



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

GB/T 6519-2024

**Ultrasonic inspection of wrought aluminium and magnesium
alloy products**

变形铝、镁合金产品超声波检验方法

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Foreword

This document was drafted in accordance with the provisions of GB/T 1.1-2020 "Directives for standardization - Part

1.Rules for the structure and drafting of standardizing documents". This document replaces GB/T 6519-2013 "Ultrasonic inspection of wrought aluminium and magnesium alloy products". Compared with GB/T 6519-2013, in addition to structural adjustments and editorial changes, the main technical changes are as follows:

- a) CHANGE the method overview, indicating the factors affecting the flaw detection results (see Chapter 4; Chapter 4 of the 2013 edition);
- b) CHANGE the requirements for inspectors (see 5.1; Chapter 5 of the 2013 edition);
- c) CHANGE the inspection environment requirements, clarifying the inspection temperature

(see 5.2; Chapter 6 of the 2013 edition);

d) CHANGE the materials, detailing the requirements for standard test blocks and comparison test blocks (see Chapter 6;

7.1 of the 2013 edition);

e) ADD the requirements for dynamic test reference specimens (see 6.1.3);

f) CHANGE the probe (see 7.1;

7.2 of the 2013 edition);

g) CHANGE the ultrasonic testing instrument (see 7.2;

7.3 of the 2013 edition);

h) ADD the test mode and test method (see 9.1);

i) ADD the testing reliability verification requirements for special types of defects (see 9.7);

1 Scope

GB/T 6519-2024 is the Chinese method for ultrasonic inspection of wrought aluminium and magnesium alloy products. Wrought light alloy is inspected ultrasonically because the defects that matter in it, the residual porosity, the oxide film inclusions and the internal cracks left by rolling or extrusion, are invisible from the surface and are exactly the features that fail an aerospace or a pressure application. The document describes the pulse reflection technique and its physical basis, the requirements on the instrument, the probes and the coupling, the reference blocks and the setting of sensitivity, the scanning procedure and coverage, the classification and evaluation of indications and the acceptance levels, and the report. It covers wrought aluminium and aluminium alloy and wrought magnesium and magnesium alloy products, and it deliberately excludes castings, welds and laminated composites, which are inspected to other documents. The 2024 edition takes effect on 1 October 2024. For a mill, an aerospace buyer or an NDT laboratory working to Chinese requirements, this is the governing method.

This document describes the ultrasonic inspection method for wrought aluminum and aluminum alloys, wrought magnesium and magnesium alloy products. This document is applicable to ultrasonic inspection of wrought aluminum and aluminum alloys, wrought magnesium and magnesium alloy products, using ultrasonic pulse reflection technology. This document is not applicable to ultrasonic inspection of castings, welded parts, layered composites, which are produced by aluminum, magnesium and their alloys.

2 Normative references

The contents of the following documents constitute the essential terms of this document

through normative references in the text. Among them, for dated references, only the version corresponding to that date is applicable to this document; for undated references, the latest version (including all amendments) is applicable to this document.

GB/T 12604.1 Non-destructive testing - Terminology - Ultrasonic testing

GB/T 18694 Non-destructive testing - Ultrasonic inspection - Characterization of search unit and sound field

GB/T 18852 Non-destructive testing - Ultrasonic testing - Reference blocks and test procedures for the characterization of contact probe sound beams

GB/T 19799.1 Non-destructive testing - Ultrasonic testing - Specification for calibration block No.1

GB/T 28880 Non-destructive testing - Evaluating performance characteristics of ultrasonic pulse-echo testing systems without the use of electronic measurement instruments JJG 746 Verification regulation for ultrasonic flaw detectors YS/T 874 Ultrasonic inspection of wrought aluminium alloy columniform ingots by the water immersion method YS/T 1187 Ultrasonic inspection of aluminium and aluminium alloy thin-walled tubing YS/T 1188 Ultrasonic inspection of wrought aluminium alloy ingots YS/T 1633 Ultrasonic phased array inspection method for deformed aluminum and aluminum alloy products

3 Terms and definitions

The terms and definitions, which are defined in GB/T 12604.1, apply to this document.

4 Method overview

The piezoelectric crystal in the probe generates ultrasonic waves under the stimulation of electric pulses. The ultrasonic waves propagate in the sample under test through the coupling medium. If they encounter defects (heterogeneous interfaces), they will generate reflected waves and refracted waves, which will be received by the probe. The piezoelectric crystal in the probe converts the ultrasonic waves into electrical signals, which are received by the instrument for signal processing, amplification, display. The displayed information is compared with the ultrasonic response signal of the known ultrasonic reference reflector specified in the acceptance standard; the value and position of the detected defects are evaluated, to assess the quality of the sample under test. Note

1. Due to the surface state, geometric shape, inclination of the ultrasonic beam perpendicular to the incident surface of the sample under test, the amplitude of the defect and the bottom reflection wave may be reduced. These factors will seriously reduce the reliability of the test results of the ultrasonic inspection method specified in this document. Note

2. The assessment of the defect equivalent value is affected by factors such as the

characteristics of the probe, the surface state of the defect, the nature and shape of the defect. The comparison and assessment of the ultrasonic inspection defect test data specified in this document with the data of the recognized ultrasonic reference reflector test is carried out under restricted conditions; it is difficult to determine the actual size of the defect detected in the sample under test. Note

3. Because there are many variables in the inspection system that affect the results of ultrasonic inspection, it is difficult to determine the actual quantitative impact of the detected defects on the mechanical properties of the inspected samples. Although this method provides a reliable method for quality control in product manufacturing, it is inappropriate to use it as a special indication of the final performance and quality of the product processing workpiece inspected in this document.

5.1 Inspectors

5.1.1 Ultrasonic inspectors shall pass the training and examination of the nationally recognized or customer-recognized non-destructive testing professional certification body; obtain the corresponding level of qualification certificate.

5.1.2 Ultrasonic inspectors shall perform ultrasonic inspection work, in accordance with the technical level of their qualification certificates.

5.1.3 Ultrasonic inspectors shall also receive training on the operation of this document, inspection procedures, inspection equipment before taking up their posts. They may only take up their posts after passing the examination and obtaining approval from the enterprise's top management or its authorized representative.

5.2 Inspection environment

5.2.1 The inspection environment temperature should be kept within the range of $22\text{ }^{\circ}\text{C} \pm 15\text{ }^{\circ}\text{C}$; the sample temperature shall be the same as the ambient temperature.

5.2.2 The inspection environment shall not have strong magnetism, vibration, high frequency, large dust, large mechanical noise, corrosive gas.

5.2.3 The inspection site shall be safe, with sufficient space and appropriate light, to ensure the validity of the inspection results.

6.1 Standard test blocks, comparison test blocks, dynamic test reference specimens

6.1.1 Standard test blocks shall comply with the provisions of Appendix A.

6.1.2 Comparison test blocks shall comply with the provisions of Appendix B.

6.1.3 Dynamic test reference specimens shall comply with the provisions of Appendix C.