

JB

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

JB/T 13977-2020

Liquefied natural gas (LNG) cryogenic submerged pumps

液化天然气 (LNG) 低温潜液泵

(English Translation)

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1 Scope

This Standard specifies the terms and definitions, type and model, technical requirements, junction boxes, inspection and test, inspection rules, preparations before delivery, and seller's information of cryogenic submersible pumps for transporting liquefied natural gas (LNG).

This Standard applies to submersible centrifugal pumps for transporting liquefied natural gas (LNG) (hereinafter referred to as submersible pumps).

2 Normative References

The following documents are essential to the application of this Document. For the dated documents, only the versions with the dates indicated are applicable to this Document; for the undated documents, only the latest version (including all the amendments) is applicable to this Document.

GB/T 191 Packaging - Pictorial marking for handling of goods

GB/T 755-2019 Rotating electrical machines - Rating and performance

GB/T 1032-2012 Test procedures for three-phase induction motors

GB/T 1974 Tangential keys and keyways

GB/T 2828.1 Sampling procedures for inspection by attribute - Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection

GB/T 3215-2019 Centrifugal pumps for petroleum, petrochemical and natural gas industry

GB/T 3216 Rotodynamic pumps - Hydraulic performance acceptance tests - Grade 1, 2 and 3

GB 3836.1 Explosive atmospheres - Part 1: Equipment - General Requirements

GB 3836.2 Explosive atmospheres - Part 2: Equipment protection by flameproof enclosures "d"

GB 3836.3 Explosive atmospheres - Part 3: Equipment protection by increased safety "e"

GB/T 4942.1 Degrees of protection provided by the integral design of rotating electrical machined (IP code) - Classification

GB/T 6391 Rolling bearings - Dynamic load ratings and rating life

GB/T 7306.2 Pipe threads with 55° thread angle where pressure-tight joints are made on the threads - Part 2: Taper internal and external threads

GB/T 7307 Pipe threads with 55° thread angle where pressure-tight joints are made on the threads

GB/T 9124 (all parts) Specification for steel pipe flanges

GB/T 9125 (all parts) Fasteners for pipe flange joints

GB/T 9126 Dimensions of non-metallic flat gaskets for pipe flanges

GB/T 9239.1-2006 Mechanical vibration - Balance quality requirements for rotors in a constant (rigid) state - Part 1: Specification and verification of balance tolerances

GB/T 13306 Plate

GB/T 19204 General characteristics of liquefied natural gas

GB/T 22670 Test procedures for converter-fed three phase cage induction motors

GB/T 22719.1 Interturn insulation of random-wound winding for AC low-voltage electrical machines - Part 1: Test methods

GB/T 29529-2013 Methods of measuring and evaluating noise of pumps

GB/T 29531-2013 Methods of measuring and evaluating vibration of pumps

JB/T 6880.2 Steel castings for pumps

JB/T 6913 Cleanliness of pump products

3 Terms and Definitions

For the purposes of this Document, the terms and definitions given in GB/T 3215-2019 and the following apply.

3.1 Sump

A sealed metallic container for installing submersible pumps.

3.2 Thermal transient working condition

The working conditions in which the fluid temperature in the pump changes due to compression, throttling, friction, etc.

b) Medium temperature is no lower than -196°C, and no higher than -110°C:

c) The submersible pump operates within the range of 70%~120% of the rated flow.

5 Technical Requirements

a) Based on the center of the first-stage impeller of the submersible pump, the submerged depth shall not exceed 20m:

5.1 General

5.1.3

The performance of the submersible pump is based on the specified speed.

5.1.4

The NPSH3 value at the specified point of the submersible pump shall not exceed the guaranteed NPSHR value.

5.1.5

During the operation of the submersible pump, the change of power supply voltage and frequency and its influence on the performance of the motor and the limit of temperature rise shall comply with the provisions of GB/T 755-2019.

5.1.6

Under specified operating conditions, the mean time between failures of submersible pumps shall be no less than 5000h.

5.1.7

The design of the submersible pump shall meet the following requirements:

--- Thermal transient working conditions shall comply with the provisions of GB/T 19204;

--- During the hydrostatic test, the maximum allowable working pressure of the pressure-bearing parts shall be less than 90% of the elastic limit stress of the materials used for the parts at 293K;

--- Connecting flanges, fasteners (nuts and bolts) and gaskets shall comply with the provisions of GB/T 9124 (all parts), GB/T 9125 (all parts) and GB/T 9126.

5.1.8

The submersible pump shall be able to work at the maximum continuous speed. The maximum continuous speed shall meet the following requirements:

a) It is equal to the corresponding synchronous speed under the condition of the maximum supply frequency of the motor;

b) For variable-speed submersible pumps and fixed-speed submersible pumps that may overspeed, it shall be no lower than 110% of their rated speed.