INTERNATIONAL STANDARD

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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

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.

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*.

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.

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

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.

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

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

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

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

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

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

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

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.

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

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.

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.

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

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).

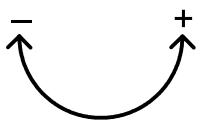

Figure 1 — Hand wheel marking

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.

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.

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:

— The cross-section of the passage way through the gauge body shall at some point be limited to an area equivalent to or less than a 1,5 mm diameter hole.

— The orifice shall be controlled by a vent screw.

— The vent screw shall remain captive, or be permanently attached to the gauge body.

— The direction of venting shall be either horizontal or towards the ground.

— The length of the dip tube shall be determined according to the requirements of the operating conditions.

4.4.4 Excess flow device (flow limiter)

Excess flow devices shall meet the requirements of a regional or national standard, for example EN 13175.

Excess flow devices shall be designed so that their function does not interfere with the operation of a pressure relief valve, if fitted.

4.4.5 Non-return valve

Non-return valves shall be designed so that, when closed, the reverse flow past the seat shall not exceed 15 cm^3/h air at room temperature (typically between 15 °C and 30 °C).

4.4.6 Liquid level indicator

Liquid level indicators shall be designed not to interfere with the performance of the pressure relief valve or excess flow valve (if fitted).

The liquid level indicator mechanism shall be securely fitted to the valve.

4.4.7 Sealing cap

The valve may also be fitted with a sealing cap.

4.4.8 Sediment tube

The sediment tube inlet shall be in the vapour space when the cylinder is in its normal operating orientation at its maximum fill and operating temperature.

4.5 Leak tightness

4.5.1 The external tightness shall be assured for all positions of the valve, from fully open to complete closure and during operation. Leakage rate shall not exceed the value in 5.3.2.

4.5.2 The design and manufacture of the valves shall be such that they shall not leak or become loose or detached during transport.

4.5.3 To obtain internal tightness, the closing torque shall not exceed 3 Nm.

4.6 Operating torque

The operating torque shall not exceed 3 Nm during the valve service life and shall meet the requirement of 5.12 and 5.17.

4.7 Opening torque

After application of the closing torque, the torque required to open the valve shall not exceed 4 Nm and shall meet the requirement of 5.17.2.

4.8 Closing torque

The closing torque shall not exceed 3 Nm during the valve service life and shall meet the requirement of 5.17.

5 Valve type test

5.1 General

The test regime shall consist of tests nos. 1 to 18 in accordance with Table 1.

The acceptance criteria shall be as detailed in 5.22.

Documentation/Reports shall be as detailed in Clause 6.

Valves which are only used for cylinders up to and including 7,5 litre water capacity shall meet the requirements of Annex B or Clause 5.

5.2 Test procedure and test requirements

Thirteen sample valves shall be numbered and tested in accordance with the requirements of Table 1.

Each test shall be carried out in accordance with the relevant clause designated in Table 1. Generally, the clause will detail the “Test procedure” and the “Test requirement”.

Valves shall be tested with all their accessories, excluding any dust cap or sealing cap where appropriate.

5.3 External and internal tightness tests (Test nos. 2, 5, 8, 11, 12, 13, 15, 16 and 17)

5.3.1 Procedure

The valves shall be subjected to this test in accordance with the following procedure:

— The test temperature shall be as detailed in Table 1, i.e. room temperature except in test nos. 16 and 17.

— The test medium shall be air or nitrogen.

— Each external and internal tightness test sequence shall include a test at two pressure settings as shown in Table 2.

— The pressure shall be applied through a fitting reproducing the cylinder opening.

External tightness shall be determined in accordance with the following procedure on each valve:

— The outlet and components if provided shall be sealed.

— The valve operating mechanism shall be in the open position.

— The specified pressure shall be applied to the open valve.

— After a period of at least 1 min, the external tightness shall be checked. The check shall last at least 1 min.

— The test shall be repeated when the valve is approximately one quarter, one half and three quarters closed.

Internal tightness shall be determined in accordance with the following procedure on each valve:

— The valve shall be closed under pressure.

— The outlet shall be depressurized.

— After a period of at least one minute the internal tightness shall be checked. The check shall last at least 1 min.

— The valve shall be depressurized.

Table 1 — Valve test requirements

Test	Test detail	Clause	Condition of test valve/test sequence	Temperature at which the test is performed °C	Valve sample number
1	Hydraulic pressure	5.4	As received	room temperature	1
2	External and internal tightness	5.5	From Test no. 1	room temperature	1
3	Valve closure	5.6	From Test no. 2	room temperature	1
4	Valve stem	5.7	As received	room temperature	2
5	External and internal tightness	5.8	From Test no. 4	room temperature	2
6	Hand wheel fire exposure	5.9	As received		3
7	Impact	5.10	As received	room temperature	4
8	External and internal tightness	5.11	From Test no. 7	room temperature	4
9	Resistance to excessive closing torque	5.12	As received	room temperature	5 and 6
10	Resistance to excessive opening torque	5.13	As received	room temperature	7 and 8
11	External tightness	5.14	From Test no. 9 From Test no. 10	room temperature	5 and 6 7 and 8
12	External and internal tightness	5.15	As received	room temperature	9 to 13
13	External and internal tightness after ageing	5.16	From Test no. 12	room temperature	9 to 13
14	Endurance - Part 1 Endurance - Part 2	5.17	From Test no. 13	room temperature	9 to 13
15	External and internal tightness	5.18	From Test no. 14	room temperature	9 to 13
16	External and internal tightness — High temperature	5.19	From Test no. 15	65 +2.5/–2.5	9 to 13
17	External and internal tightness — Low temperature	5.20	From Test no. 16	– 20 (+0/–5)	9 to 13
18	Examination of dismantled valves	5.21	From Test no. 17	room temperature	9 to 13

NOTE Room temperature means typically between 15 °C and 30 °C.

Table 2 — Test pressures

No.	Test pressure bar gauge
1	0,1
2	25

5.3.2 Requirement for external and internal leak tightness

The leak rate for the external and internal tightness shall not exceed 15 cm^3/h of air measured at 15,6 °C and 1,013 bar, at pressures specified in Table 2.

5.4 Hydraulic pressure test (Test no. 1)

5.4.1 Procedure

This test shall be carried out prior to other tests in the following manner:

— Valve number 1 shall be selected.

— The number of cycles shall be 1.

— The test medium shall be water or other suitable fluid.

— The temperature shall be room temperature.

— The test pressure shall be 45 bar.

— Pressure relief valves, where fitted, shall be removed and the opening plugged.

— The valve operating mechanism shall be in the closed position.

— Pressure shall be applied through a fitting reproducing the cylinder opening.

— The pressure shall be raised continuously and gradually.

— The test pressure shall be held for at least 2 min.

— The test shall then be repeated with the valve operating mechanism in the open position and with the outlet sealed.

5.4.2 Requirement

The valve shall withstand the test without permanent deformation, rupture or leak.

5.5 External and internal tightness test (Test no. 2)

If Test no. 1 is satisfactory, valve no. 1 shall be subjected to an external and internal tightness test in accordance with the procedure detailed in 5.3.1 and the requirements detailed in 5.3.2

5.6 Valve closure test (Test no. 3)

5.6.1 Procedure

If Test no. 2 is satisfactory, the valve drawings shall be examined to determine that there is metal to metal contact between the valve body and the operating mechanism with the sealing element removed.

5.6.2 Requirement

There shall be sufficient travel distance for the operating mechanism so that the seal housing makes contact with the seat.

5.7 Valve stem test (Test no. 4)

5.7.1 Procedure

If the result of Test no. 3 is satisfactory, valve no. 2 shall be tested as follows:

— The temperature shall be room temperature.

— The number of cycles shall be one.

— A mild steel cylinder opening with matching threads shall be used without thread sealant or lubricant.

— The threaded valve stem shall be tightened to the torque settings as shown in Table 3.

The torque values given in Table 3 are intended for the sole purpose of giving an indication of the strength of the valve stem and shall not be used for operational applications.

Table 3 — Minimum required torque for valve stem test

Valve stem major diameter — Large end Dm (see Figure A.1) mm	Torque Nm
$\leqslant$ 19,8	130
$>$ 19,8 $<$ 28,8	200
$\geqslant$ 28,8	250

5.7.2 Requirement

The valve shall not be damaged so as to affect its performance or operating mechanism.

5.8 External and internal tightness test (Test no. 5)

If the result of Test no. 4 is satisfactory, valve no. 2 shall be subjected to this test.

The procedure shall be in accordance with the relevant procedure detailed in 5.3.1 and the requirements detailed in 5.3.2

5.9 Hand wheel fire exposure test (Test no. 6)

5.9.1 Procedure

If Test no. 5 is satisfactory, valve no. 3 shall be subjected to this test in accordance with the following procedure:

— The number of cycles shall be 1.

— The hand wheel shall be exposed for 1 min to a gas torch flame of 150 mm length, without an additional air supply, such that the flame reaches a temperature of 800 °C to 1 000 °C.

— The hand wheel shall be completely enveloped by the flame.

5.9.2 Requirement

The valve shall still be capable of being closed manually after cooling.

5.10 Impact test (Test no. 7)

5.10.1 General

A valve, which is designed to be used only on cylinders protected by a protection cap or shroud, shall be submitted to an impact test of 40 J. The dimensions of the valve shall not exceed those shown in Annex A.

A valve, which is not designed to be protected by a protection cap or shroud, shall be submitted to an impact test with an impact value determined in accordance with the following formula:

$$J = 3{,}6 \cdot M$$

where

J is the impact value (Joules);

M is the gross mass (kilograms).

5.10.2 Procedure

If the result of Test no. 6 is satisfactory, valve no. 4 shall be tested as follows:

— The temperature shall be room temperature.

— The assembled valve, with the sealing mechanism closed, shall be firmly screwed into a cylinder opening or similar fixture.

— A weight shall be dropped from a height so as to deliver an impact at a minimum velocity of 3 m/s. This shall be achieved by mounting the weight in a pendulum or by allowing it to fall vertically.

— The point of impact of the weight shall be a hardened steel ball of 13 mm diameter.

— The point of impact shall be approximately two thirds the distance from the just exposed stem thread to the top of the valve body.

— The impact shall be normal to the centre line of the valve and not cushioned by protrusions.

5.10.3 Requirement

The valve shall not crack or shear to such an extent that LPG would be released. This shall be verified by performing Test no. 8.

5.11 External and internal tightness test (Test no. 8)

If the result of Test no. 7 is satisfactory, valve no. 4 shall be subjected to this test in accordance with the procedure detailed in 5.3.1. and the requirements detailed in 5.3.2.

5.12 Resistance to excessive closing torque test (Test no. 9)

5.12.1 Procedure

The intention of the test is to ensure that the valve can withstand, without damage, the minimum closing torque value of 20 Nm.

If the result of Test no. 8 is satisfactory, valves nos. 5 and 6 shall be tested as follows;

— The number of cycles shall be 1.

— The temperature shall be room temperature.

— The closing torque tests shall be carried out without internal pressure on the valve.

— The torque shall gradually be increased up to the value of 20 Nm.

5.12.2 Requirement

At this torque, the valve shall be able to work without noticeable difficulties and shall not show any significant damage.

For subsequent operation, after 20 Nm is reached, the valve shall not require an operating torque greater than 3 Nm.

The external leak tightness of the valve shall be maintained. This shall be verified by Test no. 11 (5.14).

5.13 Resistance to excessive opening torque test (Test no. 10)

5.13.1 Procedure

The intention of the test is to ensure that the valve can withstand, without damage, the minimum opening torque value 22 Nm (see Table 3).

If the result of Test no. 9 is satisfactory, valves nos. 7 and 8 shall be tested as follows:

— The number of cycles shall be 1.

— The temperature shall be room temperature.

— The opening torque shall be carried out without internal pressure on the valve.

— The torque shall gradually be increased up to the value of 22 Nm.

5.13.2 Requirement

At this torque, the valve shall be able to work without noticeable difficulties and shall not show any significant damage.

For subsequent operation, after 22 Nm is reached, the valve shall not require a torque greater than 3 Nm for operation.

The external leak tightness of the valve shall be maintained. This shall be verified by Test no. 11 (5.14).

5.14 External tightness test (Test no. 11)

If the result of Tests nos. 9 and 10 are satisfactory, valves nos. 5, 6, 7 and 8 shall be subjected to this test.

The procedure shall be in accordance with the procedure detailed in 5.3.1 and the requirements detailed in 5.3.2.

5.15 External and internal tightness test (Test no. 12)

If tests nos. 1 to 11 are satisfactory, valves nos. 9 to 13 shall be subjected to test in accordance with the procedure in 5.3.1 and the requirements detailed in 5.3.2

5.16 External and internal tightness test after ageing (Test no. 13)

If Test no. 12 is satisfactory, valves nos. 9 to 13 shall be subjected to an ageing process.

The ageing process shall be carried out by elevating and maintaining the temperature of the valve, to $\left(65\,^{5}_{-5}\right)$ °C, for a period of 5 days, before the tightness tests are carried out.

The procedure detailed in 5.3.1 shall be followed and the requirements detailed in 5.3.2.

5.17 Endurance test (Test no. 14)

5.17.1 Procedure

If Test no. 13 is satisfactory, valves nos. 9 to 13 shall be subjected to this test. The test shall be in two parts designated Part 1 and Part 2. The following procedure shall be applicable to both parts.

— The internal pressure shall be 12 bar.

— Rotational speed shall be approximately 100 turns per min.

— Opening shall be three quarters of total stroke.

— Open time shall be 6 s.

— Closing torque shall be 3 Nm.

— Closed time shall be 6 s.

After each closure, the pressure downstream of the valve seat shall be released to the atmosphere.

The tests shall be carried out using air or nitrogen.

Care should be taken to ensure that, due to friction, there is no excessive temperature rise in the valve during the test.

The Part 1 test shall consist of 10 000 cycles (openings/closings) without a load on the hand wheel.

The Part 2 test shall consist of 3 000 openings/closings with a load of 200 N applied vertically on the hand wheel for the duration of the test.

5.17.2 Requirement

After the tests, a visual examination of components shall be carried out. Any details regarding deformation, excessive wear, cracks, etc., likely to indicate an early failure of the valve shall be recorded.

The operating torque and the closing torque shall then be checked to ensure that they do not exceed 3 Nm. The opening torque shall not exceed 4 Nm.

5.18 External and internal tightness test (Test no. 15)

If Test no. 14 is satisfactory, valves nos. 9 to 13 shall be subjected to this test in accordance with the procedure detailed in 5.3.1. and the requirements detailed in 5.3.2

5.19 External and internal tightness test — High temperature (Test no. 16)

If Test no. 15 is satisfactory, valves nos. 9 to 13 shall be subjected to this test in accordance with the procedure detailed in 5.3.1 and the requirements detailed in 5.3.2 **except** that the temperature shall be (65)°C.

5.20 External and internal tightness test — Low temperature (Test no. 17)

If Test no. 16 is satisfactory, valves number 9 to 13 shall be subjected to this test in accordance with the procedure detailed in 5.3.1 and the requirements detailed in 5.3.2 **except** that the temperature shall be $\left(20\ {}^{0}_{-5}\right)$ °C.

5.21 Examination of dismantled valves number 9 to 13 (Test no. 18)

5.21.1 Procedure

If the results of tests nos. 12 to 17 on valves nos. 9 to 13 are satisfactory, the valves shall be dismantled and examined for deformation, wear and cracks.

5.21.2 Requirement

Any failure, deformation, excessive wear or cracks that affect the normal operation of the valve shall be a cause for rejection.

5.22 Acceptance criteria

The failure to meet any of these test requirements shall be a cause for rejection of the valve design.

6 Documentation/Test report

6.1 Documentation

The following documents shall be available:

— a set of drawings consisting of the general arrangements, parts list, specifications for metallic and non-metallic materials and detail drawings;

— description of valve and method of operation;

— information on the intended use of the valve (e.g. LPG mixtures, pressures, temperatures, connections, use with or without protection cap or shroud);

— certificates relating to material suitability and compatibility with LPG.

6.2 Test report

A written report shall be prepared detailing the tests carried out and the results from each test.

7 Markings

Cylinder valves meeting the requirements of this International Standard and having successfully passed the tests, shall be permanently marked with the following:

— manufacturer's designation or logo;

— date code, indicating year of manufacture and week or month, e.g. by YY/MM or YY-WW;

— pressure relief valve set pressure if fitted.

Valves fulfilling the requirements of Annex D shall be marked "–40 °C".

Where the valve is not protected by a protection cap, or shroud/guard, it shall be marked with the maximum gross mass of the cylinder for which it is intended (in kg), if this gross mass exceeds 10 kg.

Annex A
(normative)

Valve dimensions

Maximum dimensions for valves to be protected by a cap are as shown in Figure A.1:

— diameter 76 mm;

— height 100 mm.

Dimensions in millimetres

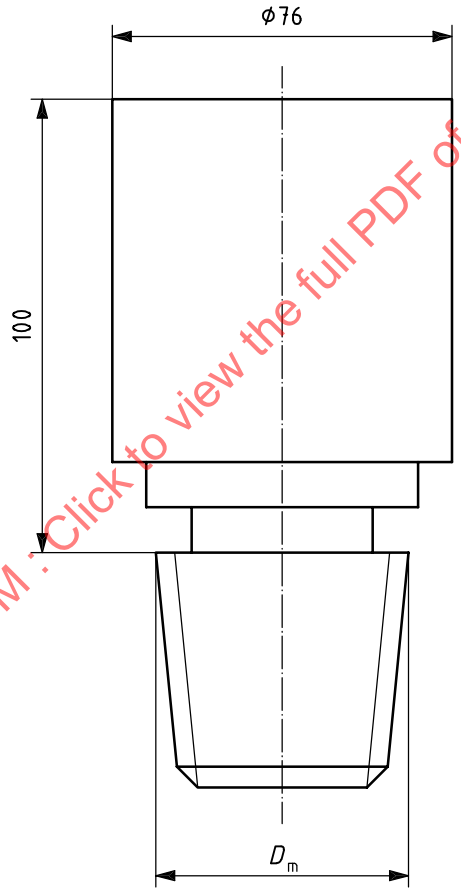

Figure A.1 — Valve dimensions

Annex B
(normative)

Valves for cylinders up to and including 7,5 litre water capacity

B.1 General

Valves with a hand wheel diameter less than 30 mm, and where the maximum section of gas passage is not more than 4 mm diameter, shall use the specification detailed below.

All other clauses of this International Standard shall apply to these valves.

The tests shall be carried out in accordance with Clause 5 with the following changes.

B.2 Test no. 14

B.2.1 Procedure

The tests shall be made on valves nos. 9 to 13.

The tests shall be carried out with air/nitrogen at 12 bar. After each closing, pressure shall be released to the atmosphere.

The tests shall consist of 2 000 openings/closings without load on the hand wheel and shall be performed under the following conditions:

— Rotation speed shall be approximately 100 turns per min.

— Opening shall be three quarters of total stroke.

— Open time shall be 6 s.

— Closing torque shall be 1 Nm.

— Closed time shall be 6 s.

— Pressure shall be 12 bar at room temperature.

B.2.2 Requirement

B.2.2.1 General

After the test, a visual examination of components shall be carried out. Any details regarding deformation, excessive wear, cracks, etc., likely to indicate an early failure of the valve shall be recorded. The operating torque and the closing torque shall then be checked to ensure that it does not exceed 1 Nm. The opening torque shall not exceed 1,3 Nm.

B.2.2.2 Procedure for Tests nos. 9 and 10

The procedures relating to the “Resistance to excessive closing torque test” (Test no. 9, 5.12) and “Resistance to excessive opening torque test” (Test no. 10, 5.13) shall be changed as follows.