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

GB/T 18443.1-2010

**Testing method of performance for vacuum insulation
cryogenic equipment - Part 1: Basic requirements**

真空绝热深冷设备性能试验方法 第1部分：基本要求

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Table of Contents

- 1 Scope
- 2 Normative references
- 3 Leak rate measurement
- 4 Leak-outgassing rate measurement
 - 4.1 Environmental conditions
 - 4.2 Test equipment
 - 4.2.1 Basic requirements
 - 4.2.2 Vacuum unit
 - 4.2.3 Vacuum gauge and vacuummeter
 - 4.2.4 Vacuum valve
 - 4.3 Measured piece and test medium
- 5 Static evaporation rate measurement
- 6 Heat-leak rate measurement
- 7 Holding time measurement

1 Scope

GB/T 18443.1-2010 is the Chinese national standard on testing method of performance for vacuum insulation cryogenic equipment - part 1: basic requirements, 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 26 September 2010 by the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China; Standardization Administration of China, and has been in force since 1 February 2011. Classification: ICS 23.020, CCS J74. 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 Part of GB/T 18443 specifies the basic requirements for the test environment, test equipment, measured piece and test medium, test items and sequence, data processing, test record and test report of the performance test of vacuum insulated cryogenic equipment. This Part applies to the performance test of vacuum insulated cryogenic equipment other than the storage and transportation of liquid hydrogen medium; it also

applies, as a reference, to the implementation of other equipment.

2 Normative references

The terms in the following documents become the terms of this Part through the reference of this Part of

GB/T 18443. For dated references, all subsequent amendments (not including errata content) or revisions do not apply to this Part. However, parties to agreements that are based on this Part are encouraged to study whether the latest versions of these documents can be used. For undated references, the latest edition applies to this Part.

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

3 Leak rate measurement

GB/T 18443.4, Testing method of performance for vacuum insulation cryogenic equipment - Part

4 Leak-outgassing rate measurement

GB/T 18443.5, Testing method of performance for vacuum insulation cryogenic equipment - Part

4.1 Environmental conditions

4.1.1 The test environment shall be clean, well ventilated, and shall be provided with anti-static and fire-proof measures.

4.1.2 The test site shall be equipped with warning areas and red signal signs.

4.1.3 The test site shall not have strong electromagnetic interference, strong vibration and shock.

4.1.4 The ambient pressure shall be the local atmospheric pressure, where the temperature range is 0 °C ~ 40 °C, and the relative humidity is less than 85%.

4.1.5 When a flammable and explosive cryogenic liquid is used as the test medium, a safe area shall be set up, and no dangerous source that may cause danger shall exit.

4.2.1 Basic requirements

4.2.1.1 When the test medium is a flammable and explosive cryogenic liquid, the measured piece and the measuring pipeline shall be provided with necessary anti-static measures, and no open flame shall be generated.

4.2.1.2 The performance, range and accuracy of the instruments and equipment shall meet the test requirements. Measuring instruments and equipment shall be calibrated or verified to be qualified by the national legal measure institute, and shall be used within the validity period of the calibration.

4.2.1.3 After the vacuum insulated cryogenic equipment is filled with cryogenic liquid, in the preparation stage of standing still, an air pipe shall be used to guide the vaporized gas from the vent of the cryogenic container to a designated safe area. The air pipe and each connector shall be well sealed and shall not leak.

4.2.1.4 When the test medium is a flammable medium, use nitrogen or inert gas to replace the relevant connecting pipes first. The vents of the vacuum insulated cryogenic equipment and the exhaust pipes of the safety valve vents shall be connected to the prepared airbags, recycling devices, or safety vents by pipelines.

4.2.1.5 The allowable measurement error of the thermometer is ± 1 °C.

4.2.1.6 The allowable measurement error of the atmospheric pressure gauge is $\pm$

4.2.2 Vacuum unit

4.2.2.1 The final vacuum degree of the vacuum unit shall be at least one order of magnitude higher than the vacuum degree of the seal of the measured piece.

4.2.2.2 The effective pumping speed of the vacuum unit shall meet the gas load of the measured piece.

4.2.3 Vacuum gauge and vacuumometer

4.2.3.1 The rubber seal connector of the vacuum gauge shall comply with the regulations of JB/T 8105.1; the metal seal connector of the vacuum gauge shall comply with the regulations of JB/T 8105.2.

4.2.3.2 The type and measurement range of the vacuum gauge and the supporting vacuumometer shall meet the requirements for vacuum degree of the interspace in the tested vacuum insulated cryogenic equipment; the uncertainty of measurement of the vacuum degree shall be less than 50%.

4.2.3.3 Hot-cathode and cold-cathode ionization vacuum gauges are not allowed to be used in high-vacuum multi-layer insulated cryogenic equipment that is loaded with liquid oxygen or flammable medium.

4.2.3.4 The vacuum interspace of the high-vacuum multi-layer insulated cryogenic equipment - which is loaded with liquid oxygen or flammable medium - can be equipped with a composite gauge combining resistance gauge and ionization vacuum gauge, or be installed with a resistance gauge and an ionization vacuum gauge in parallel. The ionization vacuum gauge can be started for measurement only when the vacuum degree is greater

than 10^{-}

4.2.4 Vacuum valve

4.2.4.1 The diameter of the air extraction pipeline connected with the evacuation unit and the vacuum valve on the measured piece shall be larger than that of the vacuum valve on the measured piece.

4.2.4.2 The leak rate of the vacuum valve shall not exceed $1 \times 10^{-}$

4.2.5 Connecting pipeline The material of the connecting pipeline should be stainless steel, copper or aluminum alloy.

5 Static evaporation rate measurement

GB/T 18443.6, Testing method of performance for vacuum insulation cryogenic equipment - Part

6 Heat-leak rate measurement

GB/T 18443.7, Testing method of performance for vacuum insulation cryogenic equipment - Part

7 Holding time measurement

3.6 Static evaporation rate The value of evaporation rate when the test evaporation rate is converted to that under the standard ambient condition, in percent per day (%/d).