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

GB/T 18443.2-2010

Replacing GB/T 18443.2-2001

**Testing method of performance for vacuum insulation
cryogenic equipment - Part 2: Vacuum degree measurement**

真空绝热深冷设备性能试验方法 第2部分：真空度测量

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Foreword

GB/T 18443 Testing Method of Performance for Vacuum Insulation Cryogenic Equipment is divided into eight parts.

- 1.Basic Requirements;
- 2.Vacuum Degree Measurement;
- 3.Leak Rate Measurement;
- 4.Leak-outgassing Rate Measurement;
- 5.Static Evaporation Rate Measurement;
- 6.Heat-leak Rate Measurement;
- 7.Holding Time Measurement;

8.Volume Measurement. This is Part 2 of GB/T 18443. This Part serves as a replacement of GB/T 18443.2-2001 Testing Method of Cryo-insulation Pressure Vessels - Vacuum Measurement and GB/T 16876-1997 Test Methods for Interspace Vacuum of Liquid Nitrogen Containers. In comparison with GB/T 18443.2-2001, the main changes are as follows:

---The scope of application is extended from the vacuum degree measurement of the interspace of low-temperature heat insulated pressure vessels to the vacuum degree measurement of vacuum insulated cryogenic equipment, such as. vacuum insulated

cryogenic pressure vessels, vacuum insulated cryogenic welding gas cylinders and vacuum insulated pipes and their pipe fittings, etc.

---Terms and definitions are added.

---The content of GB/T 16876-1997 is integrated into this Part. Appendix A and Appendix B of this Part are informative. This Part was proposed by and shall be under the jurisdiction of National Technical Committee 262 on Boilers and Pressure Vessels of Standardization Administration of China (SAC/TC 262). The drafting organizations of this Part. Shanghai Institute of Special Equipment Inspection and Technical Research; Shanghai Gas Industry Association; Shanghai Jiao Tong University; Sichuan Air Separation Plant Group; National Cryogenic Vessel Quality Supervision and Inspection Center (Guangdong); Shanghai Huayi Group Equipment Engineering Co., Ltd.; China Special Equipment Inspection & Research Institute. The main drafters of this Part. Luo Xiaoming, Zhou Weiming, Yi Xilang, Chen Guangqi, Shu Wenhua, Shou Binan, Xue Jiai, Gu Fuming, Wang Rongshun, Xue Xiaolong, Shi Fengping, Wei Yongbiao, Wang Weiguo. The issuing of the previous versions.

---GB/T 18443.2-2001;

---GB/T 16876-1997. Testing Method of Performance for Vacuum Insulation Cryogenic Equipment - Part

1 Scope

GB/T 18443.2-2010 is the Chinese national standard on testing method of performance for vacuum insulation cryogenic equipment - part 2: vacuum degree measurement, 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 test principles and methods, test devices, equipment and instruments, test conditions and preparation, test procedures, data processing, test records and test reports of the vacuum degree measurement of the interspace of vacuum insulated cryogenic equipment. This Part is applicable to the vacuum degree measurement of the interspace of vacuum insulated cryogenic equipment, such as. vacuum insulated cryogenic pressure vessels, vacuum insulated cryogenic welding gas cylinders and vacuum insulated pipes and their pipe fittings, except for liquid hydrogen storage and transportation

media. The other equipment may take this as a reference.

2 Normative References

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

GB/T 18443. In terms of references with a specified date, all subsequent amendments (excluding errata content) or revisions do not apply to this Part. However, the various parties that reach an agreement in accordance with this Part are encouraged to explore whether the latest versions of these documents are applicable. In terms of references without a date, the latest versions apply to this Part.

GB/T 18443.1-2010 Testing Method of Performance for Vacuum Insulation Cryogenic Equipment - Part

3 Terms and Definitions

What is established in GB/T 18443.1, and the following terms and definitions are applicable to this Part.

3.1 Interspaced Vacuum Degree Interspaced vacuum degree refers to the absolute pressure (expressed in Pa) of the gas in the interlayer space of the vacuum insulated cryogenic equipment.

3.4 Interspace Vacuum Degree of Normal Atmospheric Temperature Interspace vacuum degree of normal atmospheric temperature refers to the static interspace vacuum degree (expressed in Pa) when no cryogenic liquid is injected into the vacuum insulated cryogenic equipment, and the inner tank and outer shell are both at atmospheric temperature.

3.5 Interspace Vacuum Degree after Loaded Interspace vacuum degree after loaded refers to the static interspace vacuum degree (expressed in Pa) when the vacuum insulated cryogenic equipment has been injected with cryogenic liquid and is under the thermal equilibrium state.

4 Test Principles and Methods

4.1 The measurement of the interspace vacuum degree is divided into direct measurement method and indirect measurement method. The schematic diagram of the test device of the direct measurement method is shown in Figure 1;

4.2 The direct measurement method refers to the direct measurement of the vacuum degree of the interspace by using the vacuum gauge installed on the measured piece.

5 Test Devices, Equipment and Instruments

The test devices, equipment and instruments shall comply with the stipulations of 4.2 in GB/T 18443.1-2010.

6 Test Conditions and Preparation

6.1 The basic requirements of the test shall comply with the stipulations of GB/T 18443.1.

6.2 During the measurement of the interspace vacuum degree of normal atmospheric temperature, the inner container and outer shell of the measured piece shall be at the atmospheric temperature.

6.4 The vacuum gauge on the measurement pipeline shall be vertically placed. The opening plane of the vacuum gauge shall be parallel to the direction of airflow, and the vacuum gauge shall not be "degassed" within 15 min before the test.

6.5 When adopting flammable cryogenic liquid as the test medium, safety inspection shall be carried out before filling.

7.2 Indirect Measurement Method

7.2.1 Connect the measured piece and the vacuum measurement system in accordance with Figure 2.

7.2.2 When the vacuum valve of the measured piece and the vacuum valve of the pumping system are closed, start the vacuum unit.

7.2.3 Open the vacuum valve of the pumping system. Use the low vacuum pump to pump the pressure of the measurement pipeline to below

3 Pa, then, use the high vacuum pump to pump it. When the measurement pipeline receives air pumping, heating degassing is allowed.

7.2.7 After 2 min of observation, after the pressure between the interlayer space and the measurement pipeline space is balanced, record the vacuum degree P1 of the connected space after it becomes stable.

8 Data Processing

8.1 During the measurement of interspace vacuum degree of normal atmospheric temperature through the indirect measurement method, calculate in accordance with Formula (1).

8.2 During the measurement of interspace vacuum degree after loaded through the indirect measurement method, calculate in accordance with the following formulas.