SLOVENSKI STANDARD
SIST EN 3718:2012

01-september-2012

Aeronavtika - Preskuševalna metoda za kovinske materiale - Ultrazvočno preiskovanje cevi

Aerospace series - Test method for metallic materials - Ultrasonic inspection of tubes

Luft- und Raumfahrt - Prüfverfahren für metallische Werkstoffe - Ultraschallprüfung von Rohren

Série aérospatiale - Méthode d'essai applicable aux matériaux métalliques - Contrôle par ultrasons des tubes

Ta slovenski standard je istoveten z: **EN 3718:2012**

ICS:

49.025.01	Materiali za letalsko in vesoljsko gradnjo na splošno	Materials for aerospace construction in general
49.035	Sestavni deli za letalsko in vesoljsko gradnjo	Components for aerospace construction

SIST EN 3718:2012 **en,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 3718

March 2012

ICS 49.030.60

English Version

Aerospace series - Test method for metallic materials - Ultrasonic inspection of tubes

Série aérospatiale - Méthode d'essai applicable aux matériaux métalliques - Contrôle par ultrasons des tubes

Luft- und Raumfahrt - Prüfverfahren für metallische Werkstoffe - Ultraschallprüfung von Rohren

This European Standard was approved by CEN on 21 January 2011.

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (EN 3718:2012) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, prior to its presentation to CEN.

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of an identical text or by endorsement, at the latest by September 2012, and conflicting national standards shall be withdrawn at the latest by September 2012.

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

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies the requirements for ultrasonic inspection of tubes in metallic materials with an external diameter ≥ 5 mm.

For other cases, the use of this standard is by agreement between the manufacturer and the purchaser.

The purpose of the ultrasonic inspection is the detection of defects within the wall thickness and at the outer and inner surfaces of the tube. The method will detect two dimensional defects in the longitudinal and circumferential directions perpendicular to the tube wall. Where inspection for other types of defects is required, this requirements should be stated on the order.

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.

EN 2078, *Aerospace series — Metallic materials — Manufacturing schedule, inspection schedule, inspection and test report — Definition, general principles, preparation and approval*

EN 4050-1, *Aerospace series — Test method for metallic materials — Ultrasonic inspection of bars, plates, forging stock and forgings — Part 1: General requirements* [1)]

EN 4179, *Aerospace series — Qualification and approval of personnel for non-destructive testing*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 4050-1 apply.

4 Short description of the procedure

The inspection shall be carried out using ultrasonic test equipment, which emits ultrasonic signals passing through a liquid coupling medium obliquely into the tube under test and which receives and evaluates the reflected (or transmitted) signals. The tubes shall be inspected automatically and completely i.e. the relative movement of probe and tube under test shall be accomplished with the aid of a manipulator. The corresponding signal amplitudes from the ultrasonic test equipment shall be plotted as a function of the location, e.g. amplitude scans or C-scans.

5 Equipment requirements

5.1 Calibration blocks

Calibration blocks as per ISO 7963 or equivalent standards shall be used to check the proper function and characteristics of the ultrasonic test unit and probes. The method of checking the equipment and requirements concerning the calibration blocks shall be agreed between the manufacturer and the purchaser.

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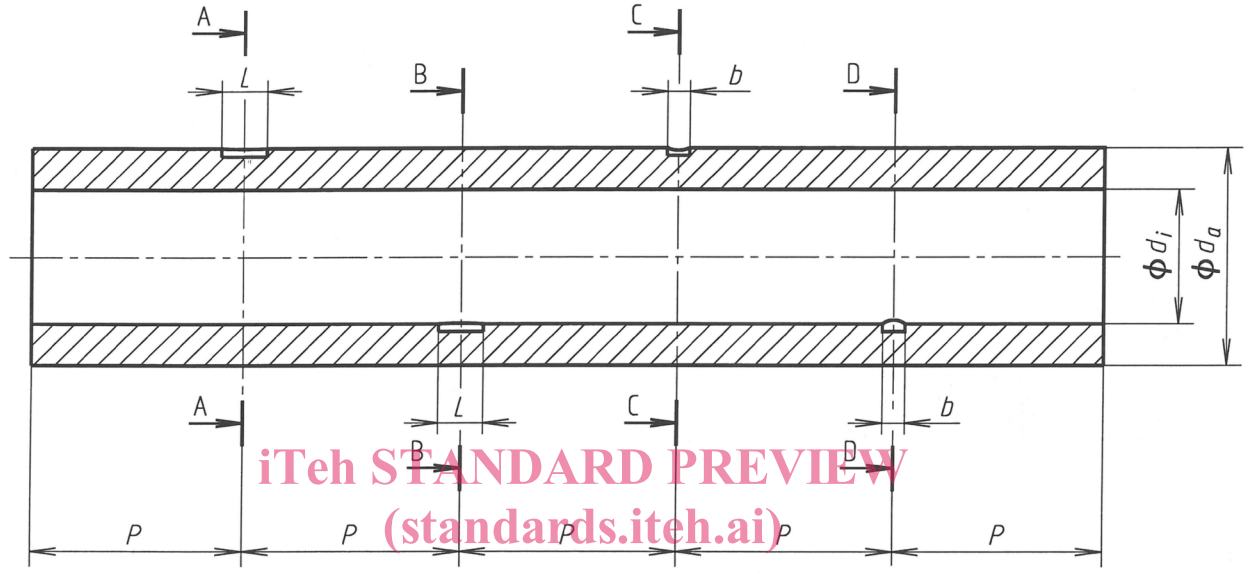
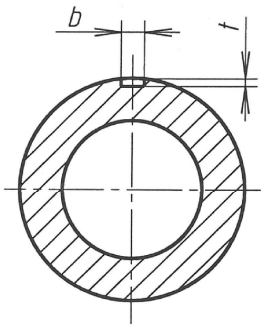
1) Published as ASD-STAN Prestandard at the date of publication of this standard (www.asd-stan.org).

5.2 Reference specimens

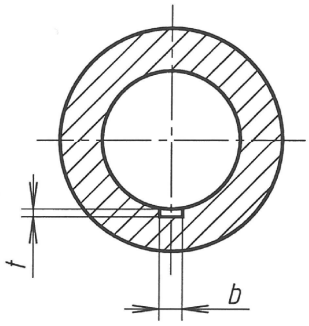
A reference specimen shall be fabricated from a tube consisting of the same material, having the same nominal diameter, wall thickness, surface condition and heat treatment condition as the tubes to be inspected. The selected length of the reference specimen shall be such that it can be tested in the test system described below. The reference specimen shall not have any defects or other irregularities that can produce indications or interfere with the detection of the reference notches. Four reference notches of the same dimensions (depth, width, length) as shown in Figure 1 shall be introduced in each tube. The depth, width and length of the notches are defined in Table 1 and subdivided into classes.



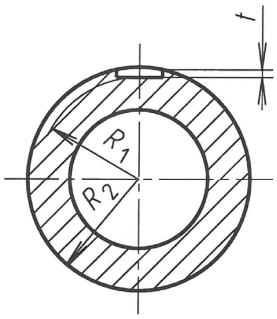
A-A
Longitudinal defects



B.B
Longitudinal defects

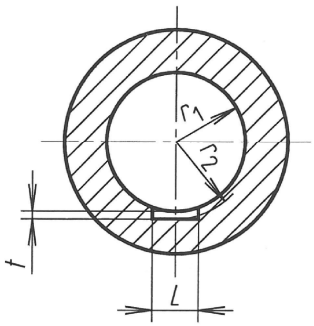


C-C
Circumferential defects



$R_2 = R_1 + t \quad R_2 = \frac{d_a}{2}$

D-D
Circumferential defects



$r_2 = r_1 + t \quad r_2 = \frac{d_i}{2}$

t = Depth
b = Widht
L = Length
d_i = Internal diameter
d_a = External diameter
$P \geq 20$ mm

Figure 1 — Reference specimen with four notches in longitudinal and circumferential direction on the inner and outer surface of the tube wall

Table 1 — Reference notch dimensions

Dimensions in millimetres

Class	Depth	Length	Width
5	0,05	1,5	0,10
4	0,05	3,0	0,10
3	0,08	3,0	0,10
2	0,10	3,0	0,10
1	5 % of *a* [a]	6,0	0,10

[a] *a* is wall thickness in millimetres.

The reference notches shall be rectangular for notches in the longitudinal direction and shall have the shape of a ring segment in the circumferential direction and edge radii ≤ 0,13 mm. The depth of the notch shall correspond to a mean value, measured from the tube surface to the respective penetration depth of the notch. Notch dimensions shall comply with the values specified in Table 1 to within ± 15 %.

The notch depth shall be measured from the circular surface to the deepest penetration of the notch. Measurements may be made by replication or by a destructive method on a duplicate notch which has identical ultrasonic response (amplitude within 90 % to 110 % of the reference notch amplitude).

In order to have access to notches lying inside the reference specimen, a window may be cut into the opposite tube wall to provide access to the notch. The window shall not be so large as to interfere with the ultrasonic responses from the notch.

Each reference specimen shall be identified. The serial number and EN 3718 shall be permanently marked on the reference specimen and the following information shall either be marked on the specimen or maintained in a log book: alloy, heat treatment condition, diameter, wall thickness, size and location of reference notches.

5.3 Ultrasonic test equipment

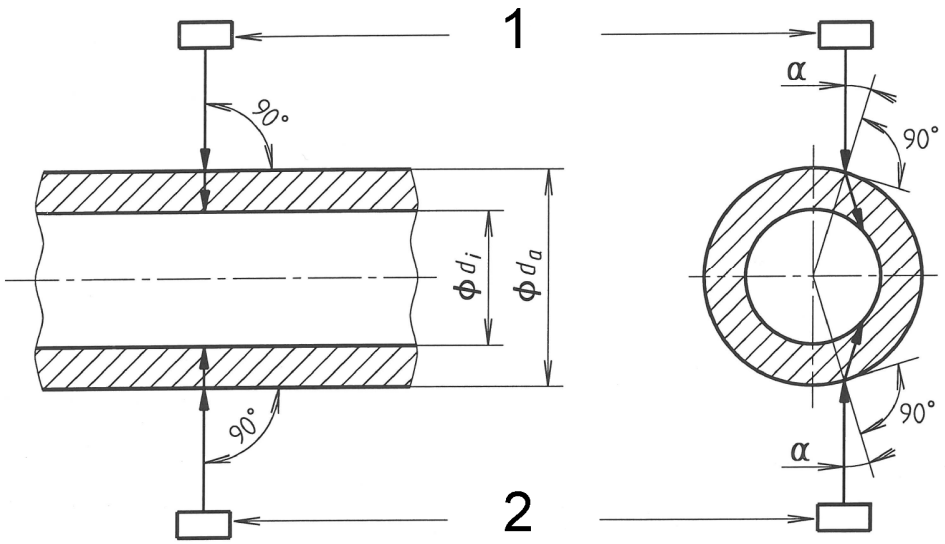
The ultrasonic test equipment shall be of the pulse echo type with appropriate signal outputs for registration of the measuring values.

5.4 Probes and probe arrangement

In view of the geometry of the defects anticipated, the use of spherical or cylindrical focused probes as determined by the specified notch dimensions is recommended.

For the ultrasonic echo inspection to detect defects running primarily in the longitudinal or circumferential direction of the tube, identical probes shall be used to achieve oblique incidence on both sides of the tube. The probes shall be sufficiently far apart to ensure that they will not influence one another. It is also possible to use just one probe on one side, although it is then necessary to inspect from the other side in a subsequent run.

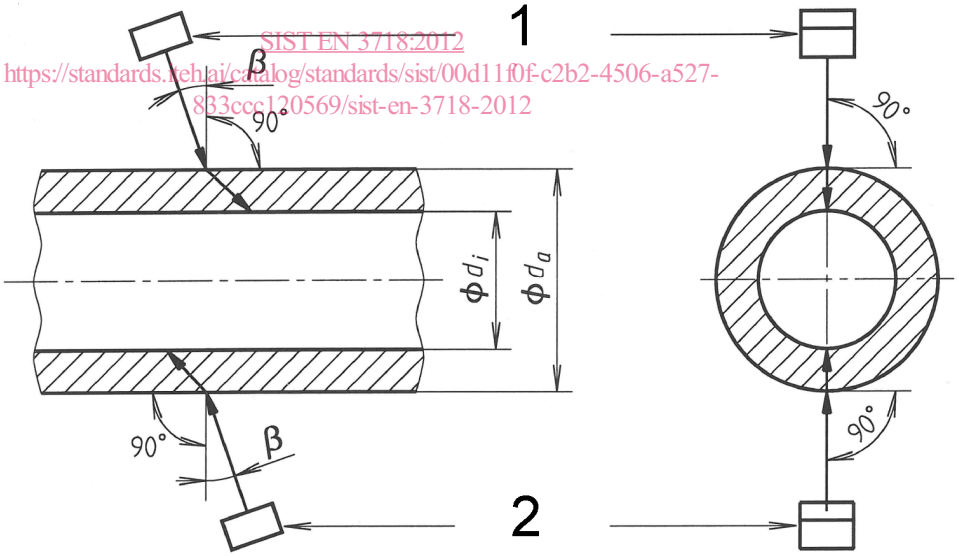
For example, the inspection of steel tube may be carried out by using 45° transverse waves. In this case the angle of incidence in water is approximatively 17° for detection of defects in longitudinal tube direction (see Figure 2), and approximatively 19° for detection of defects in circumferential tube direction (see Figure 3).



Key

1 Probe 1
2 Probe 2

Figure 2 — Oblique incidence on both sides to detect defects in longitudinal direction of the tube $\alpha = 17°$



Key

1 Probe 1
2 Probe 2

Figure 3 — Oblique incidence on both sides to detect defects in circumferential direction of the tube $\beta = 19°$