



**Technical
Specification**

ISO/TS 22499

**Thermoplastic pipes for the
conveyance of fluids — Inspection
of polyethylene butt fusion joints
using phased array ultrasonic
testing**

*Tubes en matières thermoplastiques pour le transport des
fluides — Contrôle des assemblages par soudage bout à bout
en polyéthylène au moyen de la technique par ultrasons multi-
éléments*

**Second edition
2024-02**

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Contents

	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 General	2
5 Information required prior to testing	3
5.1 Items required for procedure.....	3
5.2 Specific information required by the operator before testing.....	3
5.3 Written test procedure.....	3
6 Personnel qualifications	3
7 Equipment	4
7.1 General.....	4
7.2 Ultrasonic instrument and display.....	4
7.3 Ultrasonic probes.....	4
7.4 Scanning mechanisms.....	4
7.5 Couplant.....	4
8 Range and sensitivity settings	5
8.1 Settings.....	5
8.1.1 General.....	5
8.1.2 Range setting — Test volume.....	5
8.1.3 Sensitivity setting.....	6
8.2 Reference sample.....	7
8.2.1 General.....	7
8.2.2 Reference block.....	7
8.2.3 Reference reflectors.....	7
8.3 Checking of the settings.....	7
9 Equipment checks	7
10 Test procedure	7
10.1 Procedure qualification.....	7
10.2 Scan increment.....	9
10.3 Geometry of the fusion joint tested.....	9
10.4 Preparation of scanning surfaces.....	9
10.5 Temperature of fusion joint tested.....	9
10.6 Testing.....	9
10.7 Data storage.....	10
11 Interpretation and analysis of test data	10
11.1 General.....	10
11.2 Assessing the quality of the test data.....	10
11.3 Identification of relevant indications.....	10
11.4 Classification of relevant indications.....	10
11.5 Determination of location and size of indications.....	11
11.6 Assessment of indications.....	11
12 Test report	11
Annexe A (informative) Example of reference reflectors and reference blocks	13
Annexe B (informative) Example procedures for producing imperfections in butt fusion joints^[17]	16
Bibliography	20

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).

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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 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 5, *General properties of pipes, fittings and valves of plastic materials and their accessories — Test methods and basic specifications*.

This second edition cancels and replaces the first edition (ISO/TS 22499:2019), which has been technically revised.

The main changes are as follows:

- clarification of the definition of "cold fusion" and "lack of fusion";
- revision of the procedure qualification.

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.

Introduction

At the present time, laboratory experiences exist on the use of PAUT for polyethylene BF joints and/or reference blocks of wall thickness between 8 mm to 100 mm^{[1][2][3][4][5]}. Field experience on BF joints in PE80 and PE100 materials has been reported^[6].

Interlaboratory test has shown that PAUT is a viable method for enhancing the integrity assessment of butt-fusion joints^{[7][16]}.

PAUT techniques for cold fusion detection are known to be available. However further research, verification and experience are needed to transfer the technique into an ISO Standard. This document does not provide any information regarding the detection of cold fusions^[16].

Thermoplastic pipes for the conveyance of fluids — Inspection of polyethylene butt fusion joints using phased array ultrasonic testing

1 Scope

This document describes the phased array ultrasonic testing (PAUT) of polyethylene butt fusion (BF) joints, including pipe-to-pipe, pipe-to-fitting and fitting-to-fitting joints, used for the conveyance of fluids. This document provides a test, whereby the presence of imperfections such as voids, inclusions, lack of fusions, misalignment and particulate contamination in the BF joints can be detected. The document is only applicable to polyethylene pipes and fittings without a barrier to ultrasonic waves.

This document also provides requirements for procedure qualification and guidance for personnel qualifications, which are essential for the application of this test technique.

This document also covers the equipment, the preparation and performance of the test, the indication assessment and the reporting for polyethylene BF joints.

Acceptance criteria are not covered in this document.

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 13953, *Polyethylene (PE) pipes and fittings — Determination of the tensile strength and failure mode of test pieces from a butt-fused joint*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5577 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

cold fusion

incomplete intermolecular diffusion of polymer chains for proper molecular entanglement at the joint interface due to reasons other than contamination

Note 1 to entry: Cold fusion results in insufficient joint integrity including significant reduction of joint ductility.

3.2

inclusion

foreign material trapped in the fusion joint