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

**GB/T 47561-2026**

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**Non-destructive testing of welds - Ultrasonic testing - Testing  
technique and acceptance for aluminium and its alloys**

焊缝无损检测 超声检测 铝及铝合金检测技术及验收

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## Foreword

GB/T 47561-2026 | Non-destructive testing of welds - Ultrasonic testing - Testing technique and acceptance for aluminum and its alloys

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33 National Standards of the People's Republic of China Non-destructive testing of welds, ultrasonic testing of aluminum and aluminum alloys Testing technology and acceptance  
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01 State Administration for Market Regulation The State Administration for Standardization issued a statement.

1.Scope This document specifies the testing levels, equipment and materials, and testing preparation for ultrasonic pulse echo testing of fusion welded joints of aluminum and aluminum alloys. Requirements for instrument adjustment, testing techniques, non-continuous acceptance, and test reports. This document applies to base material thicknesses of 6mm to 130mm, outer diameters of not less than 500mm, and base material and welds made of aluminum or aluminum alloys, and is suitable for applications involving acoustic attenuation. Full penetration butt joints that reduce (especially those with low scattering attenuation). Welded joints with an outer diameter less than 500mm, other

thickness ranges, and high acoustic attenuation. The ultrasonic pulse echo detection shall be performed in accordance with the reference procedure.

4. Symbols and Abbreviations The following symbols and abbreviations apply to this document, see Table 1.

## 5 Information required before testing

5.1 Necessary Items The contract or technology agreement should include at least the following items.

- a) Reference level;
- b) Discontinuous assessment methods;
- c) Acceptance level;
- d) Detection level;
- e) The manufacturing and processing state of the object being inspected at the time of inspection;
- f) Detection range with lateral discontinuities;
- g) Pre-weld and/or post-weld base material inspection;
- h) The contents of the written testing process specifications.

Note. Reference level is also called reference grade. Acceptance grade is also called acceptance grade.

5.2 Necessary Information Required Before Testing Before ultrasonic testing of welded joints, the testing personnel should obtain the following necessary information.

- a) Base material type and product category;
- b) The manufacturing or processing condition of the object under inspection at the time of inspection, including heat treatment or other conditions;
- c) The timing and extent of post-weld heat treatment;

## 6 Detection Level

6.1 Classification of Testing Levels The detection levels are divided into Grade A, Grade B, and Grade C. From Grade A to Grade C, the detection coverage should be increased progressively (e.g., by increasing scanning coverage). (Number of times and surface grinding, etc.)

6.2 Selection of Detection Level The selection of the inspection level should conform to the weld quality level (e.g., GB/T 22087), weld inspection documents (e.g., GB/T 34628), and

product documentation. As specified in the document or technical agreement, the testing level adopted should conform to the provisions of Table 2.

## 7 Equipment and Materials

7.1 Testing Equipment The instruments, probes, and combined equipment used in conjunction with this document shall comply with GB/T 27664.1, GB/T 27664.2, and GB/T 27664.3, respectively. The provisions of GB/T 27664.3.

7.2 Standard test block The standard test block used is calibration test block No. 1 specified in GB/T 19799.1 or standard test block No. 2 specified in GB/T 19799.2.

### 7.3 Comparative test blocks

7.3.1 Classification of Comparative Test Blocks The comparative test blocks used in this document are RB-AL-1, RB-AL-2, and RB-AL-3. RB-AL-1 is suitable for base material thicknesses ranging from [insert thickness range here]. Ultrasonic testing of welded joints with a thickness ranging from 6mm to 40mm. RB-AL-2 is suitable for welded joints with a base metal thickness ranging from 40mm to 80mm. Ultrasonic testing. RB-AL-3 is suitable for ultrasonic testing of welded joints with a base material thickness ranging from 80mm to 130mm.

7.3.2 Preparation of Comparative Test Blocks The test block should be made of aluminum or aluminum alloy materials that have the same or similar acoustic properties as the workpiece being tested. When using a straight probe for testing, the test block should not have any defects in the equivalent size of a flat-bottomed hole greater than or equal to 2 mm in diameter. This should meet the reference sensitivity requirements. When sensitivity adjustment is required, the reference reflectors on the test block can be arranged in other ways or added as needed for testing.

7.3.3 Comparison of test block dimensions The shape and dimensions of the aluminum and aluminum alloy comparative test blocks RB-AL-1, RB-AL-2 and RB-AL-3 should conform to Figure 1, Figure 2, Figure 3 and Table 4. Requirements.

### 7.4 Probe Parameters

7.4.1 Detection Frequency The testing frequency should be between 2MHz and 5MHz. When the base material thickness is no greater than 40mm, or when testing non-continuous sections according to the method described in GB/T 29711... When conducting further evaluations, a higher testing frequency should be used.

7.4.2 Angle of Refraction The angle of refraction refers to the angle of refraction of the transverse wave in the inspected workpiece, and should preferably be selected according to the specifications in Table

5. When conditions permit, a larger angle of refraction should be used. Angle. When using two or more probes, the difference in refraction angle between the probes should not be less than  $10^{\circ}$ . When inspecting for incomplete fusion at the bevel surface, the following should be used. The refraction angle should be such that the sound beam is nearly perpendicular to the weld bevel surface. When inspecting incomplete penetration at the back opening of a weld, a refraction angle ranging from  $35^{\circ}$  to  $55^{\circ}$  should be used. Angle of refraction. When the thickness of the base material is less than 20 mm, a refraction angle of  $70^{\circ}$  is recommended.

7.4.3 Chip Size The wafer size should be selected according to Table 6.

7.5 Coupling agent The coupling agent shall conform to the requirements of GB/T 39240. The same coupling agent shall be used for range adjustment, sensitivity setting, and workpiece inspection.

## 8 Testing Preparation

8.1 Determination of weld shape and dimensions Before inspection, the weld groove type, base metal thickness, weld width, etc. should be understood or measured and recorded.

8.2 Detection Area The inspection area refers to the weld and the width of the heat-affected zone on both sides of the weld. If the width of the heat-affected zone is unknown, samples are taken from the base material on both sides of the weld. 10mm width. The testing surface should be flat and free from any adhering layers or products that may obstruct ultrasonic transmission or probe movement, or cause misjudgment.

8.3 Base Material Testing Unless it can be confirmed (e.g., pre-inspection during manufacturing) that the presence of high attenuation or defects in the base metal does not affect shear wave detection, the base metal in the scanned area... Longitudinal wave testing should be performed on the metal before or after welding. The technical aspects and acceptance procedures for longitudinal wave testing shall be in accordance with the provisions of sections 9.4, 10.4, and

11.2 of this document. implement.

## 9 Instrument Adjustment

9.1 Angled probe incident point The angle probe should be measured using calibration block No. 1, standard block No. 2, or comparison blocks (RB-AL-1, RB-AL-2, and RB-AL-3). Incident point. When using a comparison test block to determine the incident point of the angle probe, formula (2) should be used, as shown in Figure 4.

## 9.2 Time Baseline Adjustment

9.2.1 Time Baseline Adjustment The time baseline is adjusted using the following two