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Method of ultrasonic testing for round steel

圆钢超声检测方法

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1 Scope

This Standard specifies testing requirements, contrast sample, testing equipment, testing conditions and steps, determination, testing record and report of ultrasonic testing for round steel.

This Standard is applicable to pulse reflection method for ultrasonic automatic or semi-automatic detection (including phased array ultrasonic testing) for round steel of which diameter is 8mm~400mm. Manual testing and ultrasonic testing for round steel of other specifications may refer to this Standard for implementation.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 9445, *Qualification and certification for nondestructive testing personnel*

GB/T 12604.1, *Non-destructive testing - Terminology - Terms used in ultrasonic testing*

JJG 746, *Verification Regulation for Ultrasonic Flaw Detectors*

YB/T 145, *Die Casting and Size Measurement Method of Artificial Defects on the Contrast sample Pipes*

YB/T 4082, *Measurement method of comprehensive properties for automatic ultrasonic flaw detection system for steel tubes*

3 Terms and definitions

For the purposes of this document, the terms and definitions defined in GB/T 12604.1 as well as the followings apply.

3.1 automatic testing

4.2 Testing method

Ultrasonic testing for round steel may use automatic testing, semi-automatic testing or manual testing. During manual testing, scanning speed of probe shall not exceed 150mm/s.

4.3 Coupling method

Ultrasonic testing for round steel may use contact technology, gap technology or liquid immersion technology. Contact technology may use water, oil, grease or paste as couplant. Gap technology or liquid immersion technology usually use water or oil as couplant. In order to prevent round steel rusted and surface of round steel and probe to have bubbles, it may add preservatives, wetting agents and defoamers.

4.4 Scanning mode

During ultrasonic testing, probe performs circumferential-direction scanning. In semi-automatic or automatic testing, relative motion scanning mode for probe and round steel can be: probe rotates round steel to go forward straight; probe fixes round steel to go forward spiral (or straight); probe moves along with round steel axis and round steel rotates in situ or probe fixes round steel to go forward straight. No matter which scanning mode used, scanning track of probe shall continuously and uniformly cover round steel surface. Scanning of adjacent tracks shall have an overlap of 10% of effective detection areas of probe.

4.5 Testing personnel

Testing personnel shall have qualification certificate of GB/T 9445 or equivalent standard. Testing personnel that performs ultrasonic testing shall have qualification certificate for ultrasonic flaw detection professional level 1 and above. Testing report issuer shall have qualification certificate for ultrasonic flaw detection professional level 2 and above.

5 Contrast sample

5.1 Material

Contrast sample material and acoustic performance shall be same or similar with testing round steel (acoustic attenuation difference shall be within ±4dB). There shall be no defects that affect equipment verification inside material.

5.2 Diameter, length and straightness

Diameter of contrast sample for automatic testing and semi-automatic testing shall meet requirements for nominal size. Length and straightness shall meet

standards (phased array ultrasonic detector meets relevant standards), perform regular calibration test. Calibration test cycle generally does not exceed 1 year.

6.2 Probe

Frequency of ultrasonic testing probe of round steel is usually within 1MHz~10MHz. Probe's wafer size is between 6mm~25mm (excitation aperture of phased array probe meets above requirements). Round steel ultrasonic testing can use combined probe of multiple wafers so as to improve testing speed.

6.3 Testing host

When performing semi-automatic or automatic testing, relative scanning movement between probe and round steel is realized by testing host. For testing system of which probe rotates round steel and goes straight ahead, testing host includes rotating water chamber that drives probe to rotate and clamping drive device that drives round steel to go straight ahead. For testing system of which probe fixes round steel to perform spiral (or straight line) going-forward, testing host includes water tank that places probe and clamping drive device that drives round steel to perform spiral (or straight line) going-forward. For testing system of which probe moves along with round steel axis and round steel perform in situ rotation, testing host includes scanning mechanism that drives probe to move and roller system that drags round steel to perform in situ rotation. Testing host is a core component to ensure reliable testing.

6.4 Mechanical transmission device and other auxiliary devices

During semi-automatic or automatic testing, mechanical transmission device makes testing round steel pass through testing host concentrically at a constant speed. According to different testing modes, mechanical transmission device can drive round steel to perform straight going-forward or spiral going-forward. Other auxiliary devices include defect marking device, sorting device.

7 Testing conditions and steps

7.1 Testing conditions

7.1.1 Unless otherwise agreed in agreement between supplier and purchaser, ultrasonic testing of round steel shall be performed after main production processes (rolling, heat treatment, hot-cold processing and straightening).

7.1.2 Surface of testing round steel shall be flat and smooth, free from loose scale, oil and other contaminants that affect testing. Internal organization of testing round steel shall not produce interference echo waves during testing

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