

ICS 23.020.30

CCS J 74



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 12137-2025

Replacing GB/T 12137-2015

Methods for leakage test of gas cylinders

气瓶气密性试验方法

Issued on: August 29, 2025

Implemented on: March 1, 2026

**Issued by: State Administration for Market Regulation;
Standardization Administration of China**

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1 Scope

GB/T 12137-2025 is the Chinese national standard on methods for leakage test of gas cylinders, in the field of fluid systems and general-purpose components. The /T suffix marks it as a recommended standard: it is not compulsory by itself, but it becomes binding as soon as a contract, a tender or a customer specification calls it up - which in practice is how most foreign buyers meet it. It was issued on 29 August 2025 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 1 March 2026. Classification: ICS 23.020.30, CCS J 74. This page is published from the official record of the standard held by the Chinese standards administration: the identification, the dates, the classification and the issuing body are taken from there. The clause text, the tables and the numeric limits are in the document itself, which is delivered complete in English translation.

This document specifies the principles, test conditions, test media, instruments and equipment, testing cylinder, post-test processing, and test records for the methods for leakage test of gas cylinders. This document applies to the leakage test of gas cylinders with a nominal working pressure not exceeding 70 MPa (gauge pressure).

2 Normative references

The provisions of the following documents constitute the essential clauses of this document through normative references in this text. Among them, for any dated reference, only the

version corresponding to that date applies to this document; for any undated reference, the latest version (including all amendments) applies to this document.

GB/T 12604.7 Non-destructive testing - Terminology - Leak testing

GB/T 13005 Terminology of gas cylinders

GB/T 13979 Mass spectrometer leak detector

GB/T 15823 Non-destructive testing - Test methods for helium leak testing

GB/T 18443.2 Testing method of performance for vacuum insulation cryogenic equipment - Part

2. Vacuum degree measurement NB/T 47013.8 Nondestructive testing of pressure equipment - Part

3 Terms and definitions

The terms and definitions defined in GB/T 13005 and GB/T 12604.7, as well as the following terms and definitions, apply to this document.

3.1 testing cylinder Gas cylinders awaiting or undergoing testing.

3.2 water-immersion test A pressure measuring instrument used to display and record the pressure of the testing cylinder. NOTE. A working pressure gauge includes both the pressure gauge itself and a pressure transmitter (or a digital pressure gauge capable of outputting a pressure signal).

3.10 capillary standard leak A leak having an independent helium tank with a pressure of not less than

0.1 MPa and allowing tracer helium gas to pass through the locally thinned tube. NOTE. The helium leakage rate of the capillary standard leak ranges from $1 \times 10^{-}$

4 Principle

Using a specified gas as the pressurizing medium, the pressure inside the testing cylinder is increased slowly and uniformly to its leakage test pressure, and maintained at that pressure for a specified time. Different test methods are employed to determine the leakage of the testing cylinder under the leakage test pressure.

5 Test conditions

5.1 The ambient temperature for the test shall be greater than 5 °C and not exceed the maximum permissible operating temperature of the testing cylinder.

5.2 According to the test requirements for different gas cylinders, the test cylinder shall be

pressurized slowly and uniformly to the leakage test pressure.

6 Test media

6.1 When using the water-immersion test or the soap bubble test, the test medium shall meet the following requirements.

- a) The test medium shall be dry, clean air, nitrogen, or other non-flammable gas that is compatible with the properties of the testing cylinder and the gas it contains, and is non-toxic and non-corrosive to humans.
- b) For testing cylinders containing non-flammable, non-toxic, and non-corrosive gases, the gas contained therein can be directly selected as the test medium.
- c) For testing cylinders that have previously contained combustible gas, if the volume concentration of combustible gas in the bottle is less than 0.4%, air may be used as the test medium; otherwise, nitrogen or an inert gas shall be used as the test medium.
- d) For testing cylinders that have previously contained toxic or corrosive media, nitrogen or an inert gas shall be used as the test medium.
- e) For testing cylinders containing oxygen or oxidizing gases, the test medium shall be free of oil and grease.

6.2 When using the leak detection by helium mass spectrum, the test medium shall meet the following requirements.

- a) The test medium shall be dry and clean helium, nitrogen, hydrogen, or a helium-nitrogen mixture.
- b) The hydrogen leakage rate shall be determined according to the method in Appendix A, wherein the leakage rate conversion coefficient α between pure helium and helium-nitrogen mixture and the leakage rate conversion coefficient β between pure hydrogen and pure helium shall be obtained by the cylinder manufacturer, inspection agency, or type testing agency through testing.
- c) The volume content of helium in the helium-nitrogen mixture used in the experiment shall be determined by comparative testing, but shall not be less than 2%; if the volume content of helium in the helium-nitrogen mixture cannot be determined by comparative testing, the volume content of helium in the helium-nitrogen mixture shall not be less than 10% when using the pressure accumulation test or the suction gun method, and the volume content of helium in the helium-nitrogen mixture shall not be less than 5% when using the vacuum chamber test. For the preparation of the helium-nitrogen mixture, see the pressure proportioning method in Appendix B.

7.1 Basic requirements for instruments and equipment

7.1.1 The pressurization of the testing cylinder shall be carried out using a pressurization system with stable pressure output (such as a pump, compressor, buffer tank, etc.).

7.1.2 The rated working pressure of the pressurizing device shall be

1.1 times greater than the leakage test pressure of the testing cylinder.

7.1.3 The pressure piping of the pressurization system shall be made of metal pipe, shall be fixedly installed, and its connection to the pressurization device, valve, and metering instrument shall have good sealing. The pressure for the pressure resistance test of the pressure piping shall be greater than three times the leakage test pressure of the testing cylinder.

7.1.4 The pressurization system shall be equipped with pressure measuring instruments and pressure control devices.

7.1.5 A reliable oil removal, degreasing, and water removal device shall be installed in the pressurization system to ensure that the test medium meets the requirements of

7.1.6 When using the water-immersion test, the depth of the test tank shall be sufficient to completely submerge the testing cylinder. The inner wall of the tank shall be white, and the water in the tank shall be kept clean and transparent. If the brightness inside the tank is insufficient, lighting facilities shall be installed at the bottom of the tank.

7.1.7 When using the soap bubble test, the test solution shall be a liquid with low surface tension, and shall be able to detect even tiny leaks of air bubbles. The test solution shall not have a harmful effect on the testing cylinder. For testing cylinders containing oxygen or oxidizing gases, oil-free and grease-free test solutions shall be used.

7.1.8 Vacuum units, vacuum valves, and vacuum pipelines in the vacuum system shall comply with the relevant provisions of GB/T 18443.2.

7.1.9 The helium mass spectrometer leak detector shall meet the requirements of GB/T 13979. The helium mass spectrometer leak detector shall be able to sense and measure trace amounts of tracer helium gas, and shall display the leakage amount through instruments or screens on or attached to the detection instrument. The minimum detectable leakage rate of the helium mass spectrometer leak detector shall be less than the leakage rate requirement for the testing cylinder.

7.1.10 The dimensions of the detection chamber shall match the size of the testing cylinder. The detection chamber for the pressure accumulation test shall be made of steel, aluminum alloy, or PVC plastic and be able to withstand external pressure. The detection chamber for the vacuum chamber test shall be made of steel and be able to withstand external pressure.