SLOVENSKI STANDARD
SIST EN 16090:2020

01-januar-2020

Nadomešča:
SIST EN 16090:2012

Baker in bakrove zlitine - Ocena povprečne velikosti zrn z ultrazvokom

Copper and copper alloys - Estimation of average grain size by ultrasound

Kupfer und Kupferlegierungen - Bestimmung der mittleren Korngröße durch Ultraschall

Cuivre et alliages de cuivre - Estimation de la taille moyenne de grain par ultrasons

Ta slovenski standard je istoveten z: **EN 16090:2019**

ICS:

77.120.30 Baker in bakrove zlitine Copper and copper alloys

SIST EN 16090:2020 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 16090

November 2019

ICS 77.120.30

Supersedes EN 16090:2011

English Version

Copper and copper alloys - Estimation of average grain size by ultrasound

Cuivre et alliages de cuivre - Estimation de la taille moyenne de grain par ultrasons

Kupfer und Kupferlegierungen - Bestimmung der mittleren Korngröße durch Ultraschall

This European Standard was approved by CEN on 4 September 2019.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents

Page

European foreword

This document (EN 16090:2019) has been prepared by Technical Committee CEN/TC 133 “Copper and copper alloys”, the secretariat of which is held by DIN.

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 May 2020, and conflicting national standards shall be withdrawn at the latest by May 2020.

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

This document supersedes EN 16090:2011.

The following modifications were implemented in this new edition of EN 16090:

— updated normative references;

— editorial modifications.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

The test by ultrasound described in this standard has the objective of estimating the dimension of average grain size in copper and copper alloy products.

When using this test by ultrasound technique it is important to recognize that the estimation of grain size is not a precise measurement because a metal structure is an aggregate of three-dimensional crystals of varying sizes and shapes. Clearly, no two areas of observation can then be exactly the same.

1 Scope

This document specifies a method for the estimation of the average grain size of copper and copper alloy products by ultrasound. This document can be applied for seamless round tubes as well as for flat products.

This method can be used in place of test methods according to EN ISO 2624, mentioned in the relevant product standards. As reference method and in case of doubt the intercept procedure or planimetric procedure will be used.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 2624, *Copper and copper alloys - Estimation of average grain size (ISO 2624)*

EN ISO 5577, *Non-destructive testing - Ultrasonic testing - Vocabulary (ISO 5577)*

EN ISO 9712, *Non-destructive testing - Qualification and certification of NDT personnel (ISO 9712)*

EN ISO 16810:2014, *Non-destructive testing - Ultrasonic testing - General principles (ISO 16810:2012)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 5577 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
grain
area in a metal within the boundary of a crystal

Note 1 to entry: For the purpose of applying the method described in this document, a crystal and its twin bands are considered as one grain. Sub-grains, minor constituent phases, inclusions and additives are not considered in the estimation of the grain size.

4 General requirements

4.1 Personnel qualification

The ultrasonic test shall be conducted by operators trained in this technique and it shall be done under the responsibility of qualified staff. The qualified staff shall be competent. When agreed upon between the purchaser and the supplier, qualification of the personnel shall be certified according to EN ISO 9712.

The qualified staffs is especially responsible for the:

— issue and release of test procedures for operators;

— training of operators in ultrasonic testing;

— compilation and release of correlation of ultrasonic signals and grain size (calibration curve).

4.2 Condition of products to be tested

Products shall be sufficiently clean to permit satisfactory test operation and adequate coupling. Products shall be free of deep cracks and grooves generating ultrasonic signals.

This method is only applicable for products in the material condition:

— annealed;

— light-annealed;

— light-drawn;

— soft annealed.

4.3 Test equipment

Ultrasonic equipment with pulse echo technique shall be used as described in EN ISO 16810:2014, 5.4. It is recommended to use test equipment according to EN 12668-1 and EN 12668-2.

Ultrasonic testing and result analysis typically is done in an automated system against pre-determined criteria without human intervention (see Figure 1).

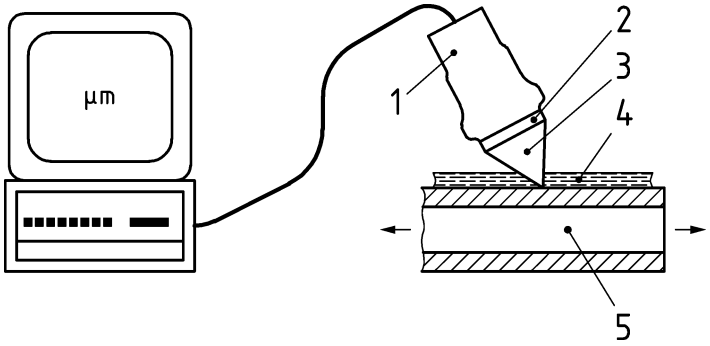
When driving mechanics are used for the sample they shall be as vibration-free as possible. In general, if samples will be moved during the test (in axial direction or by rotation), it is required to keep the distance between sample and probe constant.

Probes within the frequency range of 1 MHz to 60 MHz shall be applied.

Coupling of the ultrasonic waves is provided by a coupling fluid, e.g. water or oil (see EN ISO 16810:2014, 6.3). For constant coupling an automated ultrasonic testing is recommended to apply the immersion technique.

Tube-curvature (ovality, roundness) is not to be considered as the ultrasonic spot size (focal point) is very small.

Parasitic echoes and echoes of discontinuities should be eliminated from the ultrasonic evaluation process by adequate means.



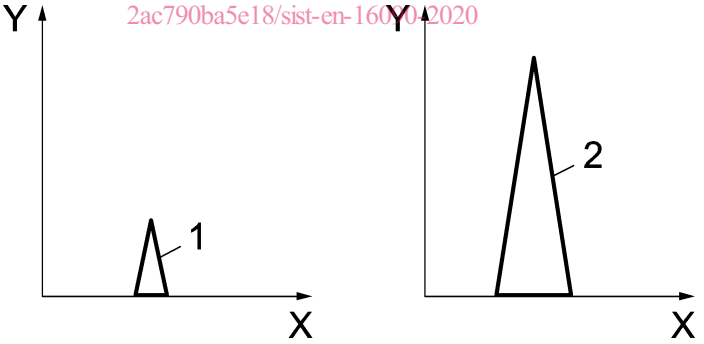
Key

1 housing
2 single transducer
3 ultrasonic beam
4 coupling medium
5 sample

Figure 1 — Simplified representation of ultrasonic technique for grain size estimation

4.4 Procedure

Prepare sample (cut to length, clean if necessary). Adjust instrument once per day before the first test (see Clause 5). Couple sample with transducer by using a coupling fluid. Estimate the grain size by using the reflection of ultrasonic waves on grain boundaries. The backscattered signals from the grains in the product are analysed in an A-scan presentation. The signals vary in dependence of the average grain size (see Figure 2).



Key

1 small grains
2 large grains
X time of flight
Y backscattered intensity

Figure 2 — Simplified illustration of backscattered signals