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OF THE PEOPLE'S REPUBLIC OF CHINA

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Calibration Specification for Ultrasonic Thickness Instruments

超声波测厚仪校准规范

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Calibration Specification for Ultrasonic Thickness Instruments

1 Scope

This Specification is applicable to the calibration of ultrasonic thickness instruments of which the resolution is 0.1mm and 0.01mm.

2 Normative references

This Specification referred to the following referenced documents.

JJF 1001-1998, *General Terms in Metrology and Their Definitions*

JJF 1059-1999, *Evaluation and Expression of Uncertainty in Measurement*

GB/T 12064.1-1999, *Nondestructive testing terms - Ultrasonic testing*

GB/T 11344-1989, *Measuring thickness by ultrasonic pulse-echo contact method*

When using this Specification, it shall use the currently valid versions of the above references.

3 Overview

The ultrasonic thickness instruments are mainly used to measure the wall thickness of hulls, oil and gas pipelines, high-pressure vessels, boilers as well as the thickness of large area sheet. The material to be tested can be metal materials such as steel, or non-metal materials such as plastic and nylon. The principle is that the instrument emits ultrasonic waves through the probe and reflects back to the test head after reaching the bottom surface of the test piece. Use a counter to accurately measure the time that ultrasonic waves travel through the material and calculate it as follows. Display the measured thickness value on the display.

6 Calibration items and calibration methods

Before calibration, it is necessary to confirm that there are no defects in appearance and electromechanical functions that affect the calibration metrological characteristics.

6.1 Repeatability

After the instrument is turned on, operate the sound speed adjustment key or the sound speed dial to adjust the sound speed to 5900m/s. Return to the state of the instrument measuring thickness. Apply the coupling agent to the center of the 5.5mm standard thickness block. Use the probe to continuously measure this thickness block 5 times. Take the difference between the maximum and minimum values as the repeatability of the instrument. It can also directly use the random calibration thickness block of the instrument to conduct this calibration.

6.2 Indication error

Conduct calibration according to the procedures specified by the instrument. Measure the standard thickness blocks in Annex B one by one in the measuring range of the instrument. Continuously measure each block 3 times. Take the average value as the indication value of the instrument in the thickness block. When the same ultrasonic thickness instrument has two resolutions: 0.1mm and 0.01mm, it shall respectively conduct the calibration of two indication errors. The indicator error δ_H is calculated according to the following formula:

$$\delta_H = \overline{H} - H$$

Where,

$\overline{H}$ - Average indication value of the instrument;

H - Nominal value of standard thickness block.

6.3 Indication error of curved wall thickness measurement

Conduct calibration according to the procedures specified by the instrument (do not recalibrate if the probe is not replaced). According to the provisions of Table 2, measure the wall thickness of a standard round tube corresponding to its resolution (see Annex C for technical requirements). When measuring, place the sound insulation layer 1 of the probe parallel to or perpendicular to the prime line of the standard round tube 2 (as shown in Figure 2). Swing the probe slightly and observe the indication value. Take the minimum stable indication

Annex A

Calibration certificate content

1. Title: Calibration certificate;
2. Laboratory name and address;
3. Site for calibration;
4. Certificate or report number, page number and total number of pages;
5. Name and address of the submission authority;
6. Name of the instrument to be calibrated;
7. Manufacturer, model specifications, and number of the instrument to be calibrated;
8. Name of the metrology standard used for calibration and its expiration date;
9. Name and number of this Specification and description on any deviation, addition or deletion to this Specification;
10. Ambient temperature during calibration;
11. Calibration results of calibration items;
12. Measurement uncertainty of calibration results of indication error;
13. Signature of calibrator, signature of verifier, signature of approver;
14. Issue date of calibration certificate;
15. Recommendation for recalibration time interval;
16. No partial reproduction of the calibration certificate without written approval from the calibration laboratory.

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Contact: Wayne Zheng, Sales@ChineseStandard.net

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