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Ships and marine technology — Safety valve for cargo tanks of LNG carriers — Design and testing requirements

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Foreword

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This document was prepared by ISO Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 3, *Piping and machinery*.

Ships and marine technology — Safety valve for cargo tanks of LNG carriers — Design and testing requirements

1 Scope

This document specifies the requirements of design, test and inspection methods for diaphragm-type pilot operated safety valves, which are used in cargo tanks of LNG carriers in order to keep the pressure inside the tank below maximum allowable working pressure.

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 4126-4, *Safety devices for protection against excessive pressure — Part 4: Pilot operated safety valves*

IMO, *The International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code)*

API STD 527, *Seat Tightness of Pressure Relief Valves*

ASME B16.34, *Valves-Flanged, Threaded and Welding End*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
blowdown
difference between the set and reseating pressures

Note 1 to entry: Blowdown is normally stated as a percentage of set pressure, except for pressures of less than 3 bar, when the blowdown is expressed in bar.

3.2
flow area
cross-sectional area (but not the curtain area) between inlet and seat that is used to calculate the theoretical flow capacity of the main valve, with no deduction for any obstruction

3.3
lift
actual travel of the main valve disk away from the closed position

3.4
pilot operated safety valve
automatic, self-actuated device comprising a main valve and an attached pilot valve

Note 1 to entry: The pilot responds to the pressure of the fluid without any other energy source than the fluid itself, and controls the operation of the main valve. The valve opens when the fluid pressure increases to the pilot valve set point. The valve re-closes when the fluid pressure is reduced to reseating pressure. See Figure 1.

3.5
reseating pressure
value of the inlet static pressure at which the disk re-establishes contact with the seat or at which the lift becomes zero

3.6
set pressure
tank pressure at which the main valve of a pilot operated safety valve under operating conditions begins to open

3.7
theoretical discharge capacity
calculated capacity expressed in mass or volumetric units of a theoretically perfect nozzle having a cross-sectional flow area equal to the flow area of a main valve

3.8
vacuum set
negative tank pressure value at which the valve starts to open under working conditions

4 Main valve components

4.1 Body

The body inlet is connected directly to the tank, and the exit is connected to a discharge pipe. It keeps the pressure contained and endures the reaction of pressurized fluid discharged from the system.

4.2 Nozzle

It jets out pressurized fluid to the discharge pipe.

4.3 Disk

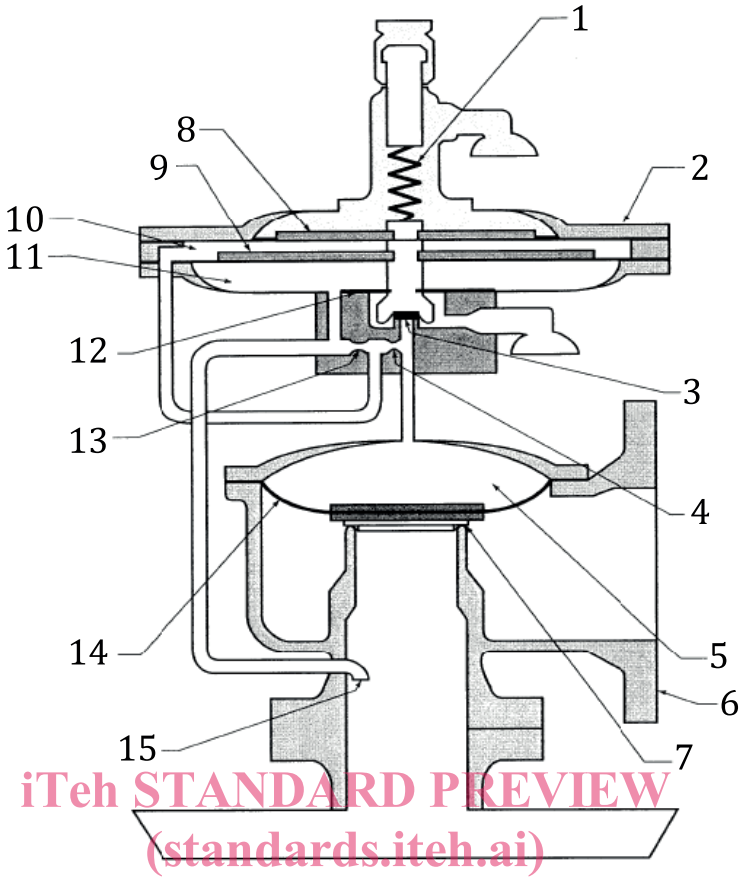
It works with the seat to provide sealing function to prevent leakage when it is closed. It is in direct contact with the working fluid, and may be damaged part if the fluid contains solids or foreign material.

4.4 Cover

It is connected to the body and makes a pressure space where flow can occur.

4.5 Diaphragm

It is a main component assembled between the main valve body and the cover. It delivers the fluid pressure to the disk.



Key

1 pilot spring
2 pilot valve
3 pilot seat
4 fixed orifice
5 dome
6 main valve
7 main valve seat
8 sense diaphragm
9 boost diaphragm
10 sense cavity
11 boost cavity
12 spindle seal diaphragm
13 blowdown adjustment orifice (variable)
14 main valve diaphragm
15 pilot pickup

Figure 1 — Main components of pilot operated safety valve (Diaphragm type)

5 Design

5.1 The design shall incorporate guiding arrangements necessary to ensure consistent operation and seat tightness.

5.2 The nozzle of the main valve, other than when it is an integral part of the valve body, shall be fastened securely to prevent the seat from becoming loose in service.

5.3 Valve operation shall be designed to provide consistent, proper function in very low pressure and cryogenic services.