



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

GB/T 40733-2021

**Non-destructive testing of welds - Ultrasonic testing - Use of
automated phased array technology**

Issued on: October 11, 2021

Implemented on: May 1, 2022

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

Table of Contents

1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Detection level	3
5 Information needed before testing	4
6 Requirements for testing personnel and testing equipment	5
7 Test preparation	6
8 Base metal inspection	7
9 Range and sensitivity setting	7
10 Equipment verification	9
11 Verification of inspection process regulations	9
12 Weld Inspection	9
13 Data storage	10
14 Interpretation and analysis of phased array data	10
15 Test report	11
Appendix A (informative) Typical reference test block and reference reflector.....	13
Appendix B (Normative) Periodic use or performance inspection of phased array ultrasonic instruments	17
Appendix C (Normative) Performance Test of Phased Array Ultrasonic Probe.....	23
Appendix D (Normative) Combined performance test of phased array ultrasonic testing instrument and probe	27
Appendix E (informative) Illustration of possible signals	29
Reference	31

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 of Standardization Documents"

Drafting.

This document uses the redrafting method to modify and adopt ISO 13588.2019
 ``Automatic Phased Array Ultrasonic Technology for Nondestructive Testing of Welds,
 Ultrasonic Testing

Application of Technology.

Compared with ISO 13588.2019, the structure of this document has been adjusted, with appendix B, appendix C and appendix D added.

Compared with ISO 13588.2019, the main technical differences between this document and ISO 13588.2019 and the reasons are as follows.

---Regarding normative reference documents, this document has made adjustments with technical differences to adapt to my country's technical conditions and adjustments.

The situation is reflected in Chapter 2 "Normative Reference Documents", and the specific adjustments are as follows.

- * Replace ISO 22825 with GB/T 40732 modified to adopt international standards (see Chapter 1, Chapter 4);
- * Replace ISO 5577 with GB/T 12604.1 which is equivalent to the international standard (see Chapter 3);
- * Replace ISO 17635 with GB/T 34628 which is equivalent to the international standard (see Chapter 4);
- * Replace ISO 9712 with GB/T 9445 which is equivalent to adopting international standards (see 6.1);
- * Added reference to ISO /T S16829 (see 6.2.1);
- * Replace ISO 17640 (see 6.2.3, 9.1.3.4) with GB/T 11345 modified to adopt international standards;
- * Added reference to ISO 15626 (see 14.6.2, 14.6.3.2.);
- * Replace ISO 11666 (see 14.6.2, 14.6.3.3) with GB/T 29712 modified to adopt international standards;
- * Replace ISO 19285 (see 14.7) with GB/T 40734 which is equivalent to the international standard.

---Increase the performance inspection requirements and methods of phased array ultrasonic instruments specified in ISO 18563-1 for regular use or after repair

(See 6.2.1, Appendix B) to increase the operability of phased array ultrasonic instrument performance testing.

---The performance inspection requirements and methods of the phased array ultrasonic probe specified in ISO 18563-2 (see 6.2.1, Appendix C) have been added to increase

The operability of phased array ultrasonic probe performance test.

---Increase the combined performance inspection requirements of phased array ultrasonic

testing instrument and probe specified in ISO 18563-3 (see 6.2.1, appendix

D), in order to increase the operability of the combined performance test of the phased array ultrasonic instrument and the probe.

This document is under the jurisdiction of the National Welding Standardization Technical Committee (SAC/TC55).

Drafting organizations of this document. Shanghai Institute of Materials, Wuhan Zhongke Innovation Technology Co., Ltd., Ayntech Technology (Shanghai) Co., Ltd.

Division, Shanghai Aerospace Precision Machinery Research Institute, Olympus (Beijing) Sales Service Co., Ltd., Tumai Testing Technology (Chengdu) Co., Ltd., Guangdong

Shantou Ultrasonic Electronics Co., Ltd. Ultrasonic Instrument Branch, China Classification Society Industrial Company, Shanghai Crown Inspection Technology Co., Ltd., Shandong

Ruixiang Mould Co., Ltd., Jingjiang Advanced Materials Technology Research Institute of Shanghai Institute of Materials, Harbin Welding Research Institute Co., Ltd.

1 Scope

This document specifies the semi-automatic or fully automatic phased array ultrasonic testing of the fusion welded joints of metal materials with a base metal thickness of not less than 6mm.

This document is applicable to full penetration welded joints such as low-alloy or fine-grained steel plates, pipes and containers for base materials and welds, and welding of other materials

The detection of joints can also be used as a reference.

This document gives the advantages and advantages of discontinuity in detection, positioning, quantification and characterization of phased array ultrasonic technology when detecting fusion welded joints.

Limitation. In manufacturing process inspection, pre-service inspection and in-service inspection, phased array ultrasonic technology can be independent or combined with other non-destructive testing methods or technologies

Used in combination.

This document specifies 4 detection levels, with different levels corresponding to different defect detection rates.

The provisions of this document can be based on the length and the highest echo amplitude (equivalent reflector size), or the length and height are not continuous.

This document does not specify discontinuous acceptance levels.

This document does not apply to the automatic phase of welds in the manufacturing process of steel products specified in ISO 10893-8, ISO 10893-11 and ISO 3183.

Array ultrasonic testing.

2 Normative references

The content of the following documents constitutes an indispensable clause of this document through normative references in the text. Among them, dated quotations

Only the version corresponding to the date is applicable to this document; for undated reference documents, the latest version (including all amendments) is applicable to

This document.

GB/T 9445 Non-destructive testing personnel qualification and certification (GB/T 9445-2015, ISO 9712:2012, IDT)

GB/T 11345 Ultrasonic testing technology, inspection level and assessment for non-destructive testing of welds (GB/T 11345-2013, ISO 17640:2010, MOD)

GB/T 12604.1 Non-destructive testing terminology Ultrasonic testing (GB/T 12604.1-2005, ISO 5577:2000, IDT)

GB/T 29712 Acceptance level of ultrasonic testing for non-destructive testing of welds (GB/T 29712-2013, ISO 11666:2010, MOD)

GB/T 34628 General Rules for the Application of Metallic Materials for Non-destructive Testing of Welds (GB/T 34628-2017, ISO 17635:2016, IDT)

GB/T 40734 Phased array ultrasonic testing acceptance level for non-destructive testing of welds (GB/T 40734-2021, ISO 19285:

2017, IDT)

GB/T 40732 Non-destructive testing of welds, ultrasonic testing of austenitic steel and nickel-based alloy welds (GB/T 40732-2021,

ISO 22825:2017, MOD)

ISO 5817 Fusion welded joints of welding steel, nickel, titanium and their alloys (except beam welding), lack of quality level [Welding-

Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded)-Quality levels for imperfections]