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Transportable gas cylinders — Cylinder valves for non-refillable cylinders — Specification and prototype testing

Bouteilles à gaz transportables — Robinets pour bouteilles non rechargeables — Spécifications et essais de prototype

Reference number
ISO 13340:2001(E)

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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 3.

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 member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 13340 was prepared by the European Committee for Standardization (CEN) in collaboration with ISO Technical Committee TC 58, *Gas cylinders*, Subcommittee SC 2, *Cylinder fittings*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this standard, read "...this European Standard..." to mean "...this International Standard...".

Annex ZZ provides a list of corresponding International and European Standards for which equivalents are not given in the text.

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Foreword

The text of EN ISO 13340:2001 has been prepared by Technical Committee CEN/TC 23 "Transportable gas cylinders", the secretariat of which is held by BSI, in collaboration with Technical Committee ISO/TC 58 "Gas cylinders".

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2001, and conflicting national standards shall be withdrawn at the latest by October 2001.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This Standard specifies requirements for gas cylinder valves to be used with non refillable cylinders and the method of testing such valves for prototype approval.

NOTE : Non refillable gas cylinders are specified in prEN 12205:1998 and ISO/FDIS 11118:1999.

This Standard is not applicable to valves for breathing equipment, fire extinguishers and cryogenic equipment.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 720-2	*Transportable gas cylinders - Gases and gas mixtures - Part 2 : Determination of flammability and oxidizing ability of gases and gas mixtures*
EN 849	*Transportable gas cylinders - Cylinder valves - Specification and type testing*
EN ISO 11114-1	*Transportable gas cylinders - Compatibility of cylinder and valve materials with gas contents - Part 1 : Metallic materials (ISO 11114-1:1997)*
EN ISO 11114-2	*Transportable gas cylinders - Compatibility of cylinder and valve materials with gas contents - Part 2 : Non-metallic materials (ISO 11114-2:2000)*
ISO 188	*Rubber, vulcanized or thermoplastic - Accelerated ageing and heat-resistance tests*
ISO 1817	*Rubber, vulcanized - Determination of the effect of liquids*
ISO 5145:1990	*Cylinder valve outlets for gases and gas mixtures - Selection and dimensioning*

3 Terms and definitions

For the purposes of this standard, the following definitions apply :

3.1
working pressure (p_W)

settled pressure, at a uniform temperature of 15 °C, for a full gas cylinder

3.2
valve test pressure (p_{Vt})

for compressed gases:

$p_{Vt} = 1,2 \times p_W$

For liquefied gases and dissolved gases under pressure (for example, acetylene), p_{Vt} is at least equal to the minimum test pressure of the cylinder quoted in the relevant transportation regulation for that gas or gas group, taking account of the actual filling ratio to be used.

NOTE : Transportation regulations sometimes offer a choice of filling ratio together with appropriate minimum test pressures. Generally, p_{Vt} will be the highest of these minimum test pressures for the gas, but in circumstances where a lower filling ratio is to be used, p_{Vt} may be an appropriate lower test pressure.

3.3
single use operating mechanism

a mechanism which when opened once will not reseal

4 Valve requirements

4.1 General

Valves shall operate satisfactorily over the full range of service temperatures, normally from - 20 °C to 65 °C. The range may be extended for short periods (e.g. during filling).

Where higher or lower service temperatures are required for longer periods, the purchaser shall specify accordingly.

Valves shall be capable of withstanding the mechanical stresses and chemicals they may experience during normal operation.

The valves shall be cleaned to meet the requirements of the intended service.

4.2 Description

The cylinder valve shall comprise :

- a body ;
- a valve operating mechanism and sealing device ;
- connection(s) for use (fill and discharge) ;
- a connection system, between the valve and gas cylinder ;

and may occasionally incorporate :

- a safety device against overpressurisation ;
- a dip tube ;
- a screw plug or cap on the outlet connection, to ensure leak tightness or protection ;
- an excess flow limiting device.

4.3 Materials

Metallic and non-metallic materials in contact with the gas shall be chemically and/or physically compatible with the gas under all intended operating conditions (as specified in EN ISO 11114-1 and EN ISO 11114-2).

Where valves may come into contact with oxygen or other oxidizing gases then compatibility of materials with these gases and ignition resistance of materials and lubricants, shall be established by an appropriate test procedure (see for example EN ISO 11114-3).

Valves for acetylene may be manufactured from copper based alloys if the copper content does not exceed 70 % (by weight). The manufacturer shall not use any procedure resulting in copper enrichment of the surface. The silver content of alloys shall be limited for acetylene valves. The acceptable limit varies between 43 % (by weight) and 50 % (by weight), depending on the composition of the alloy.

Non-metallic sealing materials for use with air, oxygen and oxygen enriched gases, shall be capable of withstanding an ageing sensitivity test in accordance with ISO 188.

Non-metallic sealing materials in valves for use with corrosive gases shall be tested in accordance with ISO 1817.

4.4 Design and construction

4.4.1 Valve body

The valve body shall be manufactured by a process that will ensure the reproducibility of the mechanical characteristics necessary to meet the requirements. The anisotropy of the material shall be considered.

It shall be fixed to the gas cylinder in such a way that the valve cannot be replaced without the use of special procedures and tools, e.g. permanently welded, brazed, crimped or glued.

The valve body shall be capable of withstanding a hydraulic pressure test in accordance with 5.2.2.

4.4.2 Valve operating mechanism

The valve operating mechanism shall be manufactured from materials capable of withstanding the mechanical stresses including possible dynamic loads (for example, pressure shocks or cyclic changes) and the extremes of service temperature to which it may be subjected.

The valve operating mechanism shall fulfil the following conditions :

- it shall be designed in such a way that the cylinders cannot be refilled ;

- it shall not be dependent on the pressure in the cylinder ;

- it shall, under normal conditions, operate without difficulty throughout its service life ;

- it shall be designed in such a way that the setting of the operating position of the valve can only be changed by a positive action ;

- it shall be designed to ensure that lubricants that are not oxygen compatible do not come into contact with highly oxidizing gases as defined in EN 720-2 ;

- if relevant, it shall be designed in such a way that it cannot be unscrewed from the valve body with a torque less than 40 Nm.

4.4.3 Tightness

External and internal tightness shall be achieved over the full range of service pressures and temperatures.

The minimum gauge pressure, during the tightness test, shall be 0,1 bar. Where the valve is not intended for use with flammable or toxic gases this pressure may be increased to 0,5 bar.

At the customers request the tightness test may be carried out under vacuum.

The tightness test is normally carried out with air or nitrogen. Valves designated for use with gases lighter than air, or very searching gases (e.g. carbon dioxide), may be subjected to a test using helium. The tightness test shall be carried out at room temperature, at - 20 °C and at + 65 °C.

For the definition of a flammable gas see EN 720-2, and for the definition of a toxic gas see ISO 5145:1990, annex A.

4.4.4 Leakage rate

The internal or external leakage rate shall not exceed 6 cm^3/h at 20 °C and 1 013 mbar.

The specified rate may be amended by agreement and subject to special applications, for example, for valves for highly toxic or high purity gas service, a lower leakage rate may be specified.

5 Prototype valve test

5.1 General

Before valves are introduced into service, they shall be submitted for prototype test.

The manufacturer shall make available to the authorised body the following documents :

- a set of drawings consisting of the general arrangement, parts list and material specifications. Any type variant, within the given family, shall be clearly identified ;

- description of valve and method of operation ;

- information on the field of application of the valve (e.g. gases and gas mixtures, pressures, use with or without valve protection device). It shall be clearly indicated which gases and gas mixtures may be used with each type variant ;

- certificates of material compatibility as required.

5.2 Test valves

5.2.1 Schedule of tests

A minimum of 9 sample valves are required (more samples may be necessary, depending on the number of type variants to be tested) :

- one sample (n° 1) for the hydraulic pressure test (see 5.2.2) ;

- five samples (n°s 2 to 6) for the tightness test (see 5.2.3) ;

- one sample (n° 7) for the non-refillability test (see 5.2.4) ;

- one sample (n° 8) for the valve to cylinder interface test (see 5.2.6) ;

- one sample (n° 9) for any additional test which may be required.

For oxygen service two samples (n° 10 and n° 11) shall be subjected to the oxygen pressure surge valve test (see 5.2.5).

5.2.2 Hydraulic pressure test

For safety reasons this test shall be carried out prior to all other tests.

The hydraulic pressure test shall be carried out under the following conditions :

- valve seat in open position ;
- valve outlet connection sealed ;
- safety relief devices (where fitted) removed and the opening sealed ;
- the test medium is water or any other suitable fluid ;
- the hydraulic test pressure is twice the test pressure of the cylinder, except for valves for acetylene, where the test pressure of the valve shall be 450 bar ;
- the test temperature is the ambient temperature (20 $\pm$ 5) °C ;
- the pressure holding time is 2 minutes minimum.

The pressure shall be raised continuously and gradually. The prototype valve shall withstand the test without permanent deformation or rupture.

5.2.3 Tightness test

Five samples shall be tested. Both internal (across the seat) and external (using the adaptor if any) tightness shall be tested at 0,1 bar or 0,5 bar (see 4.4.3) and at p_{vt}. The leak rate shall not exceed the requirements of 4.4.4.

The valve shall be tested in the flow direction, in the two following conditions :

1) valve closed ;

2) valve open (by an appropriate device if any) the outlet being plugged.

5.2.4 Testing for non-refillability

One sample shall be tested to ensure the valve will resist a positive pressure in the reverse flow direction.

a) for non-return valve types :

either :

1) attach a suitable container of the same water capacity of the cylinder intended to be used to the valve outlet. The valve stem shall be at atmospheric pressure for these tests. Pressurize the container to a positive pressure of 10 % of p_{vt} but not less than 2 bar. Ensure that the valve is open. After 1 hour check the pressure in the container. The fall in pressure of the container shall not exceed 5 % of the original pressure ;

or :

2) attach the valve stem to a suitable container of the same water capacity as the cylinder intended to be used. Apply a continous positive pressure of 10 % of p_{Vt} but not less than 2 bar to the valve outlet. Ensure that the valve is open. After 1 hour check the pressure in the container. The pressure shall not exceed 5 % of the applied pressure.
pressure ;

b) for valves of the single use operating mechanism type :

by visual examination, it shall be established that it is not possible to reassemble the mechanism for the purpose of refilling.

5.2.5 Oxygen pressure surge valve test

Two samples shall be tested in accordance with EN 849. Each valve shall be tested :

- firstly in the closed condition ;

- secondly in the open condition (stem plugged) ;

with the pressure applied to the outlet connection.

5.2.6 Valve to cylinder interface test

One sample valve and cylinder shall be subjected to a hydraulic overpressure to prove each design of valve to cylinder interface. The interface shall not fail at less than 2 times the highest test pressure of any cylinder to be used for that design of interface.

6 Marking

Gas cylinder valves conforming to this standard shall have the standard number marked EN ISO 13340.

7 Test report

A written report shall be prepared summarizing all the tests carried out and the results obtained.

This report shall be signed by the responsible person(s) of the testing organisation and shall include drawings, parts, lists, material certificates, etc.

The report shall be obtainable from the valve manufacturer on request.

Annex ZZ
(informative)

Corresponding International and European Standards for which equivalents are not given in the text

At the time of publication of this Standard, the editions of the following documents were valid. All standards are subject to revision, and parties to agreements based on this Standard are encouraged to investigate the possibility of applying the most recent editions of the documents indicated below. Members of ISO and IEC maintain registers of currently valid international Standards.

EN 720-2	ISO 10156 *Gases and gas mixtures - Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets*
EN 849	ISO 10297 *Gas cylinders - Refillable gas cylinder valves - Specification and type testing*

Bibliography

EN ISO 11114-3	Transportable gas cylinders - Compatibility of cylinder and valve materials with gas contents - Part 3 : Autogenous ignition test in oxygen atmosphere (ISO 11114-3:1997) (AC:1998, included)

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