

ICS 23.020.30

CCS J74



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

GB/T 42626-2023

**Periodic inspection and evaluation of fully wrapped fibre
reinforced composite gas cylinders of compressed hydrogen
gas for automotive vehicles**

车用压缩氢气纤维全缠绕气瓶定期检验与评定

Issued on: May 23, 2023

Implemented on: December 1, 2023

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

Table of Contents

1	Scope
2	Normative References
3	Terms and Definitions...
4	Technical Requirements
4.1	Types and Descriptions of Gas Cylinder
4.2	Inspection Tools and Devices...
4.3	Inspection Cycle...
4.4	Inspection Items...
5	Inspection Preparation
5.1	Pre-inspection of Hydrogen Storage System
5.1.3	Hydrogen leak detection
5.2	Information Query and Recording
5.3	Depressurization and Nitrogen Replacement of Gas Cylinders...
5.4	Disassembly and Surface Cleaning of Gas Cylinders and Cylinder Valves...
6	Appearance Inspection and Evaluation...
6.1	Types of Damage...
6.2	Damage Level...
6.3	Inspection and Evaluation of Appearance Damages...
7	Treatment of Outer Surface Damage
8	Internal Inspection and Evaluation...
8.1	Types of Damage...
8.2	Damage Level...
8.3	Internal Damage Inspection and Evaluation...
9	Cylinder Neck Thread Inspection and Evaluation...
10	Hydrostatic Test
11	Internal Drying
11.1	Method and Requirements for Drying
11.2	Inspection of Drying Condition...
12	Inspection and Assembly of Cylinder Valve
12.5	When the cylinder valve or TPRD end plug does not satisfy the stipulations of
13	Air-tightness Test...

1 Scope

GB/T 42626-2023 governs what happens to a hydrogen cylinder after it has been in service. A fuel cell vehicle carries hydrogen at 35 or 70 MPa in a composite cylinder - a plastic or metal liner wound in carbon fibre - and the cylinder is the single component whose failure is not survivable. It is also a component that ages in ways a steel tank does not: the fibre accumulates damage from impacts, from ultraviolet exposure, from thousands of pressure cycles, and much of that damage is on or just under a surface that is not designed to be taken apart. This document specifies the basic method and the technical requirements for the periodic inspection and evaluation of such cylinders, covering the cylinder types and their descriptions, the inspection tools and equipment, the inspection interval, the inspection procedure itself, and the evaluation and disposal decision that follows. It applies to cylinders designed and manufactured to GB/T 35544 and GB/T 42612. Under ICS 23.020.30 and CCS J74, it is the working document for the inspection bodies that certify cylinders for continued service, for hydrogen refuelling operators, and for the vehicle and cylinder manufacturers whose products depend on a credible in-service regime.

This document specifies the basic method and technical requirements for the periodic inspection and evaluation of fully wrapped fiber reinforced composite gas cylinders of compressed hydrogen gas for automotive vehicles (hereinafter referred to as "gas cylinders"). This document is applicable to gas cylinders designed and manufactured in accordance with GB/T 35544 and GB/T 42612, whose nominal working pressure does not exceed 70 MPa, nominal water capacity is not greater than 450 L, and the storage medium is compressed hydrogen gas, and operating temperature is not lower than 40 C and not higher than 85 C. This document is not applicable to gas cylinders installed on passenger vehicles with a length of not more than 8 m and a seating capacity of not more than 19, and cannot be disassembled for periodic inspection. The periodic inspection and evaluation of gas cylinders for hydrogen supply, such as: hydrogen fuel cell urban rail transits, hydrogen energy ships and hydrogen energy power generation devices, etc. may take this document as a reference.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 3464.1 Machine and Hand Taps - Part 1: Plain Parallel Shank Machine and Hand Taps

GB/T 3836.1 Explosive Atmospheres - Part 1: Equipment - General Requirements

GB/T 3934 Specification of Gauges for General Purpose Screw Threads

GB/T 8979 Pure Nitrogen and High Purity Nitrogen and Ultra Pure Nitrogen

GB/T 9251 Methods for Hydrostatic Test of Gas Cylinders

GB/T 13005 Terminology of Gas Cylinders Resin refers to a material used to bond fibers and transmit loads. NOTE: it is usually thermoset.

3.8 stress corrosion cracking Stress corrosion cracking refers to cracks or fractures of composite materials caused by a combined action of load and harsh environments.

3.9 thermally-activated pressure relief device (TPRD) end plug Thermally-activated pressure relief device (TPRD) end plug refers to an end plug installed at one end of the double-port structure gas cylinder, and equipped with a thermally-activated pressure relief device (TPRD) and the function of blind plugging.

3.10 rejection elastic expansion; REE Rejection elastic expansion refers to the allowable upper limit of elastic expansion of gas cylinder specified by the manufacturing organization in the design and finalization stage of each specification and model of gas cylinder, and it is expressed in milliliters.

3.11 bulge Bulge refers to visible partial bulging of the gas cylinder.

3.12 buckling Buckling refers to the failure caused by the plastic liner losing its original regular geometric shape under the action of compressive stress.

3.13 blister Blister refers to a local defect in the plastic liner that that looks like a bubble.

3.14 hydrogen storage system Hydrogen storage system refers to a collection of components related to on-board hydrogen storage and transmission. NOTE: it usually consists of gas cylinders (including cylinder valves), valves and connecting pipelines, etc. For a single gas cylinder, it refers to gas cylinder and cylinder valve; for a cylinder group consisting of two or more gas cylinders, it refers to gas cylinders (including cylinder valves), and connecting pipelines and valves within the frame, etc.

4.1 Types and Descriptions of Gas Cylinder

4.1.1 Type 3 gas cylinder Fully-wrapped carbon fiber reinforced cylinder with an aluminum alloy liner.

4.1.2 Type 4 gas cylinder Fully-wrapped carbon fiber reinforced cylinder with a plastic liner.

4.2 Inspection Tools and Devices The inspection institution shall be equipped with at least the following tools and devices:

a) Explosion-proof lamp: used to inspect the inner and outer surfaces of gas cylinders and the surface of accessories. The voltage shall not exceed 12 V, and shall satisfy the requirements of explosion-proof level II class C and group T1 in GB/T 3836.1;

- b) Inspectoscope and endoscope: used to inspect the surface of gas cylinder and the inner surface of gas cylinder (including the inner surface of the neck) that are partially obscured due to installation. The endoscope shall be in high-definition color and have the function of storage;
- c) Special tools, for example, torque wrench: used for the disassembly and installation of gas cylinders, cylinder valves or TPRD end plugs;
- d) Depth gauge: used to measure the depth of damages, such as: scratches, dents and abrasions, etc.;
- e) Length measurement tools: including rulers, squares and tape measures, which are used to measure the length of damages, etc.;
- f) Hydrostatic test device: used for hydrostatic test of gas cylinders;
- g) Air-tightness test device: used for air-tightness test of gas cylinders;
- h) Air-tightness helium leak detection device: used for helium leak detection of gas cylinders;
- i) Hydrogen venting / recovery device: used for the discharge or recovery of hydrogen gas;
- j) Cleaning device: used for the cleaning of contaminants and corrosion products on the inner and outer surfaces of gas cylinders;
- k) Portable pumping-type hydrogen leak detection device: used to detect hydrogen

5.1 Pre-inspection of Hydrogen Storage System

5.1.1 Overview The pre-inspection of the hydrogen storage system includes appearance patrol inspection and hydrogen leak detection.

5.1.2 Appearance patrol inspection Before the appearance patrol inspection, it shall be confirmed that the on-board hydrogen system has been powered off. In the appearance patrol inspection, the gas cylinders, cylinder valves, connecting pipelines, fixing brackets or fastening belts shall be inspected. If the following conditions are satisfied, the inspection result is qualified:

- a) The fixing bracket or fastening belt of the gas cylinder is intact, and not loosening or deformed;
- b) The cylinder valves and hydrogen pipelines of the cylinder group or a single cylinder are not loosening or damaged, and there are no obvious signs of gas leakage;
- c) There is no abnormality on the surface of the gas cylinder and cylinder valve.

5.1.3 Hydrogen leak detection