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

GB/T 18442.5-2019

Replacing GB/T 18442.5-2011

**Static vacuum insulated cryogenic pressure vessels - Part 5:
Inspection and testing**

固定式真空绝热深冷压力容器 第5部分：检验与试验

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1 Scope

GB/T 18442.5-2019 is the Chinese national standard on static vacuum insulated cryogenic pressure vessels - part 5: inspection and testing, 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 31 December 2019 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 31 December 2019. Classification: ICS 23.020.40, CCS J76. 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 18442 specifies the test methods and inspection rules during and after the fabrication of static vacuum insulated cryogenic pressure vessels (hereinafter referred to as "cryogenic vessels"). This Part applies to cryogenic vessels, which simultaneously

meet the following conditions.

- a) The working pressure of the inner vessel is not less than 0.1 MPa;
- b) The geometric volume is not less than 1 m³;
- c) The insulation method is vacuum powder insulation, vacuum composite insulation, or high vacuum multilayer insulation;
- d) The storage medium is a refrigerated liquefied gas with a standard boiling point of not lower than -196 °C. This Part does not apply to cryogenic vessels in the following scope.
 - a) The material of inner vessel and outer jacket is non-ferrous metal or non-metal;
 - b) HAVE a spherical structure;
 - c) Stacked insulation;
 - e) STORE refrigerated liquefied gas medium with standard boiling point below -196 °C;
 - f) The storage medium is toxic gas according to GB 12268;
 - g) Those with special requirements such as national defense and military equipment.

2 Normative references

The following documents are indispensable for the application of this document. For the dated references, only the editions with the dates indicated are applicable to this document. For the undated references, the latest edition (including all the amendments) are applicable to this document.

GB/T 150 (all parts) Pressure vessels

GB/T 18442.1 Static vacuum insulated cryogenic pressure vessels - Part 1. General requirements

GB/T 18442.2-2019 Static vacuum insulated cryogenic pressure vessels - Part

3 Terms and definitions

The terms and definitions defined in GB/T 150, GB/T 18442.1, GB/T 18442.3, and GB/T 18442.4 and the following ones apply to this document.

4.1 Test sequence

4.1.1 When the cold shock test is required, it shall be carried out after the inner vessel has been manufactured and the nondestructive testing is passed.

4.1.4 The pressure-tight test of the external piping shall be carried out after the tank and

external piping have been manufactured and the nondestructive testing is passed.

4.1.5 The leak test shall be carried out after the tank and piping system have been assembled, and after all safety accessories, instruments, and loading- unloading accessories have been installed.

4.2.1 Pressure-tight test of inner vessel

4.2.1.1 Basic requirements for pressure-tight test 4.2.1.2.3 The hydraulic test shall meet the following requirements. 4.2.1.2.4 During the hydraulic test, if the inner vessel has no leak, no visible deformation, and abnormal noise, it is qualified.

4.2.1.3 Air pressure test 4.2.1.3.1 For inner vessels that do not allow residual test liquid due to structure or support, medium, etc., the air pressure test is generally used. 4.2.1.3.2 The gas used in the test shall be dry and clean air, nitrogen, or other inert gas. 4.2.1.3.6 During the air pressure test, if there is no abnormal noise in the inner vessel, and there are no air leak and no visible deformation checked through liquid soap or other reliable leak detection methods, it is qualified.

4.2.2 Pressure-tight test of piping

4.2.2.1 The internal piping of the annular space and the inner vessel are subjected to a pressure-tight test together. After the external piping passes the nondestructive testing, the pressure-tight test shall be carried out according to the drawing.

4.2.2.2 Pressure-tight test requirements and test procedures of piping are in accordance with the provisions of GB/T 20801.5; and, meet the requirements of drawings.

4.3 Air tightness test

4.3.1 After the pressure-tight test is passed, all safety accessories, instruments, loading-unloading accessories shall be installed and subjected to the air tightness test.

4.4 Helium leak detection test The helium leak detection test shall meet the requirements of GB/T 18443.3 or design documents.

4.5 Cold shock test

4.5.1 Whether to do the cold shock test shall be based on the requirements of the drawing.

4.5.2 Liquid nitrogen shall be used as the test medium for the cold shock test.

4.6 Cleanliness detection

4.6.1 The cleanliness testing method of the surface of the parts in contact with the medium is in accordance with the provisions of JB/T 6896.

4.6.2 The testing methods for degreasing, descaling, drying, etc. on the surface of the vacuum annular space and the surfaces of its internal parts are in accordance with the design documents.

4.7 Volume measurement

4.9 Detection of air leak rate of vacuum annular space The detection method of the air leak rate of vacuum annular space is in accordance with the provisions of GB/T 18443.3.

4.10 Detection of leak-outgassing rate of vacuum annular space The detection method of the leak-outgassing rate of vacuum annular space is in accordance with the provisions of GB/T 18443.4.

4.11 Detection of static evaporation rate The detection method of static evaporation rate is in accordance with GB/T 18443.5.

4.12 Detection of holding time The detection method of holding time is in accordance with the provisions of GB/T 18443.7.

4.13 Test of safety accessories The performance test of safety accessories shall comply with the provisions of the corresponding product standards and design documents.

4.14 Other inspections

4.14.1 The inspection items after the final assembly of cryogenic vessel include at least the following contents. The conformity requirements shall meet the requirements of this Part and the design documents.

5 Inspection rules

5.1 Inspection classification The inspection is classified into one-by-one inspection, lot size inspection, and type test.

5.2 One-by-one inspection After the cryogenic vessel is completed, it shall pass the inspection one by one before leaving the factory. The one-by-one inspection items and requirements shall be in accordance with Table 1 and Table 2.

5.4 Type test

5.4.1 Cryogenic vessels shall be subjected to low-temperature performance type tests. The low-temperature performance type tests shall be carried out by a type test agency approved by the relevant national competent authority. A low-temperature performance type test report and certificate shall be issued.

5.4.2 In one of the following situations, it shall carry out a low-temperature performance type test.