

ICS 19.100

CCS N 77



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

GB/T 42399.3-2023

**Non-destructive testing instruments - Characterization and
verification of ultrasonic phased array equipment - Part 3:
Combined system**

Issued on: March 17, 2023

Implemented on: October 1, 2023

**Issued by: State Administration for Market Regulation, China National
Standardization Administration**

Table of Contents

Preface	
Introduction	
1 Scope	1
2 Normative references	1
3 Terms and Definitions	1
4 symbols	2
5 General requirements	3
6 Operating Mode	4
7 Test Equipment	7
8 Group 1 Test	7
8.1 General	7
8.2 Array elements and channels	7
8.2.1 General	7
8.2.2 Channel assignment	8
8.2.3 Relative Sensitivity of Array Elements	8
8.3 Beam characteristics	10
8.3.1 General	10
8.3.2 Unsaturation	10
8.3.3 Beam characteristics of contact probes	11
8.3.4 Beam characteristics of liquid immersion probes	17
8.4 Imaging examination	20
8.4.1 General	20
8.4.2 Positioning of reflectors	20
8.4.3 -6dB spot size	20
8.4.4 Amplitude comparison	21
9 Group 2 Test	21
9.1 General	21
9.2 Appearance inspection of equipment	21
9.2.1 Detection method	21
9.2.2 Acceptance criteria	21
9.3 Relative Sensitivity of Array Elements	22
9.3.1 General	22

9.3.2 Detection method	22
9.3.3 Identifying failed array elements	22
9.3.4 Sensitivity variation compensation	22
9.3.5 Acceptance criteria	22
9.4 Linearity of amplified systems	22
9.4.1 Detection method	22
9.4.2 Acceptance criteria	22
9.5 Virtual Probe Absolute Sensitivity	23
9.5.1 General	23
9.5.2 Detection method	23
9.5.3 Acceptance criteria	23
9.6 Relative Sensitivity of Virtual Probes	23
9.6.1 General	23
9.6.2 Detection method	23
9.6.3 Acceptance criteria	23
9.7 Probe incidence point	24
9.7.1 General	24
9.7.2 Detection method	24
9.7.3 Acceptance criteria	24
9.8 Angle of refraction	24
9.8.1 General	24
9.8.2 Detection method	24
9.8.3 Acceptance criteria	25
9.9 Deflection angles of contact probes	25
9.9.1 General	25
9.9.2 Detection method	25
9.9.3 Report	25
10 System Record Table	25
Appendix A (informative) Test items and acceptance criteria	26
Reference	28

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 is part 3 of GB/T 42399 "Performance and Inspection of Phased Array Ultrasonic Equipment for Nondestructive Testing Instruments". GB/T 42399

The following parts have been released.

--- Part 1.Instruments;

--- Part 2.Probes;

--- Part 3.Combined system.

This document is equivalent to ISO 18563-3:2015 "Performance and inspection of phased array ultrasonic equipment for non-destructive testing - Part 3.Combination system".

This document has made the following minimal editorial changes.

--- In order to be consistent with the existing standard series, the name of the standard is changed to "Performance and Inspection of Phased Array Ultrasonic Equipment for Nondestructive Testing Instruments No.

Part 3.Composite Systems".

Please note that some contents of this document may refer to patents. The issuing agency of this document assumes no responsibility for identifying patents.

Introduction

Like the A-type conventional detector, the phased array ultrasonic is based on the pulse reflection method for detection, and the same flaw quantitative and qualitative methods are used.

bit method. However, the phased array ultrasonic detector is a high-performance digital instrument, which can record the signal of the whole detection process.

The system can generate and display high-quality images projected in different directions, so its unique measurement calibration and verification methods need to be specified.

Certainly. GB/T 42399 aims to pass the testing methods and acceptance criteria for phased array ultrasonic detectors including instruments, probes and combined systems

Standards are stipulated, so as to unify the technical requirements of products, so that they can be better applied in actual production and testing.

GB/T 42399 "Performance and Inspection of Phased Array Ultrasonic Equipment for Nondestructive Testing Instruments" is divided into the following three parts.

--- Part 1.Instruments. The purpose is to specify the detection frequency of multi-channel

phased array ultrasound in the range of 0.5MHz~10MHz

The detection method and acceptance criteria of the main technical performance of the detector.

--- Part 2.Probes. The purpose is to specify the use of contact method or liquid immersion method, the center frequency range is 0.5MHz~10MHz

The detection methods and acceptance criteria for the main technical performance of phased array probes that need to be inspected after fabrication is completed.

--- Part 3.Combined system. The purpose is to specify the use of linear phased array probes, contact (with or without wedge) or water immersion, center

The performance detection method of phased array combination equipment (that is, connected instruments, probes and cables) with a frequency in the range of 0.5MHz~10MHz

laws and acceptance criteria.

The three parts of GB/T 42399 "Performance and Inspection of Phased Array Ultrasonic Equipment for Nondestructive Testing Instruments" are independent of each other, but they echo each other and form a

into a complete set of standards.

Non-destructive testing instrument phased array ultrasonic equipment

Performance and inspection part 3. combined systems

1 Scope

This document describes the inspection methods and acceptance criteria for the inspection of combined equipment (ie instruments, probes and connecting cables).

This document is applicable to contact type (with or without wedges) or liquid immersion linear array phased array probes with a center frequency of 0.5MHz~10MHz.

Ultrasonic testing system. This detection method is applicable to users in the field or workshop environment. Its purpose is to verify that the system is working correctly,

Beam characteristics or check for system performance degradation. This test method is not intended to prove the suitability of the system for a particular application, but to

Demonstrate the ability of the combined device to generate an ultrasonic sound beam according to the setup.

The scope of this document does not include application-specific device calibration, which is generally covered by the testing process.