SLOVENSKI STANDARD
SIST EN 17263:2019

01-september-2019

Baker in bakrove zlitine - Preskušanje z vrtinčnimi tokovi na zunanji površini drogov, palic, votlih drogov in žic za odkrivanje napak s preskusno tuljavo

Copper and copper alloys - Eddy current testing on the outer surface of rods, bars, hollow rods and wires for the detection of defects by encircling test coil

Kupfer und Kupferlegierungen - Wirbelstromprüfung an der Oberfläche von Stangen, Rechteckstangen, Hohlstangen und Drähten zur Messung von Fehlern mit umfassender Prüfspule

Cuivre et alliages de cuivre - Contrôle par courants de Foucault de la surface externe des barres, des barres rectangulaires, des barres creuses et des fils pour la détection des défauts avec une bobine encerclante

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77.150.30	Bakreni izdelki	Copper products

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Copper and copper alloys - Eddy current testing on the outer surface of rods, bars, hollow rods and wires for the detection of defects by encircling test coil

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This European Standard was approved by CEN on 12 May 2019.

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European foreword

This document (EN 17263:2019) 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of an identical text or by endorsement, at the latest by January 2020, and conflicting national standards shall be withdrawn at the latest by January 2020.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.

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Introduction

The eddy current testing (ET) described in this document has the objective of detecting defects located on or near the surface in copper and copper alloy rods, bars, hollow rods and wires in a non-destructive way.

The eddy current test referenced in this document is able to detect significant discontinuities of the short abrupt type (typical defects e.g. cracks, laps, fins, shells, rolled-in matter) by the differential method with encircling test coils. Inhomogeneities evenly extending longitudinally over a large area cannot always be detected with this method.

The purpose of this document is not to define a method of measuring the actual extent of the material inhomogeneities, as the signal amplitude is also depending of factors e.g. volume, form and position of the inhomogeneity.

For the tested rods, bars, hollow rods and wires with no inhomogeneities detected, no conclusions can be drawn as to the functionality of the parts made from these rods, bars, hollow rods and wires.

1 Scope

This document specifies a procedure for fully automatic eddy current testing with no operator involvement with an encircling test coil for detecting defects on the surface of copper and copper alloy rods, bars, hollow rods and wires with a minimum diameter or width across flats defined in the relevant product standards.

This test method can be continuous or discontinuous depending on the product.

The product size range and test acceptance level are defined in the relevant product standards.

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 12718, *Non-destructive testing — Eddy current testing — Vocabulary (ISO 12718)*

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

EN ISO 15549, *Non-destructive testing — Eddy current testing — General principles (ISO 15549)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12718 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

4 General requirements

The eddy current testing method with self-comparison mode using encircling test coils is employed. A suitable encircling test coil corresponding to the dimension of the rods, bars, hollow rods or wires to be tested is chosen. Since the distribution density of eddy currents decreases as the distance from the test coil increases, the amplitude of defect signals also decreases with increasing distance from the test coil. The mechanical arrangement shall be chosen in order that the material can pass through the test coil as concentrically and vibration-free as possible. The influence of the test speed on the signal amplitude shall be corrected by a suitable dynamic effect compensating unit. Signal evaluation is done automatically. All materials with signal amplitudes equal to or higher than the acceptance level set in accordance with 8.1 are to be considered defective.

Inline eddy-current testing before cutting to length would not be subject to end effect. During the test of individual rods an untested area occurs at both ends of the rods.

For the suppression of magnetic effects an additional constant field magnetization might be necessary.

If the evaluation operates by phase selection, the inhomogeneities to be detected shall lie within the evaluation range determined. It shall be taken into consideration that the phase depends on the type and position of the inhomogeneity.

Rods, bars, hollow rods and wires shall be sufficiently clean and straight to allow satisfactory operation of the drive mechanism and eddy current test equipment.

5 Personnel qualification

The eddy current testing shall be supervised by operators trained in this technique and it shall be done under the responsibility of qualified staff.

When agreed upon between the purchaser and the supplier, the qualification of the supervisor personnel shall be certified according to EN ISO 9712.

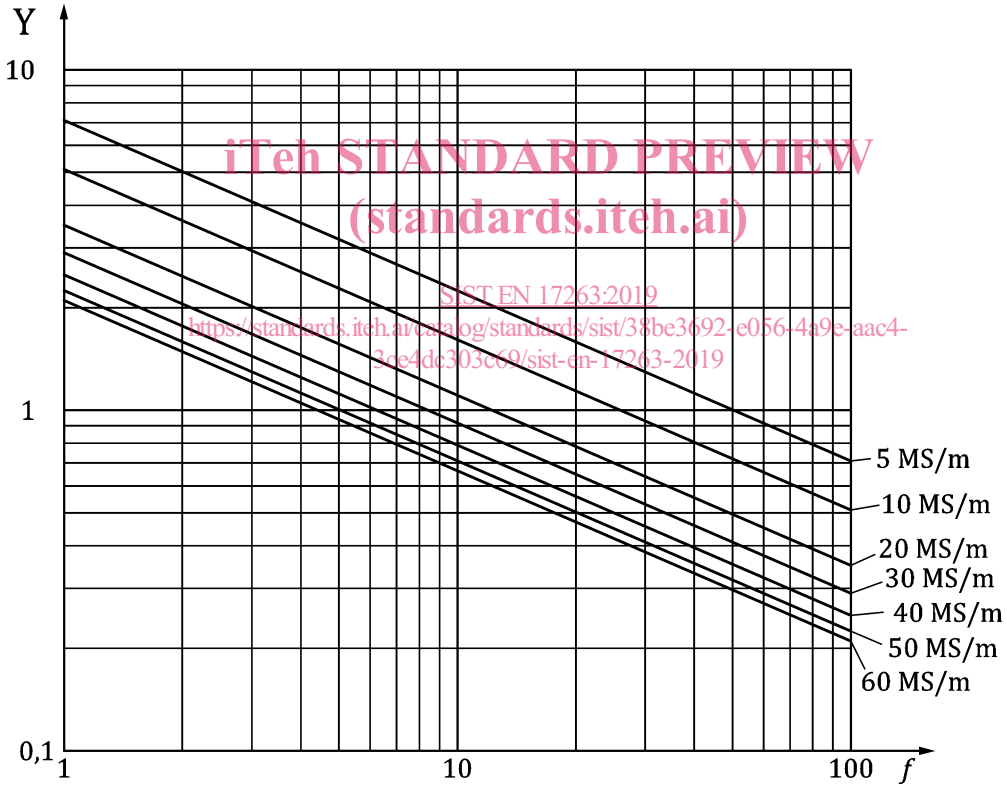
6 Eddy Current Test equipment

6.1 Test layout

6.1.1 Nominal frequency

The materials are typically tested with a frequency between 1 kHz and 100 kHz.

The standard penetration depth depends on the excitation frequency and electrical conductivity of the specimen. Figure 1 shows the evolution of this parameter for various electrical conductivities and thus different materials.



Key

Y depth of penetration in mm

f excitation frequency in KHz

Figure 1 — Standard depth of penetration as a function of excitation frequency and specimen electrical conductivity

6.1.2 Test coil

Normally differential or multi-differential coils are used. To get good signal/noise ratio the distance of the product to be examined and test coil should be as small as possible. Indicative coil sizes in function of product size are shown in Table 1.

Table 1 — Indicative test coil sizes

Rod size	Test coil size (internal diameter)
< 10 mm	Not more than 2 mm bigger than the rod
10 mm to 40 mm	Not more than 4 mm bigger than the rod
> 40 mm	Not more than 6 mm bigger than the rod

6.2 Reference standard

In practice the evaluation of signals received from the product under examination shall be compared with known signals reproduced from reference standard.

Reference standards used for system set-up shall be obtained from typical defect-free product and shall have the following characteristics compared to the product under evaluation:

1) Shape: Identical

2) Size: Differing not more than:

   — ± 0,5 mm for sizes smaller than 10 mm;

   — ± 1,0 mm for sizes bigger or equal to 10 mm.

3) Electrical conductivity: Differing not more than ± 50 %.

Deviations of these specifications are allowed, but need to be taken into consideration by correcting the sensitivity.

For materials with electrical conductivity equal or less than 10 MS/m, the deviation shall be in the range ± 5 MS/m.

The used reference standards shall contain artificial discontinuities:

a) Round and hexagonal products

   — three holes located on three generating lines offset by 120°,

   or alternatively

   — one hole rotated during the calibration procedure to reproduce the situation as above;

b) Square and octagonal products

   — four holes located generating lines offset by 90°

   or alternatively

   — one hole rotated during the calibration procedure to reproduce the situation as above.