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Gas cylinders — Quick-release cylinder valves — Specification and type testing

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National foreword

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European foreword

This document (EN ISO 17871:2015) has been prepared by Technical Committee ISO/TC 58 “Gas cylinders” in collaboration with Technical Committee CEN/TC 23 “Transportable gas cylinders” the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by March 2016, and conflicting national standards shall be withdrawn at the latest by March 2016.

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The text of ISO 17871:2015 has been approved by CEN as EN ISO 17871:2015 without any modification.

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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.

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 58, *Gas cylinders*, Subcommittee SC 2, *Cylinder fittings*.

Introduction

This International Standard covers the function of a quick-release cylinder valve as a closure (defined by the UN Model Regulations). Additional features of a quick-release cylinder valve (e.g. pressure regulators, residual pressure-retaining devices, non-return devices, and pressure-relief devices) might be covered by other standards and/or regulations.

This International Standard has been written to be in conformity with the UN Model Regulations. When published, it will be submitted to the UN Subcommittee of Experts on the Transport of Dangerous Goods with a request that it be included in the UN Model Regulations.

Where there is any conflict between this International Standard and any applicable regulation, the regulation always takes precedence

In this International Standard, the unit bar is used due to its universal use in the field of technical gases. However, it is 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 International Standard are given as gauge pressure (pressure exceeding atmospheric pressure) unless noted otherwise.

INTERNATIONAL STANDARD ISO 17871:2015(E)

Gas cylinders — Quick-release cylinder valves — Specification and type testing

1 Scope

This International Standard in conjunction with ISO 10297:2014 and ISO 14246:2014 specifies design, type testing, marking and manufacturing tests, and examinations requirements for quick-release cylinder valves intended to be fitted to refillable transportable gas cylinders which convey non-toxic, non-oxidizing, and non-corrosive compressed or liquefied gases or extinguishing agents charged with compressed gases to be used for fire-extinguishing, explosion protection, and rescue applications.

NOTE 1 The main application of such quick-release cylinder valves is in the fire-fighting industry. However, there are other applications such as to avalanche airbags, life raft inflation, and similar applications.

This International Standard covers the function of a quick-release cylinder valve as a closure.

This International Standard does not apply to quick-release cylinder valves for cryogenic equipment, for portable fire extinguishers, or for liquefied petroleum gas (LPG).

NOTE 2 Quick-release cylinder valves of refillable propellant gas cylinders used as part of portable fire extinguishers are also covered by this International Standard, if these cylinders are transported separately.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 10286, *Gas cylinders — Terminology*

ISO 10297:2014, *Gas cylinders — Cylinder valves — Specification and type testing*

ISO 14246:2014, *Gas cylinders — Cylinder valves — Manufacturing tests and examinations*

ISO 22435, *Gas cylinders — Cylinder valves with integrated pressure regulators — Specification and type testing*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 10286, ISO 10297:2014 and the following apply.

3.1
quick-release cylinder valve
cylinder valve with a valve operating mechanism designed for quick release of gas cylinder contents that is actuated by a valve operating device and which can be activated by an *activation device* (3.2) which might not be part of the quick-release cylinder valve

Note 1 to entry: Quick-release cylinder valves are further subdivided in accordance with 3.1.1 and 3.1.2.

Note 2 to entry: Commonly used valve operating mechanisms are pistons, flaps, bursting discs, piercing discs, or differential pressure devices.

3.1.1
quick-release cylinder valve of type A
quick-release cylinder valve for one-time operation for the purpose of discharging the entire contents of the gas cylinder where the valve operating mechanism is damaged/destroyed

Note 1 to entry: Consequently, the valve operating mechanism needs to be replaced or reconditioned before re-use, if intended. See ISO 22434 for further information on inspection and maintenance of cylinder valves.

3.1.2
quick-release cylinder valve of types B to E
quick-release cylinder valve for multiple operation for the purpose of total or intermittent discharging of the contents of the gas cylinder where the valve operating mechanism remains operable

Note 1 to entry: Consequently, if the valve is to be re-used, only the valve operating device or activation device needs to be replaced or reconditioned before re-use, if at all.

— type B valve: total number of operations of the valve operating mechanism by all existing valve operating devices up to 10 times

— type C valve: total number of operations of the valve operating mechanism by all existing valve operating devices up to 100 times

Note 2 to entry: This number of operations was taken from ISO 16003 and EN 12094-4.

— type D valve: total number of operations of the valve operating mechanism by all existing valve operating devices up to 500 times

Note 3 to entry: This number of operations was taken from UL 2166, UL 2127 and FM 5600.

— type E valve: total number of operations of the valve operating mechanism by all existing valve operating devices up to 2000 times

Note 4 to entry: This number of operations was taken from ISO 10297:2014.

3.2
activation device
means for initiating the activation of the valve operating device in order to open the associated valve operating mechanism and release the gas cylinder contents, e.g. by manual, mechanical, electrical, magnetical, thermal, hydraulical, pneumatical, or pyrotechnical means or combinations thereof

Note 1 to entry: A quick-release cylinder valve can be fitted with more than one valve activation device actuating the same valve operating device or with different valve activation devices actuating different valve operating devices.

4 Requirements

4.1 General requirements

Quick-release cylinder valves shall comply with the requirements of ISO 10297:2014, unless this International Standard expressly allows differing requirements or stipulates additional requirements.

It is the responsibility of the manufacturer to classify the type of the quick-release cylinder valve according to 3.1.1 (type A) or 3.1.2 (type B, C, D, or E) and to declare if the quick-release cylinder valve is designed for intermittent discharge.

4.2 Differing/additional requirements

4.2.1 Valve connections

Differing from the requirements given in ISO 10297:2014, 5.4, if the valve filling connection is separate from the valve outlet connection, the relevant requirements given in ISO 22435 shall be met, but the number of endurance cycles for the filling connection non-return valve shall be as given in Table 1.

For type A valves, if the non-return valve in the separate valve filling connection does not require to be replaced after each operation, it shall be subjected to a number of endurance test cycles to be specified by the manufacturer.

4.2.2 Resistance to mechanical impact

Differing from the requirements given in ISO 10297:2014, 5.5.2, quick-release cylinder valves need not remain capable of being opened for emergency venting purposes if the quick-release cylinder valve has a means of safely venting the gas contents. After the impact test, the securing arrangements used shall still ensure the quick-release cylinder valve does not open.

4.2.3 Valve operating device

The requirements given in ISO 10297:2014, 5.7, are not applicable, except for the requirement for the handwheel diameter.

4.2.4 Leakage

Differing from ISO 10297:2014, 5.8, the total external leakage (if to be tested, see 4.2.8) shall not exceed 12 cm^3/h.

4.2.5 Documentation

In addition to the requirements given in ISO 10297:2014, 6.2, the manufacturer shall provide an operating instruction, including at least the following:

a) the valve type including explanation of the related restrictions for use [e.g. application(s) and number of permitted operations as well as information on replacement or reconditioning, if applicable];

b) the gases and extinguishing agents the valve is intended to be used with;

c) the valve test pressure (see 4.2.5) or information on the filling conditions (e.g. for liquid fire-extinguishing agents charged with compressed gases: filling ratio, filling pressure and related filling temperature of compressed gas) to determine valve test pressure;

d) all applicable activation conditions (e.g. activation pressure range, forces, angle of rotation, current and/or voltage);

e) information on securing arrangements (see 4.2.10);

f) for quick-release cylinder valves with a non-return valve in the separate filling connection which will not be replaced after operation of the quick-release cylinder valve, the maximum permissible number of filling cycles which is equal to the number of endurance cycles (see 4.2.1).

4.2.6 Valve test pressure

In addition to the requirements given in ISO 10297:2014, 6.6.2, p_{vt} for liquid extinguishing agents charged with compressed gases shall be at least the developed pressure of a full gas cylinder at 65 °C. The developed pressure at 65 °C shall be calculated depending on the compressed gas and its filling pressure at a given filling temperature as well as filling ratio. The vapour pressures and volumetric expansion of all substances in the gas cylinder shall be taken into account.

NOTE 1 Liquid phase expansion coefficients and vapour pressures are for example available from NIST databases[1)] or from fire-extinguishing agents manufacturer's data sheets.

NOTE 2 The calculation method is given in Packing Instructions P 200 and P 206 of the UN Model Regulations.

1) NIST = National Institute of Standards and Technology, USA, www.nist.gov.

If available, experimental data for the developed pressure at 65 °C taking the solubility of the compressed gas into account may be used instead of calculated data.

If the filling conditions are not known; the manufacturer has to specify p_{vt}.

4.2.7 Flame impingement test

Differing from ISO 10297:2014, 6.10, the flame impingement test need not be carried out.

4.2.8 Leak tightness tests

Differing from ISO 10297:2014, 6.12, the internal leak tightness test at a pressure of 0,5 bar in accordance with ISO 10297:2014, Table 4, need not be carried out. The internal leak tightness test at a pressure of 10 bar in accordance with ISO 10297:2014, Table 4, shall only be carried out for quick-release cylinder valves designed for intermittent discharge.

The external leak tightness tests need only be carried out for quick-release cylinder valves whose valve operating mechanism is open during stand-by operation. The external tightness test shall be carried out with the quick-release cylinder valve in the "fully open" position only.

In case the test procedures given in ISO 10297:2014, 6.12.2.2 and 6.12.2.3, cannot be completely followed, a similar test procedure to verify tightness shall be applied.

EXAMPLE 1 Quick-release valves of type A cannot be closed after being opened.

EXAMPLE 2 Certain designs of quick-release valves cannot be closed under pressure.

4.2.9 Endurance test

Differing from ISO 10297:2014, 6.13, the endurance test is not applicable for quick-release cylinder valves of type A.

For quick-release cylinder valves of types B to E, the endurance test with the number of cycles given in Table 1 shall be carried out for each valve operating mechanism with each valve operating device which will not be replaced after operation of the quick-release cylinder valve. For each valve operating device to be tested; the number of test samples shall be taken from ISO 10297:2014, Table 3. If the valve operating device can be activated by different valve activation devices, the most severe activating conditions shall be used for testing.

Table 1 — Number of cycles to be completed during endurance test

Valve type	Number of cycles
B	10
C	100
D	500
E	2 000

In case the test procedure given in ISO 10297:2014, 6.13, cannot be completely followed, the endurance test shall be carried out in a manner comparable to the intended use (e.g. for certain quick-release valves designed for total discharge the inlet pressure has to be released after each cycle).

Differing from ISO 10297:2014, 6.13, the pause at each fully open position of the quick-release cylinder valve (valve operating mechanism open) may be reduced to not less than 3 s.

4.2.10 Securing arrangements

In addition to the requirements given in ISO 10297:2014 in order to prevent inadvertent operation and release of gas cylinder contents during any other situation than intended use, either:

a) the valve operating device of the quick-release cylinder valve shall be fitted with securing arrangements (e.g. pin), or

b) the valve outlet shall be equipped with a pressure retaining gas-tight closure. Such gas-tight closures shall incorporate a means of safely releasing trapped gas (e.g. a plug or cap with multiple thread turns and equipped with a venting hole).

4.3 Manufacturing tests and examinations

Manufacturing tests and examinations shall be carried out in accordance with Annex A.

5 Marking

Differing from the requirements in ISO 10297:2014, Clause 6, quick-release cylinder valves complying with this International Standard shall be durably and legibly marked with the following:

a) coded identification of this International Standard "ISO Q"; followed by the letter indicating the type of quick-release cylinder valve (see 3.1);

EXAMPLE "ISO QA" for a quick-release cylinder valve of type A.

b) manufacturer's identification;

c) year and month (or week) of manufacture, i.e. YY/MM (or YY-WW) or YYYY/MM (or YYYY-WW);

d) test pressure, with the prefix "TP" followed by the value of p_{vt}, and "BAR";

EXAMPLE "TP250BAR".

e) identification of the valve inlet connection if it is not already required by the relevant inlet connection standard. This identification shall be given by a unique alphanumeric code such as that found in ISO/TR 11364;

f) identification of the valve outlet connection if it is not already required by the relevant outlet connection standard. This identification shall be given by a unique alphanumeric code identified by the manufacturer;

g) identification of the valve filling connection if separate to the valve outlet connection and if it is not already required by the relevant filling connection standard. This identification shall be given by a unique alphanumeric code identified by the manufacturer;

h) for valves meeting the requirement of ISO 10297:2014, 5.5.2, the maximum permitted total package mass for which the quick-release cylinder valve has been tested shall be marked (e.g. 70 KG);

i) If the valve operating device operates by rotation, the closing direction shall be clearly marked.

Additional marking may be required upon request.

NOTE The relevant transport regulation might require additional marking.

Annex A
(normative)

Manufacturing tests and examinations

A.1 General requirements

Quick-release cylinder valves shall comply with the requirements of ISO 14246:2014, unless this International Standard expressly allows differing requirements or stipulates additional requirements.

A.2 Differing/additional requirements

A.2.1 Valve test pressure

The valve test pressure shall comply with 4.2.6.

A.2.2 Tests to be performed on every valve

Differing from the requirements in ISO 14246:2014, the external leak tightness test need only be carried out for quick-release cylinder valves whose valve operating mechanism is open during stand-by operation. Differing from the requirements in ISO 14246:2014, the external leakage shall not exceed 12 cm^3/h at STP.

Bibliography

[1] EN 12094-4, *Fixed firefighting systems — Components for gas extinguishing systems — Part 4: Requirements and test methods for container valve assemblies and their actuators*

[2] ISO 16003, *Components for fire-extinguishing systems using gas — Requirements and test methods — Container valve assemblies and their actuators; selector valves and their actuators; nozzles; flexible and rigid connectors; and check valves and non-return valves*

[3] ISO 22434, *Transportable gas cylinders — Inspection and maintenance of cylinder valves*

[4] ISO 80000-4, *Quantities and units — Part 4: Mechanics*

[5] ISO/TR 11364, *Gas cylinders — Compilation of national and international valve stem/gas cylinder neck threads and their identification and marking system*

[6] FM 5600, *Approval Standard for Clean Agent Extinguishing Systems, Class Number 5600*[2)]

[7] UL 2127, *Inert Gas Clean Agent Extinguishing System Units*[3)]

[8] UL 2166, *Halocarbon Clean Agent Extinguishing System Units*

[9] Model Regulations UN *Recommendations on the Transport of Dangerous Goods — Model Regulations,* as amended

[10] Safety Info EIGA 22/08/E, *Potential Hazards of quick opening cylinder valves used with fire-fighting gases*

[11] CGA SB-39 – 2008, *Potential Hazards of quick opening cylinder valves used with fire-fighting gases*

2) Available from FM Approvals, www.fmglobal.com.

3) Available from UL, Underwriters Laboratories Inc., www.ul.com.

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