

SVENSK STANDARD

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Oförstörande provning av svetsar – Ultraljudsprovning – Provning av svetsar i austenitiska stål och nickelbaserade legeringar (ISO 22825:2017)

Non-destructive testing of welds – Ultrasonic testing – Testing of welds in austenitic steels and nickel-based alloys (ISO 22825:2017)



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Denna standard ersätter SS-EN ISO 22825:2012, utgåva 2.

The European Standard EN ISO 22825:2017 has the status of a Swedish Standard. This document contains the official version of EN ISO 22825:2017.

This standard supersedes the Swedish Standard SS-EN ISO 22825:2012, edition 2.

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EUROPEAN STANDARD

EN ISO 22825

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2017

ICS 25.160.40

Supersedes EN ISO 22825:2012

English Version

Non-destructive testing of welds - Ultrasonic testing - Testing of welds in austenitic steels and nickel-based alloys (ISO 22825:2017)

Essais non destructif des assemblages soudés -
Contrôle par ultrasons - Contrôle des soudures en
aciers austénitiques et en alliages à base nickel (ISO
22825:2017)

Zerstörungsfreie Prüfung von Schweißverbindungen -
Ultraschallprüfung - Prüfung von
Schweißverbindungen in austenitischen Stählen und
Nickellegierungen (ISO 22825:2017)

This European Standard was approved by CEN on 26 August 2017.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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European foreword

This document (EN ISO 22825:2017) has been prepared by Technical Committee ISO/TC 44 “Welding and allied processes” in collaboration with Technical Committee CEN/TC 121 “Welding and allied processes” the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2018 and conflicting national standards shall be withdrawn at the latest by May 2018.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

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Endorsement notice

The text of ISO 22825:2017 has been approved by CEN as EN ISO 22825:2017 without any modification.

SS-EN ISO 22825:2017 (E)**Introduction**

Welds in austenitic steel components and dissimilar metal welds are widely regarded as very difficult to test by ultrasound. The problems are mainly associated with unfavourable structure and grain size, as well as with different material properties which result in inhomogeneous and anisotropic mechanical and acoustic properties that contrast with the relatively homogeneous and isotropic behaviour in low-alloy steel welds.

Austenitic weld metal and other coarse-grained, anisotropic materials can significantly affect the propagation of ultrasound. In addition, beam distortion, unexpected reflections and wave mode conversions on the fusion line and/or columnar grains can occur. Therefore it can be difficult and sometimes impossible for ultrasonic waves to penetrate the weld metal.

Ultrasonic testing of these metals may require techniques that differ from conventional testing techniques. These special techniques often include the use of dual-element probes designed for refracted compression (longitudinal) waves or creeping waves rather than for conventional shear (transverse) waves.

In addition, it is necessary to produce representative reference blocks with welds in order to develop a testing procedure, set a preliminary sensitivity level, assess the procedure and demonstrate effectiveness before a definitive procedure is written. Material, weld preparation and welding procedure, as well as the geometry and surface condition of reference blocks are the same as for the component being tested.

Non-destructive testing of welds — Ultrasonic testing — Testing of welds in austenitic steels and nickel-based alloys

1 Scope

This document specifies the approach to be followed when developing procedures for the ultrasonic testing of the following welds:

- welds in stainless steels;
- welds in nickel-based alloys;
- welds in duplex steels;
- dissimilar metal welds;
- austenitic welds.

The purposes of the testing can be very different, for example:

- for the assessment of quality level (manufacturing);
- for the detection of specific discontinuities induced in service.

Acceptance levels are not included in this document, but can be applied in accordance with the scope of the testing (see [4.1](#)).

The requirements of this document are applicable to both manual and mechanized testing.

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 7963, *Non-destructive testing — Ultrasonic testing — Specification for calibration block No. 2*

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

EN 12668-3, *Non-destructive testing — Characterization and verification of ultrasonic examination equipment — Part 3: Combined equipment*

ISO 17635, *Non-destructive testing of welds — General rules for metallic materials*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5577, ISO 17635 and the following apply.

SS-EN ISO 22825:2017 (E)

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

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

3.1
dual-element probe
ultrasonic probe in which the transmit and receive transducers are separate and are electrically and acoustically isolated from each other

3.2
focal distance
<dual-element probes> distance between probe and focal point on the acoustical axis where the acoustic pressure is at its maximum

3.3
focal curve
<dual-element probes> curve, representing the relationship between sound path and sensitivity of a probe on a specified material containing specified reflectors

4 Information required prior to testing

4.1 Items to be defined by specification

Information on the following items is required:

- a) material type and grade;
- b) purpose and extent of testing, including testing for transverse discontinuities, if required;
- c) testing levels (see [Clause 10](#));
- d) manufacturing or operation stage at which the testing shall be carried out;
- e) requirements for access, the surface condition (see [11.2](#)) and temperature;
- f) whether or not parent metal testing shall be carried out prior to and/or after welding (see [11.3](#));
- g) reference blocks (see [Clauses 6 and 7](#));
- h) personnel qualifications (see [Clause 5](#));
- i) reporting requirements (see [Clause 12](#));
- j) acceptance criteria and/or recording level.

4.2 Specific information required by the operator prior to testing

Before any testing of a welded joint, the operator shall have access to all the information as specified in [4.1](#), together with the following additional information:

- a) the written testing procedure (see [Clause 9](#));
- b) type(s) of parent material and product form (i.e. cast, forged, rolled);
- c) the joint preparation and dimensions;
- d) the welding procedure or relevant information on the welding process;
- e) the time of the testing with regard to any post-weld heat treatment;

- f) the result of any parent metal testing carried out prior to and/or after welding;
- g) reference points and details of coordinate systems for the test object.

5 Personnel

Personnel performing testing in accordance with this document shall be qualified to an appropriate level in accordance with ISO 9712 or equivalent in the relevant industrial sector.

In addition to a general knowledge of ultrasonic weld testing, the operators shall be familiar with and have practical experience in testing problems specifically associated with the type of materials and weld joints to be tested. Specific training and examination of personnel should be performed on representative pieces (duplex, austenitic, stainless steel) containing welds and using dual-element longitudinal wave probes. This training and the examination results should be documented.

If this is not the case, specific training and examination should be performed with the finalized ultrasonic testing procedures and selected ultrasonic testing equipment on representative samples containing natural or artificial reflectors similar to those expected. This training and the examination results should be documented.

6 Test equipment

6.1 Conventional equipment

The equipment used for testing shall fulfil the requirements of EN 12668-1 and EN 12668-2. The verification of the combined equipment shall be done in accordance with EN 12668-3, with the exception of dual-element compression wave angle-beam probes, which may be verified on appropriate reference blocks other than the blocks mentioned in EN 12668-3.

Focal curves shall be available for the dual-element probes to be used, determined on a material representative of the material to be tested.

6.2 Phased array equipment

Phased array equipment may be used provided that:

- the combination of probe, wedge and focal laws is able to produce sound beams allowing the implementation of techniques defined in A.1 to A.6;
- the phased array equipment is compliant to the requirements of ISO 18563-1 and ISO 18563-2;
- the verification of the combined equipment shall be done in accordance with ISO 18563-3, with the exception of dual-element compression wave angle-beam probes, which may be verified on appropriate reference blocks other than the blocks mentioned in ISO 18563-3.

Focal curves shall be available for the phased array probes to be used, determined on a material representative of the material to be tested.

7 Range setting for compression waves

Range setting shall be carried out on appropriate calibration blocks, e.g. as shown in [Annex B](#), which are designed to be similar in dimension to Block No. 2 in accordance with ISO 7963. The dimension of at least one of the radii of the block used shall be close to the focal distance of the probes.

The index point of each probe shall be marked on the probe's side, after having optimized the echo amplitude on the radius closest to its focal distance. Since echo optimization can be difficult for high-angle probes and creeping wave probes, the shear wave component may be used for optimization instead. In that case, the calibration methodology shall be included in the test procedure.