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**中华人民共和国团体标准**  
**GROUP STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA**

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**Fully-Wrapped Carbon Fiber Reinforced Cylinder with a  
Plastic Liner for On-Board Storage of Compressed  
Hydrogen for Land Vehicles**  
**车用压缩氢气塑料内胆碳纤维全缠绕气瓶**

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# Fully-Wrapped Carbon Fiber Reinforced Cylinder with a Plastic Liner for On-Board Storage of Compressed Hydrogen for Land Vehicles

## 1 SCOPE

This standard specifies the type and parameters, specifications, test methods, inspection rules, installation protection, marking, packaging, transportation and storage requirements with respect to the fully-wrapped carbon fiber reinforced cylinder with a plastic liner for on-board storage of compressed hydrogen for land vehicles (hereinafter referred to as the "cylinders").

This standard is applicable to the design and manufacture of the refillable cylinders that are fixed in road vehicles as fuel tanks to store compressed hydrogen, with a nominal working pressure  $\leq 70\text{MPa}$ , a nominal capacity  $\leq 450\text{L}$ , and a working temperature  $\geq -40^\circ\text{C}$  and  $\leq 85^\circ\text{C}$ .

Note: Other gas cylinders for hydrogen supply intended for urban rail transit powered by hydrogen fuel cell, hydrogen-powered vessels, hydrogen-powered aircrafts, hydrogen power generation unit, etc. may use this standard as a reference.

## 2 NORMATIVE REFERENCES

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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 229	Metallic materials - Charpy pendulum impact test method
GB/T 528	Rubber, vulcanized or thermoplastic - Determination of tensile stress-strain properties
GB/T 1033.1	Plastics - Methods for determining the density of non-cellular plastics - Part 1: Immersion method, liquid pycnometer method and titration method
GB/T 1040.1	Plastics - Determination of tensile properties - Part 1: General principles
GB/T 1040.2	Plastics - Determination of tensile properties - Part 2: Test conditions for moulding and extrusion plastics
GB/T 1220	Stainless steel bars
GB/T 1458	Test method for mechanical properties of ring of filament-winding reinforced plastics
GB/T 1633	Plastics - Thermoplastic materials - Determination of Vicat softening temperature (VST)
GB/T 1636	Plastics - Determination of apparent density material that can be poured from a specified funnel
GB/T 2941	Rubber - General procedures for preparing and conditioning test pieces for physical test methods
GB/T 3190	Chemical composition of wrought aluminum and aluminum alloys
GB/T 3191	Aluminum and aluminum alloys extruded bars, rods
GB/T 3362	Test methods for tensile properties of carbon fiber multifilament
GB/T 3452.2	Fluid power systems - O-rings - Part 2: Quality acceptance criteria
GB/T 3512	Rubber, vulcanized or thermoplastic - Accelerated ageing and heat resistance tests
GB/T 3682.1	Plastics—Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics—Part 1: Standard method
GB/T 3934	Specification of gauges for general purpose screw threads
GB/T 4612	Plastics - Epoxy compounds - Determination of epoxy equivalent
GB/T 5720	Test methods for rubber O-rings
GB/T 6031	Rubber, vulcanized or thermoplastic—Determination of hardness

	(hardness between 10 IRHD and 100 IRHD)
GB/T 7690.1	Reinforcements - Test Method for Yarns - Part 1: Determination of Linear Density
GB/T 7758	Rubber, vulcanized - Determination of low - Temperature characteristics - Temperature-retraction procedure (TR test)
GB/T 7999	Optical emission spectrometric analysis method of aluminum and aluminum alloys
GB/T 9251	Methods for hydrostatic test of gas cylinders
GB/T 9252	Method for pressure cycling test of gas cylinders
GB/T 13005	Terminology of gas cylinders
GB/T 13979	Mass spectrometer leak detector
GB/T 15385	Method for hydraulic burst test of gas cylinder
GB/T 15823	Non-destructive testing - Test methods for helium leak testing
GB/T 19466.2	Plastics - Differential scanning calorimetry (DSC) - Part 2: Determination of glass transition temperature
GB/T 19466.3	Plastics - Differential scanning calorimetry (DSC) - Part 3: Determination of temperature and enthalpy of melting and crystallization
GB/T 20668	Unified screw threads - Basic dimensions
GB/T 20975	Methods for chemical analysis of aluminum and aluminum alloys
GB/T 21060	Plastics—Determination of pourability
GB/T 26749	Carbon fiber - Determination of tensile properties of resin-impregnated yarn
GB/T 32249	Aluminum and aluminum-alloy die forgings, hand forgings and rolled ring forgings - General specification
GB/T 33215	Pressure relief devices for gas cylinders
GB/T 35544	Fully-wrapped carbon fiber reinforced cylinders with an aluminum liner for the on-board storage of compressed hydrogen as a fuel for land vehicles
GB/T 37244	Fuel specification for proton exchange membrane fuel cell vehicles-Hydrogen
HG/T 4280	Welding procedure qualification for plastics
NB/T 47010	Stainless and heat-resisting steel forgings for pressure equipment
NB/T 47013.8	Nondestructive testing of pressure equipment - Part 8: Leak Testing
T/CATSI 02 009	Specification for Glass Balls for Pressure Relief Devices of gas cylinders
YS/T 479	Aluminum and Aluminum Alloys Forging for General Industrial Use
ASTM D1921	Standard Test Methods for Particle Size (Sieve Analysis) of Plastic Materials

### **3 TERMS, DEFINITIONS AND SYMBOLS**

#### **3.1 Terms and Definitions**

For the purposes of this document, the terms and definitions given in GB/T 13005 and the followings apply.

##### **3.1.1**

liner

Inner housing in contact with filling gas; a plastic container over which carbon fiber reinforced layers are wrapped to sealing gas, and which is not designed to afford any pressure load, including plastic liner and cylinder valve boss, etc.

##### **3.1.2**

seamless liner

Plastic liner which is integrally formed and free of any butt joint

##### **3.1.3**

welded liner

Plastic liner which contains butt joints

##### **3.1.4**

fully-wrapping

A wrapping mode in which the carbon fiber with a resin impregnated matrix is wrapped continuously over the plastic liner in spiral and circumferential pattern so as to reinforce the



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