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Gas cylinders — Specifications and testing of LPG cylinder valves — Self-closing

Bouteilles à gaz — Spécifications et essais pour valves de bouteilles de GPL — Fermeture automatique

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Contents

Page

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 58, *Gas cylinders*, Subcommittee SC 2, *Cylinder fittings,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 286, *Liquefied petroleum gas equipment and accessories,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 14245:2019) of which it constitutes a minor revision. The changes compared to the previous edition are as follows:

— correction of Clause 8, list item c).

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

This document covers the function of a LPG cylinder valve as a closure (defined by the UN Model Regulations[15]).

This document has been written so that it is suitable to be referenced in the UN Model Regulations.

Cylinder valves complying with this document can be expected to perform satisfactorily under normal service conditions.

When an LPG cylinder valve has been approved according to a previous edition of this document, the body responsible for approving the same LPG cylinder valve to this new edition should consider which tests need to be performed.

In this document the unit bar is used, due to its universal use in the field of technical gases. It should, however, be noted that bar is not an SI unit, and that the corresponding SI unit for pressure is Pa (1 bar = 10^5 Pa = 10^5 N/m^2).

Pressure values given in this document are given as gauge pressure (pressure exceeding atmospheric pressure) unless noted otherwise.

Gas cylinders — Specifications and testing of LPG cylinder valves — Self-closing

1 Scope

This document specifies the requirements for design, specification, type testing and production testing and inspection for dedicated LPG self-closing cylinder valves for use with and directly connected to transportable refillable LPG cylinders.

It also includes requirements for associated equipment for vapour and liquid service. Bursting discs and/or fusible plugs are not covered in this document.

Annex A identifies requirements for production testing and inspection.

This document excludes other LPG cylinder devices which are not an integral part of the dedicated self-closing cylinder valve.

This document does not apply to cylinder valves for fixed automotive installations and ball valves.

NOTE For manually operated LPG cylinder valves see ISO 15995. For cylinder valves for compressed, dissolved and other liquefied gases see ISO 10297, ISO 17871 or ISO 17879.

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 11114-1, *Gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 1: Metallic materials*

ISO 11114-2, *Gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 2: Non-metallic materials*

ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 13341, *Gas cylinders — Fitting of valves to gas cylinders*

ISO 10286, *Gas cylinders — Terminology*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 10286 and the following 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 https://www.iso.org/obp

3.1
liquefied petroleum gas
LPG
low pressure liquefied gas composed of one or more light hydrocarbons which are assigned to UN 1011, UN 1075, UN 1965, UN 1969 or UN 1978 only and which consists mainly of propane, propene, butane, butane isomers, butene with traces of other hydrocarbon gases

[SOURCE: ISO 10286:2015, 723, modified]

3.2
cylinder valve
primary shutoff device fitted to LPG cylinders, intended for liquid or vapour filling and withdrawal

Note 1 to entry: The valve includes the *valve body* (3.8), *valve stem* (3.14), *valve outlet* (3.15) and *valve operating mechanism* (3.22).

Note 2 to entry: The valve can also include additional devices, e.g. *eduction tube* (3.5) *liquid level indicator* (3.7), *fixed liquid level gauge* (3.6), *excess flow valve* (3.9), *non-return valve* (3.10), *sediment tube* (3.19) and *pressure relief valve* (3.27).

3.3
external leak tightness
leak tightness to atmosphere (leakage in and/or leakage out), when the valve is open

3.4
internal leak tightness
leak tightness across the valve seat (leakage in and/or leakage out), when the valve is closed

3.5
eduction tube
tube fitted to the valve to allow withdrawal of liquid LPG with the cylinder in its normal operating position

3.6
fixed liquid level gauge
device such as a dip tube in combination with a vent valve to verify that the predetermined maximum liquid level in a cylinder has been reached or surpassed

3.7
liquid level indicator
device such as a float gauge, permitting the gauging of the liquid level in the cylinder

3.8
valve body
major valve component including *valve stem* (3.14) and *valve outlet* (3.15) and, where applicable, the provision for other optional components

3.9
excess flow valve
valve comprising two or more components designed to close or partially close when the flow of liquid or vapour passing through it exceeds a predetermined value and to re-open when the pressure differential across the valve has been restored below a certain value

3.10
non-return valve
automatic valve which allows gas/liquid to flow only in one direction

[SOURCE: ISO 10286:2015, 349, amended — liquid added]

3.11
dual valve
valve designed to allow separate vapour and liquid withdrawal from a cylinder in its normal operating position each port having its own valve operating mechanism

3.12
sealing element
element used to obtain *internal leak tightness* (3.4)

3.13
special valve
valve which is only used for cylinders up to and including 7,5 l water capacity, having a hand wheel diameter less than 30 mm and where the maximum section of gas passage is not more than 4 mm diameter

3.14
valve stem
section of the *valve body* (3.8), which connects to the cylinder

3.15
valve outlet
section of the *valve body* (3.8) to which a regulator or connector can be fitted for vapour or liquid withdrawal

Note 1 to entry: The valve outlet is also normally used for filling the cylinder.

3.16
type test
test or series of tests conducted to prove that the design meets the requirements of this document

3.17
cylinder opening
part of the cylinder to which the *valve stem* (3.14) connects

3.18
test pressure
pressure at which the valve or component is tested

3.19
sediment tube
device designed to reduce the risk of foreign matter, which can be in the cylinder, entering the valve

3.20
sealing cap
device which is intended to seal the external outlet connection of a valve

[SOURCE: ISO 10286:2015, 368]

3.21
sealing plug
device which is intended to seal the internal outlet connection of a valve

[SOURCE: ISO 10286:2015, 369]

3.22
valve operating mechanism
mechanism which closes and opens the valve orifice and which includes the internal and external sealing systems

[SOURCE: ISO 10286:2015, 328, modified — EXAMPLE deleted]

3.23
valve protection cap
device securely fixed over the valve during handling transport and storage and which is removed for access to the valve

[SOURCE: ISO 10286:2015, 360]

3.24
valve shroud
integral part of a cylinder which is permanently attached for valve protection during transportation, handling and storage

[SOURCE: ISO 10286:2015, 362]

3.25
valve guard
device securely fixed over the valve during handling transport and storage and which does not need to be removed for access to the valve

[SOURCE: ISO 10286:2015, 361]

3.26
gross mass
total package mass of the heaviest cylinder on which the valve is intended to be fitted, including any permanently attached accessories and the maximum mass of the LPG content

3.27
pressure relief valve
pressure actuated valve held shut by a spring or other means and designed to relieve excessive pressure automatically by starting to open at the set pressure and reclosing after the pressure has fallen below the set pressure

3.28
nominal set pressure
predetermined pressure of the *pressure relief valve* (3.27) at which the valve is set to start to discharge

3.29
quick coupling connector
system which enables an appliance or equipment to be connected to a cylinder valve without the use of tools

3.30
self-closing cylinder valve
cylinder valve with a normally closed *valve operating mechanism* (3.22) that is actuated by a separate operating device which is not an integral part of the cylinder valve

4 Design and specification

4.1 General

The valve shall be capable of withstanding:

a) operating pressures and test pressures;

b) operating temperatures and test temperatures;

c) mechanical stresses during operation;

d) vibration during transport.

The valve shall be externally and internally leak tight for the full range of pressure and temperature conditions.

The valve and its optional components shall be secured to prevent unintentional disassembly during normal operation and their function shall not be affected as a result of vibration during transport.

4.2 Materials

4.2.1 General

Materials in contact with LPG shall be physically and chemically compatible with LPG under all operating conditions for which the valve is designed in accordance with ISO 11114-1 and ISO 11114-2.

In selecting an appropriate material for valve components, it is important to select not only for adequate strength in service, but also to give consideration to other modes of failure due to atmospheric corrosion, brass dezincification, stress corrosion, shock loads, and material failure.

4.2.2 Operating temperatures

Materials used shall be suitable for the temperatures for which the valve is designed.

The minimum operating temperature, to which the valve is expected to be exposed during normal use, is −20 °C. For some countries and for certain applications, lower minimum operating temperatures are used. When valves are designed for an operating temperature of −40 °C, they shall also meet the requirements of Annex B.

The maximum operating temperature to which the valve is expected to be exposed during normal operation is +65 °C.

4.2.3 Copper alloys

Valve bodies made from copper alloys shall be manufactured from materials in accordance with recognized international, regional (e.g. EN 12164 and EN 12165) or national standards or from alloys of equivalent properties.

4.2.4 Non-metallic materials

Non-metallic materials in contact with LPG shall be compatible with LPG and shall not fail during the service life of the valve. They shall not distort, harden, swell or adhere to the body or seat face to such an extent as to impair the function of the valve.

In accordance with recognized international, regional (e.g. EN 549) or national standards, rubber materials in contact with LPG, for temperatures of −20 °C (−40 °C for low temperature applications) to +65 °C, shall meet the requirements for resistance to:

a) gas (n-pentane test);

b) lubricants;

c) ageing;

d) compression;

e) ozone (where the material is exposed to the atmosphere); and

f) condensate/liquid phase of combustible gases (liquid B test).

4.3 Essential components

4.3.1 Valve operating mechanism

The valve operating mechanism shall be designed in such a way that it remains captive and achieves direct contact with the valve body in the absence of the sealing element, in order to limit the leakage rate of gas and shall satisfy the requirements of 5.4. The valve shall be designed in such a way that the travel distance of the valve operating mechanism cannot be modified. There shall be sufficient travel distance for the valve operating mechanism so that the seal housing makes contact with the seat.

The valve shall operate without difficulty, even after prolonged use, and shall satisfy the requirements of 5.13.

4.3.2 Valve body

If the valve body is made of more than one part, precautions shall be taken to ensure that there can be no unintentional disassembly.

4.3.3 Valve stem

Valve inlet connections shall conform to an international, regional or national standard.

NOTE Valve inlet connection standards are for example ISO 11363-1[3] and ISO 15245-1[5].

The design of the valve stem shall prevent leakage, loosening in service and meet the requirements of 5.8.

Tapered valve stem shall withstand the torque identified in Table 3, without causing such damage as to affect their performance, valve operating mechanism, internal leak tightness and external leak tightness. However, such torque values shall not be used for normal operational applications, see ISO 13341. Parallel threaded valve stems shall withstand the torque identified in 5.8 d).

4.3.4 Valve outlet

The connection between the valve and the equipment shall be by means of a quick coupling connector or a threaded connector.

Valve outlet connections shall conform to an international, regional or national standard.

NOTE Valve outlet connection standards are for example ISO 5145[1] and EN 15202[12].

In the case of a dual valve, the following requirements shall apply:

a) The valve shall have separate vapour and liquid outlet connections. The wall thickness between the passageways through the valve body shall not be less than 1 mm.

b) The liquid outlet shall be a different design to that of the vapour outlet. Valves with liquid and vapour outlets shall have clear identification to distinguish between them, such as different connection geometry and/or marking the outlet connections.

c) It shall not be possible to obtain a flow from the liquid outlet before a leak tight connection has been made. This shall be verified by dimensional check in accordance with 5.4.

4.3.5 Excess flow valve

Valves with a passageway of cross-sectional area equivalent to or greater than a 3 mm diameter hole for liquid, or an 8 mm diameter hole for vapour shall be protected by an excess flow valve (see 4.4.5).

This requirement is not applicable for hot air balloon applications where a risk assessment identifies that the fitting of an excess flow valve would constitute a significant hazard.

