

ICS 23.020.30
CCS J 74



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

GB/T 35544-2017

**Fully wrapped carbon fiber reinforced cylinders with an
aluminum liner for the on-board storage of compressed
hydrogen as a fuel for land vehicles**

(English Translation)

Issued on: December 29, 2017

Implemented on: July 1, 2018

**Issued by: General Administration of Quality Supervision, Inspection and
Quarantine of PRC**

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1 Scope

This standard specifies the type and parameters, technical requirements, test methods, inspection rules, marking, packaging, transportation, storage requirements of fully- wrapped carbon fiber reinforced cylinders with an aluminum liner for the on-board storage of compressed hydrogen as a fuel for land vehicles (hereinafter referred to as gas cylinders).

This standard is applicable to the design and manufacture of refillable gas cylinders, which have a nominal working pressure not exceeding 70 MPa, a nominal water volume not exceeding 450 L, storage medium of compressed hydrogen, working temperature not lower than -40 °C and not higher than 85 °C, fixed on road vehicles as fuel tanks.

Note: Gas cylinders for hydrogen supply, such as hydrogen fuel cell for urban rail transit, can be manufactured and inspected with reference to this standard.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document;

for the undated documents, only the latest version (including all the amendments) is applicable to this standard.

GB/T 192 General purpose metric screw threads - Basic profile

GB/T 196 General purpose metric screw threads - Basic dimensions

GB/T 197 General purpose metric screw threads - Tolerances

GB/T 228.1 Metallic materials - Tensile testing - Part 1. Method of test at room temperature

GB/T 230.1 Metallic materials - Rockwell hardness test - Part 1. Test method (scales A, B, C, D, E, F, G, H, K, N, T)

GB/T 231.1 Metallic materials - Brinell hardness test - Part 1. Test method

GB/T 232 Metallic materials - Bend test

3.1 Terms and definitions

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

3.1.1

Aluminum liner

A seamless aluminum alloy container, whose outer surface is wrapped with carbon fiber reinforced layer, to seal the gas and can or cannot withstand part of the pressure load.

3.1.2

Fully-wrapped

A continuous wrapping method, which is carried out spirally and circumferentially by carbon fiber, which is impregnated with the resin matrix, on the aluminum inner, so that the circumferential and axial directions of the gas cylinder are enhanced.

3.1.3

Fully-wrapped cylinder

A gas cylinder, which is fully wound with a carbon fiber reinforced layer, on the outer surface of the aluminum liner AND cured by heating.

3.1.4

Nominal working pressure

The limited filling pressure of the cylinder, at the reference temperature (15 °C).

3.2 Symbols

The following symbols apply to this document.

4.1 Types

The body structure of the gas cylinder shall conform to the type shown in Figure 1, in which the T-type is a convex bottom structure, whilst the S-type is a closed-end structure.

4.2 Parameters

4.2.1

The nominal working pressure of the gas cylinder shall generally be 25 MPa, 35 MPa, 50 MPa or 70 MPa.

4.3 Category

Gas cylinders are divided into category A cylinders and category B cylinders. Category

A gas cylinders are gas cylinders, which have a nominal working pressure less than or equal to 35 MPa; category B gas cylinders are gas cylinders, which have a nominal working pressure greater than 35 MPa.

4.4 Models

The model designation of gas cylinder shall consist of the following parts.

Example. The category A fully-wrapped carbon fiber reinforced cylinders with an aluminium liner for the on-board storage of compressed hydrogen as a fuel for land vehicles, whose aluminum liner has a nominal outer diameter of 356 mm, a nominal water volume of 120 L, a nominal working pressure of 35 MPa, an S-type structure, can be designated as.
CHG3-356-

120-35 S/A.

5.1.1 Nominal water volume

The nominal water volume of category A gas cylinders is not more than 450 L; the nominal water volume of category B gas cylinders is not more than 230 L.

5.1.3 Service life

The service life of category A gas cylinders is 15 years; the service life of category B gas cylinders is 10 years. When the actual service life of the gas cylinder has not reached the service life, BUT the number of fillings reaches the design cycle number, the gas cylinder shall be scrapped.

5.1.5 Temperature range

During filling and use, the temperature of the gas cylinder shall not be lower than - 40 °C and not higher than 85 °C.

5.1.6 Hydrogen quality

The compressed hydrogen composition of the refillable gas cylinder shall meet the quality requirements of hydrogen, which is used in fuel cell vehicles.

5.2.1 General requirements

The materials for manufacturing gas cylinders shall have the original quality certificate, which is provided by the material manufacturer, OR a photocopy of the quality certificate, which is stamped with the official seal of the material management organization and signed (sealed) by the person in charge.

5.2.3 Resins

5.2.3.1

The impregnating material shall be a thermosetting resin, which has high heat resistance and good stability, such as epoxy resin or modified epoxy resin. The determination of epoxy equivalent of resin shall be carried out, in accordance with the provisions of GB/T 4612. The glass transition temperature of resin materials shall be determined, in accordance with the provisions of GB/T 19466.2; its value shall not be lower than 105 °C.

5.3.1 Aluminum liner

5.3.1.1

The end of the aluminum liner shall adopt a convex structure.

5.3.1.2

The end of the aluminum liner shall be designed with a gradient thickness; the cylinder body and the end shall have a smooth transition.

5.3.2 Gas cylinders

5.3.2.1

The hydraulic test pressure of the gas cylinder shall not be lower than 1.5 times the nominal working pressure.

5.3.2.2

The fiber stress ratio shall not be less than 2.25.

5.3.2.3

The minimum burst pressure of the gas cylinder shall not be lower than 2.25 times the nominal working pressure.