INTERNATIONAL STANDARD

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Seamless steel tubes for pressure purposes — Full peripheral ultrasonic testing for the detection of transverse imperfections

Tubes en acier sans soudure pour service sous pression — Contrôle aux ultrasons sur toute la circonférence pour la détection des imperfections transversales

Reference number
ISO 9305 : 1989 (E)

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 9305 was prepared by Technical Committee ISO/TC 17, *Steel.*

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Introduction

This International Standard concerns full peripheral ultrasonic testing of seamless tubes for pressure purposes for the detection of transverse imperfections.

Four different acceptance levels are considered (see table 1). The choice between these acceptance levels is within the province of the ISO Technical Committee responsible for the development of the relevant quality standards.

Seamless steel tubes for pressure purposes — Full peripheral ultrasonic testing for the detection of transverse imperfections

1 Scope

1.1 This International Standard specifies requirements for full peripheral ultrasonic shear wave testing of seamless tubes for pressure purposes for the detection of transverse imperfections, according to four different acceptance levels (see table 1).

1.2 This International Standard is applicable to the inspection of tubes with an outside diameter greater than or equal to 9 mm.

2 General requirements

2.1 The ultrasonic inspection covered by this International Standard is usually carried out on tubes after completion of all the production process operations.

This inspection shall be carried out by suitably trained operators and supervised by competent personnel nominated by the manufacturer. In the case of third-party inspection, this shall be agreed between the purchaser and manufacturer.

2.2 The tubes to be tested shall be sufficiently straight to ensure the validity of the test. The surfaces shall be sufficiently free from foreign matter which would interfere with the validity of the test.

3 Method of test

3.1 The tubes shall be tested using an ultrasonic shear wave technique for the detection of predominantly transverse imperfections.

3.2 During testing, the tubes and/or the transducer assembly shall be moved relative to each other so that the whole of the tube surface is scanned.

NOTE — It is recognized that there is a short length at both tube ends which may not be able to be tested.

3.3 During testing, the tubes shall be scanned in two opposing longitudinal directions of beam travel, unless otherwise agreed between purchaser and manufacturer.

3.4 The maximum width of each individual transducer, measured at right angles to the major axis of the tube, shall be 25 mm.

For L1 and L2 category tubes with an outside diameter equal to or less than 50 mm the width of any one transducer is normally restricted to a maximum of 12,5 mm.

3.5 The equipment for automatic testing shall be capable of differentiating between acceptable and suspect tube by means of an automatic trigger/alarm level combined with a marking and/or sorting system.

4 Reference standards

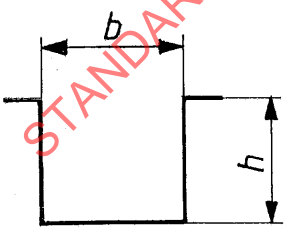
4.1 The reference standards defined in this International Standard are convenient standards for calibration of non-destructive testing equipment. The dimensions of these standards should not be construed as the minimum size of imperfection detectable by such equipment.

4.2 The ultrasonic equipment shall be calibrated using a transverse reference notch on the outside surface of a tubular test piece. By agreement between the purchaser and manufacturer and for internal diameters greater than 15 mm, both external and internal notches may be used.

4.3 The test piece shall have the same nominal diameter, thickness, surface finish and heat treated condition as the tube to be tested, and shall have similar acoustic properties (for example velocity, attenuation coefficient, etc.). However, if the internal surface of the test piece presents difficulties in meeting the tolerance on the internal notch depth, h, (see 5.2.3), the test piece internal surface may be machined such that the remaining thickness is within the specified tube thickness tolerance as given in the relevant product standard.

4.4 The external notch (and the internal notch when used) shall be sufficiently separated from the extremities of the test piece and from each other (when both are used) so that clearly distinguishable signal indications are obtained.

4.5 The reference notch or notches shall be of the "N" type (see figure 1) and shall lie at right angles to the major axis of the tube. The sides shall be nominally parallel and the bottom shall be nominally square to the sides.



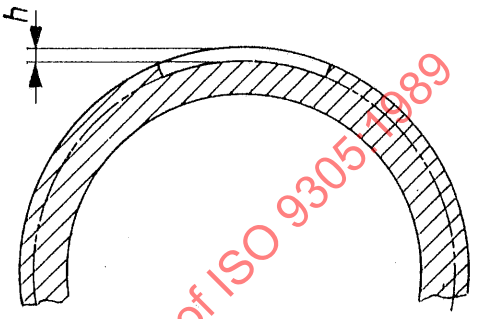
b = width h = depth

Figure 1 — "N"-type notch

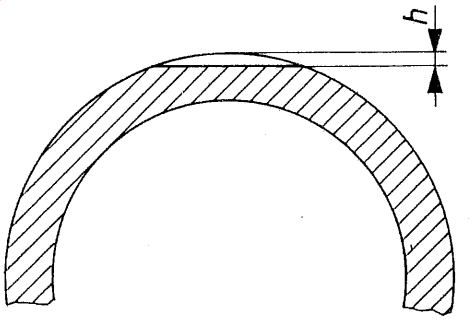
4.6 The reference notch shall be formed by machining, spark erosion or other methods.

NOTE — It is recognized that the bottom or the bottom corners of the notch may be rounded.

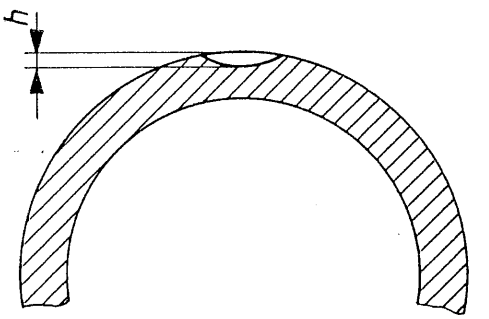
4.7 The reference notch shall be one of the forms shown in figure 2 at the discretion of the manufacturer.



a) Partial circumferential notch (full line)
Full circumferential notch (broken line)



b) Chord notch



c) Arc notch

Figure 2 — Transverse notch forms