
**Guidelines for in-service inspections
for primary coolant circuit
components of light water reactors —**

**Part 1:
Mechanized ultrasonic testing**

*Lignes directrices pour les contrôles périodiques des composants du
circuit primaire des réacteurs à eau légère —*

Partie 1: Contrôle mécanique par ultrasons



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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 documents 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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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 85, *Nuclear energy, nuclear technologies, and radiological protection*, Subcommittee SC 6, *Reactor technology*.

A list of all parts in the ISO 20890 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.

Guidelines for in-service inspections for primary coolant circuit components of light water reactors —

Part 1: Mechanized ultrasonic testing

1 Scope

This document gives guidelines for pre-service-inspections (PSI) and in-service inspections (ISI) with mechanized ultrasonic test (UT) devices on components of the reactor coolant circuit of light water reactors. This document is also applicable on other components of nuclear installations.

Mechanized ultrasonic inspections are carried out in order to enable an evaluation in case of

- fault indications (e.g. on austenitic weld seams or complex geometry),
- indications due to geometry (e.g. in case of root concavity),
- complex geometries (e.g. fitting weld seams), or
- if a reduction in the radiation exposure of the test personnel can be attained in this way.

Ultrasonic test methods are defined for the validation of discontinuities (volume or surface open), requirements for the ultrasonic test equipment, for the preparation of test and device systems, for the implementation of the test and for the recording.

This document is applicable for the detection of indications by UT using normal-beam probes and angle-beam probes both in contact technique. It is to be used for UT examination on ferritic and austenitic welds and base material as search techniques and for comparison with acceptance criteria by the national referencing nuclear safety standards. Immersion technique and techniques for sizing are not in the scope of this document and are independent qualified.

NOTE Data concerning the test section, test extent, inspection period, inspection interval and evaluation of indications is defined in the applicable national nuclear safety standards.

Unless otherwise specified in national nuclear safety standards the minimum requirements of this document are applicable. This document does not define:

- extent of examination and scanning plans;
- acceptance criteria;
- UT techniques for dissimilar metal welds and for sizing (have to be qualified separately);
- immersion techniques;
- time-of-flight diffraction technique (TOFD).

It is recommended that UT examinations are nearly related to the component, the type and size of defects to be considered and are reviewed in specific national inspection qualifications.

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 8596, *Ophthalmic optics — Visual acuity testing — Standard and clinical optotypes and their presentation*

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

ISO 16811, *Non-destructive testing — Ultrasonic testing — Sensitivity and range setting*

ISO 18490, *Non-destructive testing — Evaluation of vision acuity of NDT personnel*

EN 12668-1, *Non-destructive testing — Characterization and verification of ultrasonic examination equipment — Part 1: Instruments*

EN 12668-2, *Non-destructive testing — Characterization and verification of ultrasonic examination equipment — Part 2: Probes*

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*

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 <http://www.electropedia.org/>

3.1 analysis scan

test scan with adopted parameters that is required for more precise characterisation of an *indication* (3.3)

3.2 analysis technique

test technique that is applied for more precise characterisation of *indications* (3.3) subject to analysis

3.3 indication

representation or signal from a discontinuity in the format allowed by the NDT method used

[SOURCE: ISO/TS 18173:2005, 2.14]

Note 1 to entry: Signal that is initiated by operationally induced damage mechanisms, geometrical as well as, material or design induced influences

3.4 evaluation

assessment (3.5) of *indications* (3.3) revealed by NDT against a predefined level

Note 1 to entry: Inspection of the recorded measured data in respect to completeness and analysis capacity, localisation and registration of indications according to defined criteria, representation of the test results

[SOURCE: EN 1330-2:1998, 2.10]

3.5 assessment

comparison of the analysed measuring results with specified criteria