SLOVENSKI STANDARD
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Ship and marine technology - Technical requirements for liquefied natural gas bunkering dry-disconnect/connect coupling (ISO/DIS 21593:2018)

Schiff- und Meerestechnik- Trockene Anschluss- und Trennkupplung(en) für das Bunkern flüssigerdgasbetriebener Schiffe (ISO/DIS 21593:2018)

Navires et technologie maritime - Exigences techniques relatives au couplage de connexion et de déconnexion à sec pour le soutage de gaz naturel liquéfié (ISO/DIS 21593:2018)

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Ship and marine technology — Technical requirements for liquefied natural gas bunkering dry-disconnect/connect coupling

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Ship and marine technology — Technical requirements for liquefied natural gas bunkering dry-disconnect/connect coupling

1 Scope

This International Standard specifies the design, minimum safety and functional requirements, inspection and testing procedures for LNG dry-disconnect/connect coupling served for LNG hose bunkering system intended for use on LNG bunker ship, tank truck and shore-based facility etc. This standard is not applicable to hydraulically operated quick connect/disconnect coupler (QCDC) used for hard loading arm since it has been stipulated in ISO 16904. Based on the current technology of industrial manufacturing, the size of coupling from DN25 to DN200 is to be considered and contained within this standard at the development period.

The scope of this standard includes the following five elements.

1) General requirements: basic design principle, design parameters, functional requirements, internal valve, protective cap, handle;

2) Materials: body of coupling, welding, bolting, spring, seals;

3) Interface type and dimensions: Ends termination of receptacle, dimensions;

4) Marking: manufacturer and international standard information;

5) Testing: test conditions, test arrangement, general requirements, verification testing, production testing.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendment) applies.

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

EN 12516, *Industrial Valves — Shell Design Strength*

ASME B31.3, *Process piping*

ISO 3834, *Quality requirements for fusion welding of metallic materials*

ISO 16903, *Petroleum and natural gas industries — Characteristics of LNG, influencing the design, and material selection*

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

EN 12266-1, *Industrial valves — Testing of metallic valves — Part 1: Pressure tests, test procedures and acceptance criteria - Mandatory requirements*

ISO 20519, *Ships and marine technology — Specification for bunkering of liquefied natural gas fuelled vessels*

EN 1092-1, *Flanges and their joints*

ASME B16.5-2009, *Pipe flanges and flanged fittings*

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

EN 10222-5, *Steel forgings for pressure purposes. Martensitic, austenitic and austenitic-ferritic stainless steels*

ASTM A479, *Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels*

EN 10272, *Stainless steel bars for pressure purposes*

3 Terms and definitions

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

3.1
Bunkering
Operation of transferring LNG fuel to a vessel.(SOURCE: ISO 20519:2017, 3.1)

3.2
Dry-disconnect
Method that reduces LNG or natural gas releases into the atmosphere under normal operation to a negligible amount consistent with safety, either by equipment design or procedural practice.(SOURCE: ISO 20519:2017, 3.6)

3.3
Dry-disconnect/connect coupling
Mechanical device which permits quick connection and disconnection of a hose bunkering system of the bunker facility to the manifold of the receiving vessel in a safe manner without employing bolts. The coupling consists of a nozzle part and a receptacle part.

Note 1 to entry: These couplings are also known as “Dry Disconnect Couplings” or “Dry-break Couplings”.

3.4
Nozzle
Half part of the coupling (see 4.2.4), which is typically mounted on the hose bunkering system of the bunker facility, which permits quick connection and disconnection to the receiving vessel in a safe manner.It includes an internal valve to seal the nozzle/bunkering system when disconnected and will be opened after connection by manual operation.

3.5
Receptacle
Half part of the coupling (see 4.2.4), which is typically mounted to the manifold flange of the receiving vessel, which permits quick connection and disconnection of the hose bunkering system in a safe manner.It includes an internal valve to seal the receptacle/manifold system when disconnected and will be opened after connection by manual operation of the nozzle.

3.6
Dry gas
Gas with moisture content such that the dew point of the gas at the required test pressure is at least 11°C below the ambient test temperature.

3.7
Manifold
Pipe assembly mounted on board LNG-fuelled vessel to which the flange of the receptacle is connected.

3.8
Verification testing
A series of tests to assure that each coupling part (including nozzle and receptacle) meets all of its design specifications and requirements and that it fulfils its intended purpose.

3.9
Production testing
A process of measuring the properties or performance of the coupling and check it obtaining an indication of well productivity before being delivered from factory to customer.

4 General requirements

4.1 General

A dry-disconnect/connect coupling shall be functionally compatible with LNG bunkering system; a nozzle shall be functionally compatible with corresponding receptacles, vice versa.

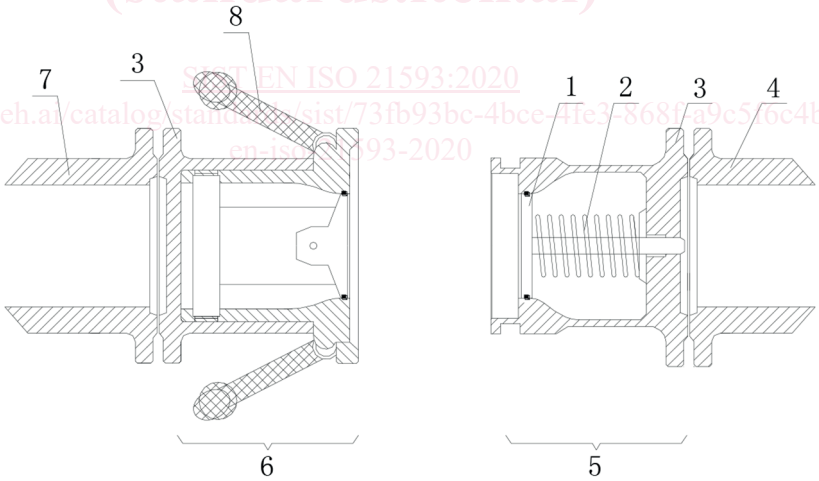
4.2 Basic design principle

4.2.1 The coupling consists of a nozzle and a receptacle. The nozzle allows quick connection and disconnection of the LNG bunkering system to the receptacle.

4.2.2 The poppet faces of internal valve from nozzle interacts and pushes the receptacle poppet toward the open position so as to allow medium flow.

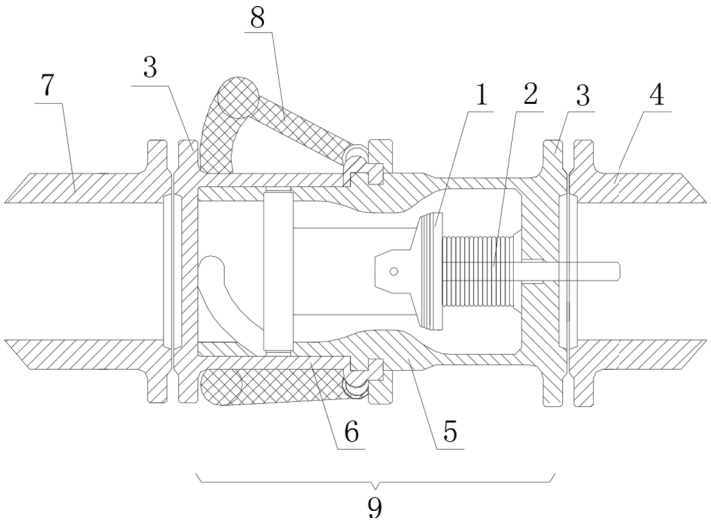
4.2.3 Nozzle and receptacle shall remain in the final position when the coupling is connected and is in fully open condition.

4.2.4 The typical structure of the two part coupling is shown below in figure 1 and figure 2:



Key
1 internal valve
2 poppet
3 flange
4 manifold of LNG receiving vessel
5 receptacle
6 nozzle
7 hose of LNG bunkering facility
8 handle

Figure 1 — Sketch structure of dry-disconnect/connect coupling (disconnected condition)



Key

1 internal valve
2 poppet
3 flange
4 manifold of LNG receiving vessel
5 receptacle
6 nozzle
7 hose of LNG bunkering facility
8 handle
9 coupling

Figure 2 — Sketch structure of dry-disconnect/connect coupling (connected condition)

4.2.5 Dry disconnect/connect coupling shall be designed according to a design standard for pressure containing equipment. Accepted design codes are:

— ASTM Boiler and Pressure Vessel Code

— European Pressure Equipment Directive 2014/68/EU

— EN 12516 Industrial Valves – Shell design strength

— ISO 16904, Section 7.2 Design of QCDC; Section 7.3 QCDC system; 9.3.8 QCDC (Testing requirements)

Other design codes can be accepted if they provide the same level of safety with respect to pressure containment.

The wall thickness of coupling shall take into account as a minimum but not limited to: internal pressure, external loads and moments.

4.2.6 Receptacle shall always be equipped with a seal as shown in Figure 3.

4.3 Design parameters

Design pressure and temperature of dry-disconnect/connect coupling shall comply with:

a) Minimum design pressure

1.6 MPa

b) Design temperature

-196°C to +85°C

4.4 Functional requirements

4.4.1 An interlock function shall be included to ensure the coupling will be sealed first under connection, before the internal valves will be opened. When disconnecting, the internal valves shall be closed first, before it is possible to disconnect the coupling. This may be achieved by an additional interlock device or by two-step action.

4.4.2 The volume between the two internal valves shall be as small as practical and reported by the manufacturer.

4.4.3 Once connected the coupling shall remain liquid and gas tight under all operating conditions and sustain:

1. The external loads applied at the connection between the bunkering system and the ship's manifold. (dynamic and static as well as ice accretion)
2. The internal loads due to LNG transfer process, either pressure or thermal loads during transient and permanent phases.

4.4.4 It shall be possible to disconnect the nozzle from the receptacle under the maximum manifold loads, including specified an ice build up on the device to the thickness of:

1. DN25 to DN80 : 10 mm solid ice (d= 800 kg/m3)
2. DN100 to DN200 : 25 mm solid ice (d= 800 Kg/m3)

4.4.5 The design of coupling shall allow the coupling to be manually connected and disconnected unaided with the maximum force to (dis)connect the nozzle from the receptacle shall not exceed 350 N. Where this force exceeds 350 N actuation shall be pneumatically or hydraulically assisted.

Nozzle shall be so designed as to be operated without the use of tools (e.g. extension bars) and excessive force for connecting and disconnecting.

4.4.6 The operation direction for open and close shall be indicated with indelible mark. Connection and disconnection shall be made with positive indication that mechanism action is fully made. The status display shall be clear for the operator in consideration with the formation of icing on the surface.

4.4.7 The design of the nozzle and receptacle shall allow for the removal of liquid and vapour before disconnection.

4.4.8 The nozzle shall have an integrated swivel function. It shall allow free rotation, to prevent the application of torsional loads on the bunkering system.

4.4.9 The coupling has suitable fire resistance properties and shall be fire type tested in accordance with the recognized standards (e.g. ISO 10497).

4.4.10 The coupling shall be conductive, non-sparking material.