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

*Bouteilles à gaz — Robinets de bouteilles à ouverture rapide —
Spécifications et essais de type*

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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.

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 23, *Transportable gas cylinders*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 17871:2015), which has been technically revised. It also incorporates the Amendment ISO 17871:2015/Amd 1:2018.

The main changes compared to the previous edition are as follows:

- extension of the scope to valves for pressure drums and tubes;
- addition of the valve burst test pressure;
- deletion of the flame impingement test;
- deletion of internal leak tightness test at $-40\text{ }^{\circ}\text{C}$ for quick-release cylinder valves only used for fixed fire-fighting systems installed in buildings;
- complete revision of [4.2.11](#) and [Annex A](#).

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 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) can be covered by other standards and/or regulations.

Quick-release cylinder valves complying with this document can be expected to perform satisfactorily under normal service conditions.

This document pays particular attention to:

- a) suitability of materials;
- b) safety (mechanical strength, impact strength, endurance, leak tightness);
- c) testing;
- d) marking.

This document has been written so that it is suitable to be referenced in the UN Model Regulations^[1].

In this document, 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 ($1 \text{ bar} = 10^5 \text{ Pa} = 10^5 \text{ N/m}^2$).

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

Charging of agents with a compressed gas is, in some areas, e.g. fire-fighting, referred to as super-pressurization.

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

1 Scope

This document, in conjunction with ISO 10297 and ISO 14246, 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, pressure drums and tubes which convey:

- non-toxic;
- non-oxidizing;
- non-flammable; 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 avalanche airbags, life raft inflation and similar applications.

NOTE 2 Where there is no risk of ambiguity, gas cylinders, pressure drums and tubes are addressed with the collective term “cylinders” within this document.

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

This document does not apply to quick-release cylinder valves for cryogenic equipment and for liquefied petroleum gas (LPG).

This document does not apply to quick-release cylinder valves if used as the main closure of portable fire extinguishers because portable fire extinguishers are not covered by transport regulation.

Quick-release cylinder valves of auxiliary refillable propellant gas cylinders used within or as part of portable fire extinguishers are covered by this document, if these cylinders are transported separately, e.g. for filling (see UN Model Regulations, Chapter 3.3, Special Provision 225, second note^[1]).

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 10286, *Gas cylinders — Terminology*

ISO 10297:2014+Amd.1:2017, *Gas cylinders — Cylinder valves — Specification and type testing*

ISO 14246, *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 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

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 which can be activated by an *activation device* (3.4) 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 3.2 and 3.3.

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

3.2

quick-release cylinder valve of type A

quick-release cylinder valve (3.1) for one-time operation for the purpose of discharging the entire contents of the gas cylinder where the valve operating mechanism is designed to be damaged/destroyed when operated

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.

3.3

quick-release cylinder valve of types B to E

quick-release cylinder valve (3.1) 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 but is designed for no more than a specific number of cycles of use

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. The total number of operations of the valve operating mechanism by all existing valve operating devices is:

- type B valve: up to 10 times (as defined in ISO 16003);
- type C valve: up to 100 times (as defined in EN 12094-4);
- type D valve: up to 500 times (as defined in UL 2166, UL 2127 and FM 5600);
- type E valve: up to 2 000 times (as defined in ISO 10297).

3.4

activation device

means for initiating the activation of the valve operating device

EXAMPLE Manually, mechanically, electrically, magnetically, thermally, hydraulically, pneumatically, pyrotechnically or a combination thereof.

Note 1 to entry: A quick-release cylinder valve can be fitted with multiple valve activation devices and/or multiple valve operating devices.

4 Requirements

4.1 General requirements

Quick-release cylinder valves shall comply with all requirements of ISO 10297, unless this document 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 the definitions in [3.2](#) (type A) or [3.3](#) (type B, C, D, or E) and to declare if the quick-release cylinder valve is designed for intermittent or total discharge.

For type A valves for auxiliary refillable propellant gas cylinders with a water capacity of not more than 1,5 l, and where each filling requires the replacement of the valve operating mechanism, the material requirements for the valve body given in ISO 10297:2014+Amd.1:2017, 5.2, do not apply because for such designs the neck of the cylinder acts as the valve body.

4.2 Differing/additional requirements

4.2.1 Valve connections

Differing from the requirements given in ISO 10297:2014+Amd.1:2017, 5.4, if the valve filling connection is separate from the valve outlet connection, the relevant requirements for the endurance test of the separate filling connection closure device given in ISO 22435 shall be met, but the number of endurance cycles for the filling connection closure device shall be as specified by the manufacturer.

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+Amd.1:2017, 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 mechanism

Differing from the requirements given in ISO 10297:2014+Amd.1:2017, 5.6.3, the number of endurance cycles is given in [Table 1](#).

4.2.4 Valve operating device

The requirements given in ISO 10297:2014+Amd.1:2017, 5.7, are not applicable, except for the requirement for the handwheel diameter.

4.2.5 Leakage

Differing from ISO 10297:2014+Amd.1:2017, 5.8, the total external leakage (if to be tested, see [4.2.9](#)) shall not exceed 12 cm³/h.

4.2.6 Documentation

In addition to the requirements given in ISO 10297:2014+Amd.1:2017, 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 charged with compressed gases the valve is intended to be used with;
- c) the valve test pressure (see 4.2.8) or information on the filling conditions (e.g. for 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 4.2.11);
- 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).

4.2.7 Valve burst test pressure

In addition to the requirements given in ISO 10297:2014+Amd.1:2017, 6.6.1, p_{vbt} for extinguishing agents charged with compressed gases is calculated as $1,5 \times p_{vt}$.

4.2.8 Valve test pressure

In addition to the requirements given in ISO 10297:2014+Amd.1:2017, 6.6.2, p_{vt} for extinguishing agents charged with compressed gases shall be at least the developed pressure of the filled cylinder at 65 °C. The developed pressure at 65 °C shall be calculated depending on the compressed gas and its maximum filling pressure at a given filling temperature as well as maximum filling ratio. The vapour pressures and volumetric expansion of all substances in the cylinder shall be taken into account.

NOTE 1 Liquid phase expansion coefficients and vapour pressures are, for example, available from NIST databases¹⁾ 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].

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.

NOTE 3 For experimental data, see, for example, the ISO 14520 series.

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

4.2.9 Leak tightness tests

Differing from ISO 10297:2014+Amd.1:2017, 6.12, the following apply:

- the internal leak tightness test at a pressure of 0,5 bar in accordance with ISO 10297:2014+Amd.1:2017, Table 4, does not need to be carried out;

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

- the internal leak tightness test at a pressure of 10 bar in accordance with ISO 10297:2014+Amd.1:2017, Table 4, shall only be carried out for quick-release cylinder valves designed for intermittent discharge;
- the internal leak tightness test at $-40\text{ }^{\circ}\text{C}$ in accordance with ISO 10297:2014+Amd.1:2017, Table 4, does not need to be carried out for quick-release cylinder valves only used for fixed fire-fighting systems installed in buildings;
- 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. This external tightness test shall be carried out with the quick-release cylinder valve in the “fully open” position only.

The applicable parts of the test procedures given in ISO 10297:2014+Amd.1:2017, 6.12.2.2 and 6.12.2.3, shall be applied.

EXAMPLE 1 Certain designs of 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.

4.2.10 Endurance test

Differing from ISO 10297:2014+Amd.1:2017, 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+Amd.1:2017, 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+Amd.1:2017, 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 shall be released after each cycle).

Differing from ISO 10297:2014+Amd.1:2017, 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.

4.2.11 Securing arrangements

In order to prevent uncontrolled release of cylinder contents through inadvertent opening of the valve operating mechanism, as a minimum one of the following measures shall be applied:

- a) the valve operating mechanism shall be safeguarded by an independent securing means (e.g. pin),
- b) the valve outlet shall be fitted with one of the following:
 - a pressure retaining gas-tight closure. It shall have means of safely releasing trapped gas (e.g., a plug or cap with multiple thread turns equipped with a venting hole). Such closures shall not be used for liquefied gases or extinguishing agents charged with compressed gases;

- an outlet closure with flow restriction. Such closures shall incorporate a means of safely releasing the contents in case of inadvertent operation (e.g. holes in the closure). The gas discharge should be directed such that the gas cylinder is not made unstable such that it could fall over.

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+Amd.1:2017, Clause 6, quick-release cylinder valves complying with this document shall be durably and legibly marked with the following:

- a) coded identification of this document “ISO Q”; followed by the letter indicating the type of quick-release cylinder valve (see [3.2](#) and [3.3](#));

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, for example, 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+Amd.1:2017, 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;
- j) if the valve was not leak tightness tested at -40 °C , “ -20 °C ” shall be marked.

Additional marking may be required upon request.

NOTE The relevant transport regulation can require additional marking.