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

*Essais non destructifs des assemblages soudés — Contrôle par  
ultrasons — Contrôle des soudures en aciers austénitiques et en  
alliages à base nickel*



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## Foreword

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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](http://www.iso.org/directives)).

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For an explanation on 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 the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 5, *Testing and inspection of welds*.

This third edition cancels and replaces the second edition (ISO 22825:2012), which has been technically revised.

The main changes compared to the previous edition are as follows:

- correction of an incorrect equation;
- update of the normative references and the bibliography;
- editorial modifications in the whole document;
- inclusion of the phased array technique.

Requests for official interpretations of any aspect of this document should be directed to the Secretariat of ISO/TC 44/SC 5 via your national standards body. A complete listing of these bodies can be found at [www.iso.org](http://www.iso.org).

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## 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.