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**ENERGY INDUSTRY STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

NB/T 47013.15-2021

**Nondestructive testing of pressure equipments - Part 15:
Phased-array ultrasonic testing**

承压设备无损检测 第15部分：相控阵超声检测

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Foreword

This document was issued on 26 April 2021 by the National Energy Administration of the PRC and takes effect on 26 August 2021.

It is a NB/T standard: recommended rather than compulsory, but it is the text a Chinese

reviewer applies when assessing a submission.

It is classified under ICS 77.040.20, Chinese classification H 26.

NB/T 47013 Nondestructive testing of pressure equipments is divided into the following 15 parts.

Part 1: General requirements.

Part 2: Radiographic testing.

Part 3: Ultrasonic testing.

Part 4: Magnetic particle testing.

Part 5: Penetrant testing.

Part 6: Eddy current testing.

Part 7: Visual testing.

Part 8: Leak testing.

Part 9: Acoustic emission testing.

Part 10: Time of flight diffraction ultrasonic testing.

Part 11: X-ray digital imaging testing.

Part 12: Magnetic flux leakage testing.

Part 13: Pulsed eddy current testing.

Part 14: X-ray computed radiography testing.

Part 15: Phased-array ultrasonic testing.

This document is Part 15 of NB/T 47013: Phased-array ultrasonic testing.

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 was proposed by and is under the jurisdiction of the National Technical Committee on Boilers and Pressure Vessels of Standardization Administration of China (SAC/TC 262).

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This document is issued for the first time.

1 Scope

NB/T 47013.15-2021 is Part 15 of the Chinese standard for non-destructive testing of pressure equipment, and it covers phased-array ultrasonic testing. A phased-array probe holds many small elements that are fired with controlled delays, so the beam can be steered and focused electronically instead of by moving the probe or changing the wedge: one probe sweeps a range of angles, and the result can be displayed as a sectorial image of the weld rather than a single trace. That capability is what this part regulates. It fixes the qualification of the personnel who perform and interpret the examination, the equipment and its verification - array probes, wedges, instruments and reference blocks - and the checks made on the system before and during the work. It then sets out the technique: the focal law and its validation, the angular range and focusing depth, the scan plan that proves the weld volume is covered, the sensitivity setting and the time-corrected gain, the encoder and scanning speed, and the recording of the data. Interpretation follows, with the characterisation, sizing and location of indications from the sectorial and linear images, and the acceptance levels by quality class. The examination report and the retention of the raw data close the document, since with phased array the data file is itself the record. It applies to welds and components in pressure vessels, boilers and pressure piping in China.

1.1 This document specifies the methods and the quality grading requirements for phased-array ultrasonic testing of pressure equipment. Phased-array ultrasonic testing carried out in accordance with the relevant technical requirements of this document is recordable pulse-echo ultrasonic testing.

1.2 This document applies to the phased-array ultrasonic testing of metallic raw materials, component parts and welded joints during the manufacture and the service of pressure equipment.

1.3 For the phased-array ultrasonic testing of electrofusion joints of polyethylene piping, reference may be made to Annex A (informative).

1.4 For the phased-array ultrasonic testing of materials and structures used in pressure equipment, and of their welded joints, that are not expressly specified in this document, this document may be applied by reference where process validation shows that the testing

requirements can be met; the phased-array ultrasonic testing of supports and structural parts related to pressure equipment may also be carried out by reference to this document.

2 Normative references

The contents of the following documents constitute indispensable provisions of this document through the normative references made to them in the text. For dated references, only the edition corresponding to that date applies to this document; for undated references, the latest edition (including all amendments) applies to this document.

GB/T 699 Quality carbon structural steels.

GB/T 11259 Non-destructive testing - Practice for fabrication and control of steel reference blocks used in ultrasonic testing.

GB/T 12604.1 Non-destructive testing - Terminology - Ultrasonic testing.

GB/T 29302 Non-destructive testing instruments - Performance and verification of phased-array ultrasonic testing systems.

GB/T 29460 Safety assessment of polyethylene piping electrofusion joints containing defects.

DL/T 694-2012 Technical guide for ultrasonic testing of high-temperature fastening bolts.

JB/T 8428 Non-destructive testing - General specification for ultrasonic test blocks.

JB/T 9214 Non-destructive testing - Test method for the operating performance of A-mode pulse-echo ultrasonic testing systems.

JB/T 10062 Test methods for the performance of probes used in ultrasonic flaw detection.

JB/T 11731 Non-destructive testing - General technical requirements for ultrasonic phased-array probes.

JB/T 11779 Non-destructive testing instruments - Technical requirements for phased-array ultrasonic testing instruments.

NB/T 47013.1 Nondestructive testing of pressure equipments - Part 1: General requirements.

NB/T 47013.3 Nondestructive testing of pressure equipments - Part 3: Ultrasonic testing.

NB/T 47013.10 Nondestructive testing of pressure equipments - Part 10: Time of flight diffraction ultrasonic testing.

JJF 1338 Calibration specification for phased-array ultrasonic flaw detectors.

ASTM E-317 Standard practice for evaluating performance characteristics of ultrasonic pulse-echo testing instruments and systems without the use of electronic measurement