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

**GB/T 22131-2022**

Replacing GB/T 22131-2008

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**Practice for ultrasonic examination from bored surfaces of  
cylindrical forgings**

筒形锻件内表面超声波检测方法

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### Foreword

This document was drafted in accordance with the rules given in GB/T 1.1-2020, Directives for standardization - Part 1: Rules for the structure and drafting of standardizing documents. This document replaces GB/T 22131-2008 Practice for ultrasonic examination from bored surfaces of cylindrical forgings; compared with GB/T 22131-2008, in addition to structural adjustments and editorial changes, the main technical changes are as follows:

- a) Change "flaw detection" to "detection" (see full text);
- b) Change the scope of this document (see Chapter 1; Chapter 1 of the 2008 edition);
- c) Add the chapter "Normative references" (see Chapter 2);
- d) Add the chapter "Terms and definitions" (see Chapter 3);
- e) Add the chapter "Requirements for test personnel" (see Chapter 4);
- f) Change "inspection specifications" to "technical requirements" (see 5.1; 2.1 of the 2008 edition);
- g) Delete the requirement that the acceptance criteria shall be clearly stated in the order requirements (see 2.2 of the 2008 edition);
- h) Add contents that shall be specified in the contract or technical requirements (see 5.2);

- i) Change the requirements for probes (see 6.2; 2.3, 3.6, 4.4 of the 2008 edition);
- j) Change "mechanical behaviors" to "mechanical properties" (see 5.4;

## 1 Scope

GB/T 22131-2022 is the Chinese national standard on practice for ultrasonic examination from bored surfaces of cylindrical forgings, in the field of metallurgy. The /T suffix marks it as a recommended standard: it is not compulsory by itself, but it becomes binding as soon as a contract, a tender or a customer specification calls it up - which in practice is how most foreign buyers meet it. It was issued on 12 October 2022 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 12 October 2022. Classification: ICS 77.140.85, CCS J32. This page is published from the official record of the standard held by the Chinese standards administration: the identification, the dates, the classification and the issuing body are taken from there. The clause text, the tables and the numeric limits are in the document itself, which is delivered complete in English translation.

This document describes the basic practice for ultrasonic examination from bored surfaces of forgings by longitudinal wave dual-crystal probes using the pulse reflection method, including requirements for test personnel, general requirements, ultrasonic testing equipment, preparation for ultrasonic testing of forgings, testing procedures, recording requirements and testing report. This document applies to the manual inspection method of cylindrical forgings with an inner diameter of  $\geq 64$  mm, but does not limit the use of other inspection methods, such as mechanized or automated inspection methods.

## 2 Normative references

The following documents are normatively referenced in this document and are indispensable for its application. 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 8541, Terminology of forging and stamping

GB/T 9445, Non-destructive testing - Qualification and certification of NDT personnel

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

GB/T 27664.1, Non-destructive testing - Characterization and verification of ultrasonic test equipment - Part 1: Instruments

GB/T 27664.3, Non-destructive testing - Characterization and verification of ultrasonic test equipment - Part 3: Combined equipment

### 3 Terms and definitions

Terms and definitions determined by GB/T 8541 and GB/T 12604.1 are applicable to this document.

### 4 Requirements for test personnel

The personnel who implement the test shall be qualified according to the requirements of GB/T 9445, and shall obtain the qualification certificate of the corresponding test method level. The work performed by the test personnel at various levels shall be compatible with their qualification levels and methods.

### 5 General requirements

5.1 When it is required in the contract or technical requirements that ultrasonic examination shall be performed from the bored surface, whether the forgings can be accepted shall be judged from the number of defects, defect amplitude, position, or a combination of the three.

5.2 The contract or technical requirements shall specify the following:

- a) scope of detection parts;
- b) requirements for calibration holes;
- c) testing procedures;
- d) terms of acceptance.

5.3 Ultrasonic testing shall be carried out on the entire bored surface. Due to the presence of fillets at the step, or due to other local shape reasons, some small parts of the inner hole surface may not be detected.

5.4 Ultrasonic testing shall be carried out after the final austenitizing treatment and tempering heat treatment to obtain the mechanical properties of the forging; it can also be carried out before or after any subsequent stress relief heat treatment.

5.5 Radial incident ultrasound beams shall be used for a comprehensive scan.

5.6 Forgings can be tested in a stationary state or in a rotating state on a lathe or the roller.

5.7 When scanning the bored surfaces, there shall be at least 20% overlap of the probe chip width between two adjacent scans.

### 6 Ultrasonic testing equipment

6.1 Equipment Ultrasonic testing equipment shall have the following properties:

6.4.1 Calibration holes can be drilled on material of similar acoustic properties to the forging to be inspected; calibration holes can also be drilled on the length margin of the forging. The calibration holes drilled shall be parallel to the inner hole of the forging.

6.4.2 The scanning surface of the probe on the material drilled with calibration holes shall have the same curvature as the forging to be inspected. The location and number of calibration holes shall be set to meet the testing requirements.

## 7 Preparation of forgings for ultrasonic testing

7.1 When performing ultrasonic testing, the bored surfaces of the forging shall be smooth and free from scratches, loose scale, wear debris or other foreign matter.

7.2 The surface roughness of forgings to be inspected is required to be  $Ra \leq 3.2 \mu m$ .

## 8 Testing procedures

When testing, the following procedures shall be followed:

- a) Use the calibration holes specified by the demand side to determine the detection sensitivity, and adjust the amplitude of the calibration holes to 100% of the full screen height of the instrument, as the sensitivity;
- b) Perform distance correction to ensure system linearity;
- c) Connect the probe to the pulse delay block, and mark the position of the signal reflected from the curved surface of the plexiglass wedge as the bored surface;
- d) Record the distance from the bored surface to the side of the calibration hole;
- e) Adjust the scanning range so that the maximum detection range is about 3/4 of the scanning line range of the instrument;
- f) Record the axial and circumferential positions of all signals up to 10% of the calibration hole sensitivity;
- g) Move the probe perpendicular to the sound insulation layer of the probe, and scan manually at regular intervals or use other structural devices to support the probe for automatic scanning.

## 9 Requirements for recording

The following defect information shall be recorded: