

ICS 23.020.30

CCS J74



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

GB/T 11640-2021

Seamless aluminum alloy gas cylinders

铝合金无缝气瓶

(English Translation)

Issued on: April 30, 2021

Implemented on: November 1, 2021

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

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Foreword

All technical contents of this part of GB 21551 are mandatory.

This standard was drafted in accordance with the rules given in GB/T 1.1-2009

"Directives for standardization - Part 1. Rules for the structure and drafting of standards".

This standard replaces GB/T 11640-2001 "Seamless aluminum alloy gas cylinders".

As compared with GB/T 11640-2001, the main changes of this standard are as follows.

- In the provisions on the scope, DELETE the lower limit of nominal working pressure and the lower limit of nominal capacity (SEE Chapter 1 of 2001 version);
- In the technical requirements, DELETE the 6351 aluminum alloy material (SEE 5.1.1 of 2001 version);

- ADD the requirements for lead and bismuth elements in aluminum alloys (SEE 5.1.1 and 5.1.6);
- MODIFY the requirement for the inner bottom radius (SEE 5.2.2.4);
- MODIFY the requirements for the collar design (SEE 5.2.5);
- MODIFY the requirements for the measured burst pressure (SEE 6.12);
- ADD Appendix B (normative) Anti-constant load crack test (SEE 5.1.2);
- ADD Appendix D (informative) Calculation method of thread shear stress safety factor (SEE 5.2.3);
- ADD Appendix F (informative) Description and determination of aluminum cylinder manufacture defects (SEE 6.2);
- ADD Appendix G (normative) Flattening test method (SEE 6.9).

This standard was proposed by the National Gas Cylinder Standardization Technical Committee (SAC/TC 31).

The drafting organizations of this standard. Shenyang Gas Cylinder Safety Technology Co., Ltd., Heilongjiang Huaan Machinery Co., Ltd., Shanghai High Pressure Containers Co., Ltd.

1 Scope

This standard specifies the type and parameters, technical requirements, test methods and qualification criteria, inspection rules and marking, coating, packaging, transportation and storage requirements of seamless aluminum alloy gas cylinders (hereinafter referred to as aluminum cylinders).

This standard applies to the design and manufacture of aluminum cylinders which have a nominal working pressure of not more than 30 MPa, the nominal volume of not more than 50 L, the use temperature is -40 °C ~ 60 °C, AND can be re-filled with permanent gas or liquefied gas.

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) are applicable to this Standard.

GB/T 191 Packaging - Pictorial marking for handling of goods

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 228.1-2010 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

GB/T 3191 Extrusion rods and bars of aluminum and aluminum alloy

GB/T 3246.1 Inspection method for structure of wrought aluminum and aluminum alloy products - Part 1.Inspection method for microstructure

GB/T 3246.2 Inspection method for structure of wrought aluminum and aluminum alloy products - Part 2.Inspection method for macrostructure

GB/T 3880.1 ~ 3880.3 Wrought aluminum and aluminum alloy plates, sheets and strips for general engineering

3.2 symbols

The following symbols apply to this document.

A. elongation at fracture, %;

C. Thickness from bottom grounding point to the inner wall, mm;

d. Circumferential tear length of rupture opening, mm;

D0.Nominal outer diameter of cylinder, mm;

Df. Indenter diameter of bending test, mm;

H. External height of spherical part (cylinder shoulder and bottom), mm;

L. Length of cylinder part, mm;

n. The ratio of the indenter diameter to the average thickness of sample;
 ph. Pressure of hydraulic test, MPa;
 pb. Pressure of hydraulic blasting test, MPa;
 r. Inner bottom corner radius, mm;
 r1. Inner bottom radius, mm;
 R. Indenter cutting edge radius of flattening test, mm;
 Rm. Measured tensile strength, MPa;
 Rp0.2. Specified non-proportional extension strength, MPa;
 S. Designed wall thickness of cylinder, mm;
 Sa0. Measured average wall thickness of cylinder, mm;
 S1. Cylinder bottom center wall thickness, mm;
 T. Indenter spacing of flattening test, mm.

4.1 Type

The typical structure of aluminum cylinders shall generally comply with the type as shown in Figure 1.

5.1.5 The cylinder material must have the product quality certificate from the material manufacturing unit, AND it can only be used after passing the re-testing by the aluminum cylinder manufacturing unit.

5.1.6 The chemical composition shall be re-tested in accordance with the material furnace number. The Pb and Bi contents can be confirmed in accordance with the data of the product quality certificate.

5.1.7 The casting ingot shall be subjected to ultrasonic test in accordance with Phi2 mm equivalent flat bottom hole, AND the inspection method shall comply with the provisions of GB/T 6519.

5.2.1.1 In the wall thickness calculation for cylinder body design, it shall use the specified non-proportional extension strength guaranteed value after material heat treatment, AND such value shall not exceed 85% of the tensile