements of the "Guidelines for Ship Welding Inspection". (For conveying flammable and explosive materials...) For pipeline connections involving explosive media, butt welding should be used, and the butt weld should be a full penetration weld. Additionally, sleeve welding and threaded connections are also acceptable. The specifications adopted should meet the requirements of the "Code for Construction and Equipment of Ships for Bulk Transport of Liquefied Gases".

5.6.2 Compressor The compressor should meet the following requirements.

- a) Screw compressors shall comply with the provisions of GB/T 19410.
- b) Piston compressors shall comply with the provisions of GB/T 20322.
- c) Centrifugal compressors shall comply with the provisions of GB/T 45595.

5.6.3 Expander The expander shall comply with the provisions of JB/T 11847.

5.6.4 Compression and Expansion Integrated Machine

5.6.4.1 General Requirements The integrated compression expander shall comply with the provisions of JB/T 6443. Its press housing, rotor, and magnetic levitation bearings (if applicable) shall also comply with... Requirements

5.6.4.2 to 5.6.4.4.

5.6.4.2 Pressure Vessel Housing The pressure compressor housing should undergo