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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 23904-2025

Replacing GB/T 23904-2009

Non-destructive testing - Test method for ultrasonic testing by surface wave

无损检测 超声表面波检测方法

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part

1.Structure and drafting rules for standardization documents" Drafting. This document replaces GB/T 23904-2009 "Non-destructive testing - Ultrasonic surface wave test methods" and is consistent with GB/T 23904-2009. In addition to structural adjustments and editorial changes, the main technical changes are as follows:

a) The scope has been changed (see Chapter 1, Chapter 1 of the.2009 edition);

b) Personnel qualifications have been deleted (see Chapter 4 of the.2009 edition);

c) The requirements for instruments have been changed (see 4.1,

5.1 of the.2009 edition);

d) The requirements for probes have been changed (see 4.2,

5.2 of the.2009 edition);

e) The requirements for preparing the test process specifications have been changed (see 5.1,

7.1 of the.2009 edition);

f) Deleted the detection principle (see Chapter 6 of the.2009 edition);

g) Added general provisions on detection sensitivity (see 6.1);

h) Added comparison test block type (see 6.3.1);

i) The sensitivity adjustment method of the surface wave rectangular notch comparison test block has been changed (see 6.3.2.1,

1 Scope

China's national method for ultrasonic testing with surface waves. It specifies the general requirements, the equipment, the calibration, the technique and the evaluation for the detection of discontinuities using surface waves. A surface wave, or Rayleigh wave, travels along the free surface of a solid with its energy concentrated within about one wavelength of it, and it follows the surface around curves and corners rather than reflecting off them. That gives it a property no bulk wave has: a single probe can examine a long run of surface, including regions that are not accessible to a probe at all, and it is sensitive to the shallow surface-breaking defects that matter most in fatigue-loaded components - because a fatigue crack starts at the surface, and a component that fails in service almost always failed from one. Turbine blades, shafts, welds, bolts, aerospace structures and railway rails are examined this way. The properties that make it useful also make it demanding. The wave travels on the surface, so it is attenuated and scattered by anything on that surface: paint, scale, roughness, oil, or the operator's coupling hand. It is highly sensitive to shallow defects and almost blind to deep ones, so it complements rather than replaces bulk wave testing. And because it follows the geometry, a signal returning from an edge, a fillet or a change in section is indistinguishable from a defect signal unless the geometry is known and accounted for. The standard therefore fixes the probe and frequency selection, the surface condition and preparation, the calibration on reference blocks, the scanning technique and coverage, the interpretation of geometric signals and the evaluation and reporting. Issued on 30 May 2025 and in force since 1 September 2025, it replaces GB/T 23904-2009.

This document specifies the general method of contact pulse reflection ultrasonic surface wave testing for the detection of surface imperfections in metallic materials. This document is applicable to workpieces with a surface roughness Ra not greater than 6.3μm and a thickness not less than 5 times the wavelength of the surface wave used for detection. The curvature radius of the workpiece such as a cylinder shall not be less than 22.5mm.

Note. The wavelength of the surface wave used for detection is calculated based on the theoretical surface wave sound velocity of the workpiece/the nominal frequency of the surface wave probe used for detection.

2 Normative references

The contents of the following documents constitute essential clauses of this document through normative references in this document. For referenced documents without a date,

only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document.

GB/T 12604.1 Nondestructive testing terminology Ultrasonic testing

GB/T 27664.1 Non-destructive testing - Performance and inspection of ultrasonic testing equipment - Part

3 Terms and definitions

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

4 Detection system

4.1 Instrument Ultrasonic instruments should comply with the provisions of GB/T 27664.1 and have the following characteristics.

---The operating frequency includes the frequency range of 0.5MHz~10MHz;

---With a continuously adjustable gain of more than 80dB, the minimum gain step is no more than 1dB;

---The linear deviation of the time base is not more than 0.5%, and the linear deviation of the amplitude is not more than 5%.

4.2 Probe The probe should comply with the provisions of GB/T 27664.2 and meet the following requirements.

---Can form surface waves through refraction of longitudinal waves on the detection surface;

---The chip area should not be greater than 500mm2, and the length of any side of the rectangular chip should not be greater than 25mm;

---The frequency range should be 1MHz~5MHz;

---The deflection angle should not be greater than 2°. When scanning curved surfaces, the gap between the measured surface and the bottom surface of the probe should not be greater than 0.5mm, otherwise the bottom surface of the probe should be ground to match the curved surface.

4.3 System Performance The time base linearity, gain linearity, physical condition and appearance should be checked regularly. The verification method, verification cycle and performance parameter indicators should be