
Aeronavtika - Metode za preskušanje kovinskih materialov - Ultrazvočno preskušanje palic, plošč, kovnih materialov in izkovkov - 1. del: Splošne zahteve

Aerospace series - Test method for metallic materials - Ultrasonic inspection of bars, plates, forging stock and forgings - Part 1: General requirements

Luft- und Raumfahrt - Prüfverfahren für metallische Werkstoffe - Ultraschallprüfung von Stangen, Platten, Schmiedevormaterial und Schmiedestücken - Teil 1: Allgemeine Anforderungen

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Série aérospatiale - Méthode d'essai applicable aux matériaux métalliques - L'inspection par ultrasons des barres, des plaques, des stocks de forgeage et de pièces forgées - Partie 1: Exigences générales

Ta slovenski standard je istoveten z: EN 4050-1:2012

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 4050-1:2014**en**

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EUROPEAN STANDARD

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English Version

Aerospace series - Test method for metallic materials -
Ultrasonic inspection of bars, plates, forging stock and forgings -
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Werkstoffe - Ultraschallprüfung von Stangen, Platten,
Schmiedevormaterial und Schmiedestücken - Teil 1:
Allgemeine Anforderungen

This European Standard was approved by CEN on 15 July 2011.

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.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



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Foreword

This document (EN 4050-1:2012) 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 March 2013, and conflicting national standards shall be withdrawn at the latest by March 2013.

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 organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, 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.

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EN 4050-1:2012 (E)**1 Scope**

This European Standard defines the ultrasonic inspection procedure for rolled, drawn, extruded and forged billets, bars and plates, rolled rings and forgings with a uniform square, rectangular or round cross section. It does not cover critical rotating parts in steel, titanium, titanium alloys, aluminium alloys and heat resisting alloys that are to be inspected in accordance with the technical supply conditions of the relevant EN standards or internal specifications.

2 Generality

For products with geometries other than those described above, the test conditions and acceptance criteria shall be agreed between the manufacturer and purchaser.

3 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 2000, *Aerospace series — Quality assurance — EN aerospace products — Approval of the quality system of manufacturers*

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

EN 4050-2, *Aerospace series — Test method for metallic materials — Ultrasonic inspection of bars, plates, forging stock and forgings — Part 2: Performance of test*

EN 4050-3, *Aerospace series — Test method for metallic materials — Ultrasonic inspection of bars, plates, forging stock and forgings — Part 3: Reference blocks*

EN 4050-4, *Aerospace series — Test method for metallic materials — Ultrasonic inspection of bars, plates, forging stock and forgings — Part 4: Acceptance criteria*

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

4 Method

The inspection shall be made in accordance with the contact or immersion method depending on the requirements of the material standard.

Echo indications are classified by comparison with the indications of flat bottom holes (FBH) of specific diameter, drilled in test blocks that shall be acoustically similar to the material to be tested or have suitable correction curves to ensure equivalency, or in accordance with the DGS (Distance Gain Size) method.

The method to be applied in each case shall be documented in the form of an ultrasonic technique sheet which if agreed with the purchaser shall be referenced on the order or in an inspection schedule in accordance with EN 2078.

The following information shall be given:

- testing location;
- material;
- surface and machined condition (round, square, surface ground, turned, peeled, burnished, etc.);
- equipment including transducers;
- calibration standards;
- couplant;
- setting up procedure;
- inspection procedure;
- attenuation;
- methods used for distance amplitude correction (DAC);
- scan plan;
- method of recording results;
- defect evaluation procedure; (standards.iteh.ai)
- scan pitch;
- scan speed; (<https://standards.iteh.ai/catalog/standards/sist/4787a916-6526-4535-9910-9bbf7793aadd/sist-en-4050-1-2014>)
- scan overlap;
- inspection classification;
- control checks;
- traceability;
- inspection limitations;
- any other relevant data.

5 Terms and definitions

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

5.1

manufacturer

See EN 2000.

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5.2 purchaser
body which purchases the products from a manufacturer or a stockist in accordance with the requirements of the user

Note 1 to entry: The purchaser may also be the user.

5.3 user
See EN 2000.

5.4 attenuation
reduction of the sound energy by absorption and scattering

5.5 multiple discontinuities
indications whose spacing to one another is below the specified limits

5.6 linear discontinuity
indication with a half-value length ≥ 3 times the length of the indications from a reference reflector of maximum permissible size

5.7 size of discontinuity
diameter of the circular reflector which produces an echo height equal to the echo height of the discontinuity to be evaluated at the same depth

5.8 distance amplitude correction (DAC)
electronic change of amplification to provide equal amplitude heights from reflectors of equal area at different depths

5.9 distance/amplitude curve correction
compensation for attenuation and coupling differences between the material to be tested and the standard test blocks is only possible if the material to be tested has parallel surfaces or if surfaces can be partly machined. Those surfaces shall be parallel within 0,05 mm

5.10 Distance/amplitude curve in metal
graphical plot of the echo amplitude of targets drilled at different depths in specified test blocks at a predetermined water gap (immersion technique) or using a specific coupling medium (contact technique)

Note 1 to entry: The shape of the distance/amplitude curve in metal is mainly affected by:

- the structure of the test block, which will influence the sound transmission characteristics;
- the transducer characteristics;
- the geometry and size of the targets.

5.11 the water distance/amplitude curve (immersion technique)
graphical plot of the amplitude of the echo reflected from a 2,5 mm diameter steel ball against distance from the probe face

5.12**distance Gain Size (DGS) diagram**

distance amplitude curves permitting prediction of reflector size compared to response from FBH and back surface reflection. An example of a DGS diagram for a certain product is given in EN 4050-2

5.13**effective probe diameter**

the effective probe diameter will always be less than its actual dimension. It is calculated from the following basic formula:

$$d = \sqrt{\frac{4 CN}{f}}$$

where

d is the effective probe diameter in millimetres;

C is the velocity of sound in water, in millimetres per second;

N is near field length measured, in millimetres;

f is the measured frequency, in hertz

5.14**near field**

region of the ultrasonic beam extending from the transducer up to “ N ” or “ Nh ” point (see 5.21) in which the ultrasonic beam is subject to variation of intensity due to interference effects

5.15**far field**

region of the ultrasonic beam from “ N ” or “ Nh ” point (see 5.21) onwards in which reflectors give uniform decrease of amplitude with increasing distance

5.16**horizontal linearity**

the ability of the ultrasonic testing system to respond in a linear manner to reflectors at different depths in a uniform transmission medium

5.17**vertical linearity**

the ability of the ultrasonic testing system to respond with indications whose amplitudes are proportional to a range of areas of reflectors at the same depth in a uniform transmission medium

5.18**distance/amplitude method**

method of direct evaluation of indications from the test item by comparing the signal height with a reference reflector in a similar material at the same metal path length

5.19**half-value method**

method of evaluating the reflector size when the defect size is smaller than the effective test beam diameter in which the transducer is moved away from the point of maximum reflection in two rectangular axes until the echo height reduces to half of its maximum

5.20**standard test block method**

indirect method of evaluating indications from the test item by comparing the indications with known reflectors on the applicable standard test block