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Gas cylinders — Specifications and testing of LPG cylinder valves — Manually operated

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

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 15995 was prepared by Technical Committee ISO/TC 58, *Gas cylinders*, Subcommittee SC 2, *Cylinder fittings*.

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Introduction

This International Standard calls for the use of substances and procedures that can be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

It has been assumed in the drafting of this International Standard that execution of its provisions is entrusted to appropriately qualified and experienced people.

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Gas cylinders — Specifications and testing of LPG cylinder valves — Manually operated

1 Scope

This International Standard specifies the requirements for design, specification and type testing of dedicated LPG manually operated cylinder valves specifically for use with transportable refillable LPG cylinders from 0,5 l up to 150 l water capacity. It includes references to associated equipment for vapour or liquid service.

NOTE Annex C gives the recommendations for production testing and inspection.

This International Standard does not apply to fixed automotive installations.

2 Normative references

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The following referenced documents are indispensable for the application 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.

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ISO 10920, *Gas cylinders — 25E taper thread for connection of valves to gas cylinders — Specification*

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

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

ISO 11116-1, *Gas cylinders — 17E taper thread for connection of valves to gas cylinders — Part 1: Specifications*

3 Terms and definitions

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

3.1
liquefied petroleum gas
LPG
mixture of predominantly butane or propane with traces of other hydrocarbon gases classified in accordance with UN number 1965, hydrocarbon gas mixture, liquefied, or NOS or UN number 1075, petroleum gases, liquefied

NOTE In some countries, UN number 1011 and UN number 1978 may also be used to designate LPG.

3.2
cylinder valve
valve designed for use in one or more of the following applications: liquid filling, liquid service, vapour service or liquid level indication

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3.3
external tightness
resistance to leakage through the valve body to or from the atmosphere, when the valve is open

3.4
internal tightness
resistance to leakage across the valve seat, or other internal sealing components 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
control 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
control 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 and/or valve outlet and, where applicable, the provision for other optional components

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3.9
excess flow device (flow limiter)
device 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

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3.10
non-return valve
valve designed to close automatically to restrict reverse flow

3.11
vapour/liquid dual valve
valve designed to allow vapour and liquid withdrawal from a cylinder in its normal operating position

3.12
sealing element
element used to obtain internal leak tightness

3.13
valve stem
section of the valve body, which connects to the cylinder

3.14
valve outlet
section of the valve body to which a regulator or connector can be fitted for vapour or liquid withdrawal

NOTE The valve outlet is also normally used for filling the cylinder.

3.15
type test
test or series of tests conducted to prove that the design meets the requirements of this International Standard

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3.16
cylinder opening
part of the cylinder to which the valve stem connects

3.17
test pressure
pressure at which the valve or component is tested in bar gauge

3.18
sediment tube
device designed to reduce the risk of foreign matter, which can be in the cylinder, entering the valve

3.19
sealing cap
device fitted to, or integral with, the outlet of the cylinder valve to provide secondary closure

3.20
valve operating mechanism
mechanism which closes and opens the valve orifice, e.g. threaded valve spindle which, when rotated, raises and lowers a seal

3.21
sealing mechanism
mechanism to obtain internal leak tightness

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3.22
operating torque
torque during opening or closing the valve, after the first half rotation of the hand wheel in opening the valve and before the last half rotation of the hand wheel in closing the valve

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3.23
opening torque
initial torque required to open the valve from the closed position

3.24
closing torque
torque required to close the valve and obtain internal tightness

3.25
protection cap
device that may be screwed to a fitting permanently attached to the cylinder to protect a cylinder valve

3.26
shroud/guard
device that may be welded to the cylinder to protect a cylinder valve

3.27
gross mass
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

3.28
pressure relief valve
valve which automatically, without the assistance of any energy other than that of the fluid concerned, discharges a quantity of fluid so as to prevent a predetermined safe pressure being exceeded, and which is designed to re-close and prevent the further flow of fluid after normal pressure conditions of service have been restored

NOTE The loading due to the fluid pressure underneath the valve-sealing element is opposed by a spring.

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4 Design and specification

4.1 General

4.1.1 The valve shall be capable of withstanding:

— operating pressures and test pressures;

— mechanical stresses, including dynamic loads such as pressure shocks or cyclic changes;

— operating temperatures.

NOTE Pressures are gauged unless otherwise specified.

4.1.2 There shall be valve external and internal leak tightness for the full range of pressure and temperature conditions.

4.1.3 The specific requirements relating to the functions, mechanical strength, pressure, operating temperatures, external and internal leak tightness of the valve and its components, are detailed in the following subclauses of this clause and/or in the relevant test of Clause 5.

4.2 Materials

4.2.1 General

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Materials in contact with LPG shall be physically and chemically compatible with LPG under all operating conditions for which the valve is designed (see 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 minus 20 °C. In service, temperatures below this may be encountered during short periods, for example, during filling. Where necessary, e.g. in some countries and for certain applications, lower minimum operating temperatures shall be used. When equipment is designed for a temperature of minus 40 °C, it shall also meet the requirements of Annex D.

The maximum operating temperature to which the valve is expected to be exposed during normal operation is 65 °C. In service, this temperature may be exceeded for short periods.

4.2.3 Copper alloys

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

4.2.4 Non-metallic materials

Non-metallic materials in contact with LPG shall be compatible with LPG, e.g. ISO 11114-2. They shall not distort, harden or adhere to the body or seat face to such an extent as to impair the function of the valve.

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In accordance with national or international standards, for example EN 549, non-metallic materials in contact with LPG shall meet the requirements for resistance to:

— gas (pentane test);

— lubricants;

— ageing;

— low temperature;

— high temperature;

— compression;

— ozone (where the material is exposed to the atmosphere).

4.3 Essential components

4.3.1 Valve operating mechanism

The valve operating mechanism normally includes a hand wheel.

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. Under normal use, the valve shall operate without difficulty even after prolonged use and shall satisfy the requirements of 5.17.

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The operating mechanism shall withstand an opening and closing torque in accordance with 5.12 and 5.13.

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When a torque is applied in excess of that given in 5.12 and 5.13 the operating mechanism shall not disassemble from the valve body and create a leak. However, the operating mechanism may break or become inoperable. The material of the valve operating mechanism shall withstand fire engulfment such that the valve can still be closed during the early stage of an incident, and shall satisfy the requirements of 5.9.

The sealing element, to ensure internal leak tightness, shall be attached or otherwise assembled such that it will not become dislocated under service conditions. The means to secure the sealing element shall not rely only on cement or adhesive.

All valves shall close when turned clockwise and open when turned anti-clockwise. It is recommended that the valve operating mechanism should be visibly marked with a portion of circle terminating by two arrows. One arrow marked "–"(closure) and the other arrow marked "+"(opening) to indicate the result of the rotation (see Figure 1).

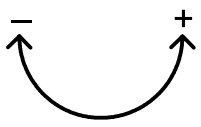

Figure 1 — Hand wheel marking

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 dismantling. Disassembly shall require specialized equipment.

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4.3.3 Sealing mechanism

The sealing mechanism shall ensure internal leak tightness.

4.3.4 Valve stem

The connection between the valve and the LPG cylinder shall be a threaded sealing system in accordance with ISO 10920, ISO 11116-1 or any other connection system that provides an equivalent level of safety.

The design of the valve stem shall prevent leakage, loosening in service, and meet the requirements of 5.7.

The valve stem shall withstand the torque identified in Table 3, without causing such damage as to affect performance, operating mechanism, internal tightness and external tightness. However, it should be noted that such torque values should not be used for normal operational application.

4.3.5 Valve outlet

Valve outlets should conform to a standard such as ISO 5145, EN 12864, or any other connection system that provides an equivalent level of safety.

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

— 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.

— The liquid outlet shall be a different design from 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.

— It shall not be possible to obtain a flow from the liquid outlet before a leak tight connection has been made.

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4.3.6 Excess flow device (flow limiter)

Valves with passageways 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 device (see 4.4.4).

4.4 Optional components

4.4.1 Pressure relief valve

A pressure relief valve shall be designed to operate in the vapour phase. Pressure relief valves for LPG cylinders shall fulfil the requirements of a regional or national standard, e.g. EN 13953.

4.4.2 Eduction tube

The eduction tube shall be securely fitted to the valve to ensure that it does not dismantle during operation, for example using adhesive, press fitting or any other mechanical means.

When a valve with an eduction tube is fitted to a cylinder, its presence and orientation should be clearly identified.

4.4.3 Fixed liquid level gauge

Fixed level gauges that operate by means of temporarily venting a limited quantity of LPG whereupon the change from vapour to liquid is detected, shall meet the following requirements:

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