International Standard

ISO 18563-3

Second edition
2024-05

Non-destructive testing — Characterization and verification of ultrasonic phased array equipment —

Part 3: Complete systems

Essais non destructifs - Caractérisation et vérification de l'appareillage ultrasonore multiélément —

Partie 3: Systèmes complets

Reference number
ISO 18563-3:2024(en)

© ISO 2024



COPYRIGHT PROTECTED DOCUMENT

© ISO 2024
All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword ... **iv**

1 Scope ... **1**

2 Normative references ... **1**

3 Terms and definitions ... **2**

4 Symbols ... **2**

5 General requirements for conformity ... **3**
5.1 General ... 3
5.2 Reference system ... 3
5.3 Identical system ... 3
5.4 Periodic checks ... 3

6 Qualification of test personnel ... **4**

7 Modes of operation for phased array techniques ... **4**

8 Equipment required for tests ... **6**

9 Tests to be performed ... **6**
9.1 General ... 6
9.2 External aspects of the equipment ... 8
9.2.1 General ... 8
9.2.2 Procedure ... 8
9.2.3 Acceptance criteria ... 8
9.2.4 Reporting ... 8
9.3 Elements and channels ... 8
9.3.1 General ... 8
9.3.2 Channel assignment ... 8
9.3.3 Relative sensitivity of elements, reference amplitude and dead elements ... 10
9.4 Verification of correct operation ... 12
9.4.1 General ... 12
9.4.2 Amplification system ... 12
9.4.3 Verification of correct operation by using imaging ... 15
9.4.4 Verification of correct operation by using beams ... 18
9.4.5 Skew angle ... 22
9.5 Other verifications ... 22
9.5.1 Squint angle ... 22
9.5.2 Grating lobes (recommended) ... 23

10 System record sheet ... **23**

Annex A (informative) **Characterization of sound beams** ... **25**

Bibliography ... **32**

© ISO 2024 – All rights reserved

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 135 *Non-destructive testing*, Subcommittee SC 3 *Ultrasonic testing,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 138, *Non-destructive testing,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 18563-3:2015), which has been technically revised.

The main changes are as follows:

— integration of matrix array probes;

— deletion of group 1 and 2 tests;

— addition of a clause on the use of imaging for complete system verification (9.4.3) as a simplification for a more functional standard (characterisation of beams moved to Annex A);

— addition of signal processing techniques using arrays (e.g. total focusing technique (TFM)) in the scope.

A list of all parts in the ISO 18563 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

© ISO 2024 – All rights reserved

Non-destructive testing — Characterization and verification of ultrasonic phased array equipment —

Part 3: Complete systems

1 Scope

This document addresses ultrasonic test systems implementing array probes, for contact technique (with or without wedge) or for immersion technique, with centre frequencies in the range of 0,5 MHz to 10 MHz.

This document provides methods and acceptance criteria for determining the compliance of the complete system (see 3.2). Its purpose is for the verification of the correct operation of the system prior to testing or verification of the absence of degradation of the system.

The methods are not intended to prove the suitability of the system for particular applications but are intended to prove the capability of the complete system (used for an application) to operate correctly according to the settings used. Tests can be performed on individual ultrasonic beams (for phased array technique, see 9.4.4) or on resulting images (for phased array technique and total focusing technique, see 9.4.3).

The tests can be limited to the functions that are intended to be used for a certain application.

This document does not cover the sensitivity setting of the system for a specific application. Nor does it apply to the characterization or verification of the mechanical scanning equipment. It is intended that these items will be covered by the test procedure.

This document does not address the phased array technique using tandem technique.

The characterization of beams, as recommended in case of dead elements or for more in-depth knowledge of the beams, is presented in Annex A. It is not applicable for signal processing technology using arrays.

NOTE Unless stated otherwise, in this document 'TFM' and 'TFM technique' refer to the total focusing technique as defined in ISO 23243, and to related techniques, see for example ISO 23865 and ISO 23234.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 5577, *Non-destructive testing — Ultrasonic testing — Vocabulary*

ISO 9712, *Non-destructive testing — Qualification and certification of NDT personnel*

ISO 18563-1, *Non-destructive testing — Characterization and verification of ultrasonic phased array equipment — Part 1: Instruments*

ISO 18563-2, *Non-destructive testing — Characterization and verification of ultrasonic phased array equipment — Part 2: Probes*

ISO 22232-2, *Non-destructive testing — Characterization and verification of ultrasonic test equipment — Part 2: Probes*

ISO 23243, *Non-destructive testing — Ultrasonic testing with arrays — Vocabulary*

© ISO 2024 – All rights reserved