INTERNATIONAL STANDARD

ISO 17577

Second edition
2016-01-15

Steel — Ultrasonic testing of steel flat products of thickness equal to or greater than 6 mm

Aciers — Contrôle ultrasonore des produits plats en acier d'épaisseur égale ou supérieure à 6 mm

Reference number
ISO 17577:2016(E)

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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).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 17, *Steel*, Subcommittee SC 7, *Methods of testing (other than mechanical tests and chemical analysis)*.

This second edition cancels and replaces the first edition (ISO 17577:2006), which has been technically revised.

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Steel — Ultrasonic testing of steel flat products of thickness equal to or greater than 6 mm

1 Scope

This International Standard specifies a method for the automated and/or manual ultrasonic testing of uncoated steel flat products for internal discontinuities by the pulse echo technique.

It is applicable to non-alloyed or alloyed steel flat products, in a nominal thickness range of 6 mm to 200 mm. However, this International Standard may be applied to austenitic and austenitic-ferritic steels, provided that the difference between the amplitude of the noise signal and that of the echo detection threshold is sufficient for the limit fixed. Unless otherwise agreed, for testing of steel flat products for welded steel tubes, ISO 10893-9 applies.

Other techniques of testing (e.g. by transmission) or other test equipment may be used at the manufacturer's discretion, provided that they give identical results to those obtained under the conditions of this International Standard. In the event of a dispute, only the method defined in this International Standard will prevail.

Testing of flat products, of thickness less than 6 mm and over 200 mm, may be the subject of special agreements between the parties concerned.

Testing is normally carried out in the place of production or on the premises of the supplier.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 10893-9, *Non-destructive testing of steel tubes — Part 9: Automated ultrasonic testing for the detection of laminar imperfections in strip/plate used for the manufacture of welded steel tubes*

ISO 11484, *Steel products — Employer's qualification system for non-destructive testing (NDT) personnel*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
internal discontinuity
any imperfection lying within the thickness of the flat products, e.g. planar or laminar imperfection, single-plane or multi-plane inclusion bands or clusters

3.2
defect
unacceptable internal discontinuities, i.e. exceeding the specified maximum size or population density limits

3.3
population density
number of individual internal discontinuities of a size greater than a specified minimum size and less than a specified maximum size per specified area of body or length of edge zone

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3.4
manual and assisted manual testing
testing by an operator applying an ultrasonic probe to the flat-product surface, manually executing the appropriate scanning pattern on the flat-product surface and visually assessing ultrasonic signal indications on the electronic equipment screen either by direct viewing or by built-in signal amplitude alarm devices

3.5
automated and semi-automated testing
testing using a mechanized means of applying the ultrasonic probe or probes to the flat-product surface and executing the appropriate scanning pattern, together with ultrasonic signal evaluation by electronic means

Note 1 to entry: Such testing can be either fully automated with no operator involvement or semi-automated when the operator performs basic equipment operation functions.

3.6
dead zone
zone adjacent to the scanning surface within which reflectors of interest are not revealed

4 Principle

The method used is based on the reflection of ultrasonic waves (generally longitudinal waves), the mean direction of which is perpendicular to the main surface of the flat products.

The examination consists of the following:

a) locating any discontinuity by comparing the amplitude of the discontinuity echo with the amplitude of the echo of a flat-bottomed hole of a given diameter and located at the same depth as the discontinuity (DGS-method);

   NOTE Only those discontinuities giving an echo height exceeding in amplitude that of the echo obtained with the reference flat-bottomed hole are taken into consideration.

b) Then determining its area, the contour of the discontinuity being defined by the positions of the centre of the probe corresponding to an echo amplitude of half the maximum amplitude of the discontinuity under consideration (6 dB drop technique).

The examination shall be carried out from one side only.

In the case of automated testing, the location of a discontinuity and the determination of its area can be realized using different algorithms together with high scanning density. In case of dispute, the 6 dB drop technique in 8.1.1 should be used.

5 Personnel

Automated testing shall be carried out only by qualified personnel under the responsibility of Level 2 or Level 3 qualified person. Qualification shall include regular training, success in examination, experience and satisfactory vision test according to the standards mentioned below. Manual testing shall be carried out only by personnel qualified at minimum Level 1 and under the responsibility of Level 2 or Level 3 qualified person.

Qualification of the responsible person shall be in accordance with ISO 9712, ISO 11484 or an appropriate national/ regional standard.

NOTE Examples of appropriate standards are listed in the Bibliography.

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