
**Gas cylinders — Cylinder valves —
Manufacturing tests and examinations**

*Bouteilles à gaz — Robinets de bouteilles à gaz — Essais de
fabrication et contrôles*

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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 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 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 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*.

This second edition cancels and replaces the first edition (ISO 14246:2001), which has been technically revised.

The main changes from ISO 14246:2001 are

- the scope refers to cylinder valves, main valves for cylinder bundles and cylinder valves or main valves with integrated pressure regulators (VIPR) according to ISO 10297 only,
- the definitions were brought in line with the revision of ISO 10297 and ISO 10286,
- addition of a separate clause for the determination of the valve test pressure,
- modification/addition/deletion of manufacturing related definitions (batch/sample/shift),
- modification of tests to be performed on every valve,
- modification of inspections, verifications and examinations to be performed on a sample,
- addition of procedures to verify materials of construction and components,
- deletion of revalidation tests, and
- modification of example of test protocol on every valve.

Introduction

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

Cylinder valves complying with this International Standard can be expected to perform satisfactorily under normal service conditions.

This International Standard pays particular attention to manufacturing tests and examinations of cylinder valves designed and type tested according to ISO 10297.

This standard has been written to be in conformity with the UN Model Regulations. When published it will be submitted to the UN Sub Committee 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. It should, however, be 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/m²).

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

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Gas cylinders — Cylinder valves — Manufacturing tests and examinations

1 Scope

This International Standard describes the procedures and acceptance criteria for manufacturing testing and examination (sometimes called initial inspection and tests) of cylinder valves that have been manufactured according to type approvals.

This International Standard is applicable to

- a) cylinder valves intended to be fitted to refillable transportable gas cylinders,
- b) main valves (excluding ball valves) for cylinder bundles, and
- c) cylinder valves or main valves with integrated pressure regulator (VIPR)

designed and type tested according to ISO 10297.

NOTE Where there is no risk of ambiguity, cylinder valves, main valves and VIPR are addressed with the collective term “valves” within this document.

The principles of these tests and examinations can be beneficially applied to cylinder valves type tested to national or International Standards other than ISO 10297.

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

ISO 15001, *Anaesthetic and respiratory equipment — Compatibility with oxygen*

3 Terms and definitions

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

3.1 valve working pressure

p_w

settled pressure of a compressed gas at a uniform reference temperature of 15 °C in a full gas cylinder for which the valve is intended

Note 1 to entry: This definition does not apply to liquefied (e.g. carbon dioxide) or dissolved (e.g. acetylene) gases.

[SOURCE: ISO 10297:2006, 3.1, modified - Terminology has changed.]

3.2 valve test pressure

p_{vt}

minimum pressure applied to a valve through a gas during testing

[SOURCE: ISO 10297:2006, 3.2, modified - Terminology has changed.]

3.3

external leak tightness

leak tightness to atmosphere (leakage in and/or leakage out) when the valve is open

[SOURCE: ISO 10297:2006, 3.3, modified - Reference to Figure 1 has been deleted.]

3.4

internal leak tightness

leak tightness across the valve seat (leakage in and/or leakage out) when the valve is closed

[SOURCE: ISO 10297:2006, 3.4]

3.5

batch

quantity of valves of the same type tested design and production order, which is produced as a controlled number in a specified time period

3.6

sample

quantity of valves selected from a *batch* (3.5) according to a recognized sampling procedure

Note 1 to entry: The ISO 2859 series specifies sampling procedures for inspection.

4 Cleaning

The valves shall be supplied clean and dry to meet the requirements of the intended service. In addition, valves for oxygen and other oxidizing gases (see ISO 10156) shall be supplied cleaned of oil, grease and particulate matter to meet the requirements of ISO 15001 or any relevant standard or regulation, except for non-medical applications where the maximum particle size shall be less than 200 µm. This shall be ensured by the cleaning process.

5 Manufacturing tests and examinations

5.1 General

Manufacturing tests and examinations shall include

- tests to be performed on every valve,
- inspections, verifications and examinations to be performed on a sample, and
- procedures to verify materials of construction and components.

Test results and examinations shall be recorded.

5.2 Valve test pressure

a) For compressed gases:

$$p_{vt} = 1,2 \times p_w$$

b) For liquefied gases, e.g. carbon dioxide, and dissolved gases, e.g. acetylene, p_{vt} shall be at least equal to the minimum test pressure quoted in the relevant transport regulation for that gas or gas group.

Where the transport regulation does not specify a minimum test pressure, the test pressure marked on the cylinder for which the valve is intended shall be used.

5.3 Tests to be performed on every valve

All valves shall be subjected to both internal leak tightness and external leak tightness testing prior to dispatch.

For internal leak tightness the valve shall be pressurized from the valve inlet gas passage. For external leak tightness the valve in open position shall be pressurized from the valve inlet gas passage with the valve outlet connection sealed or pressurized from the valve outlet connection with the valve inlet connection sealed. The external leak tightness of valves fitted with accessories which form the pressure envelope, e.g. pressure relief devices and pressure gauges shall be determined with these accessories in place.

In addition, the presence of a through passage shall be verified.

Testing shall be conducted at p_{vt} or for valves equipped with pressure activated pressure relief devices at 0,8 times the lowest value of the range of the set pressure of the pressure relief device or as per the applicable national regulation and/or standard.

Leak tightness tests shall be performed at ambient temperature (usually between 15 °C and 30 °C). Valves shall be closed with the closing torque specified by the manufacturer but not exceeding the endurance torque at start ($T_{e,start}$) as used during type testing in accordance with ISO 10297. The internal leakage rate shall not exceed 6 cm³/h. The total external leakage (typically comprising that from the external valve sealing system plus e.g. PRD, RPV, pressure indicating devices and pressure regulating or reduction system) shall not exceed 6 cm³/h for a cylinder valve or main valve, or 12 cm³/h for a VIPR. For high integrity valves, e.g. valves for very toxic or ultra-high purity gas service, lower leakage rates for both internal and external tightness tests can be required. Additionally an extra external tightness test to measure the leakage in value can be required.

These tests are usually conducted with oil free dry air or nitrogen but other suitable test gases may be used.

An example of a test protocol is given in [Annex A](#). Other qualified or accepted methods that comply with this clause may also be used.

NOTE Additional testing can be required for valves with special features, e.g. residual pressure valves or VIPRs.

5.4 Inspections, verifications and examinations to be performed on a sample

These procedures shall be performed on a sample. The sampling procedure, the sequence and the detailed content shall be specified in the manufacturer's quality assurance system. The corresponding inspections, verifications and examinations shall be carried out to verify the manufacturing process with regard to at least:

- compliance with production or customer order by comparison with the general assembly drawing and other documentation,
- metallic and non-metallic materials by verification of supplier documentation, e.g. material certificates,
- stress relieving (if required) by verification of manufacturing documentation,
- machining by visual and metrological inspection,
- dimensions by metrological inspection,
- cleanliness by visual examination and verification of manufacturing documentation,
- assembling by visual inspection for use of correct components, of application and quantity of lubricants, sealants and adhesives and inspection of torques during disassembly,
- testing by verification of manufacturing documentation, and

— marking by visual examination.

5.5 Procedures to verify materials of construction and components

Manufacturers shall define a quality management system that includes their suppliers, subcontractors, third party laboratories and their own facilities (if necessary) with the aim of ensuring that metallic and non-metallic materials of the correct and proven specifications, as well as components, are incorporated into valves as per the current type approval.

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Annex A (informative)

Example of test protocol on every valve

The following test protocol can be applied for valves for industrial service.

- a) Set the valve in the open condition with the valve outlet connection sealed. Apply the valve test pressure through the valve inlet gas passage. Check for any external leakage.
- b) With the valve outlet connection remaining sealed, close the valve under the applied valve test pressure with the closing torque specified by the manufacturer but not exceeding $T_{e,start}$ as used during type testing according to ISO 10297. Remove the seal from the valve outlet connection and verify the release of trapped gas from the valve outlet connection. This procedure ensures that the valve was not in a closed condition before the test and that the valve has a through passage.
- c) With the valve remaining in the same closed condition as above check at the valve outlet connection for any internal leakage across the valve seat.

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