



High conductivity copper — Spiral elongation test

Cuivre de haute conductivité — Essai d'allongement spirale

Technical Report 4745 was drawn up by Technical Committee ISO/TC 26, *Copper and copper alloys*, and approved by the majority of its members. The reasons which led to the decision to publish the document in the form of a Technical Report rather than an International Standard are given in annex A.

In May 1978, this document was submitted to the ISO Council, which approved its publication as a Technical Report.

0 INTRODUCTION

The spiral elongation test is essentially a proposed means for measuring the ease with which high conductivity copper may be softened by a low temperature annealing treatment. For example, the suitability of high conductivity copper rod for producing enamelled fine wires can be tested in this way.

This method of carrying out the test is proposed so that results obtained in different laboratories may be compared and discussed.

This Technical Report draws attention to the uncertainties of the test, for example the reproducibility of test results, and suggests further work by which these uncertainties might be dispelled. For problems in the standardization of the spiral elongation test see annex A; for literature references, see annex B.

Users of this Technical Report are requested to send in their test results obtained by the proposed method to the ISO/TC 26 Secretariat (DIN Deutsches Institut für Normung e.V., Kamekestr. 8, D-5000 Köln 1 Germany F. R.) within two years after publication of this Technical Report, as the same time indicating their comments on the problems pointed out in annex A.

1 SCOPE AND FIELD OF APPLICATION

1.1 This Technical Report gives a method to be used in carrying out the spiral elongation test on copper that has been worked into the form described in clauses 3 and 4.

NOTE — The word "spiral" as used in this context implies "helical" in strictly scientific terms.

1.2 The response of a given copper to the test is influenced by the treatment it has received in the preparation of the wire sample, and for this reason the details of processing are specified.

1.3 The test applies only to high conductivity copper, sampled at the wire bar or rod stage, and is not concerned with assessing the quality of copper wire selected at later stages in commercial processing.

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2 PRINCIPLE

Basically the test consists in winding a spiral copper wire spring that has received a specified low temperature anneal under carefully controlled conditions, stretching the spiral spring with a weight having a specified mass and then measuring the change in length after removing the weight. A spiral wound from wire that retains, after the annealing treatment, some effects of previous cold drawing does not extend as much as one made from wire which the annealing treatment has rendered quite limp.

3 SELECTION OF TEST SAMPLES

A sample of $6,3 \pm 0,5$ mm rod of a length suitable for cold drawing shall be prepared in one of the following ways :

3.1 Sample from a wire bar

Cut a slice 20 mm thick from the mid-length of the wire bar perpendicularly to the axis. From this slice, cut a sample 20 mm square orientated either as in figure 1 or as in figure 2.

From the sample if orientated as in figure 1, cut off and discard the oxygen-rich portion at the set surface. In the case of vertically cast bars, cut the sample in the same way; however, no discard is necessary.

Reduce the sample to a round rod of 6,3 mm diameter by rolling, swaging, hammering or any convenient method.

NOTE — See sub-clause A.2.1 of annex A.

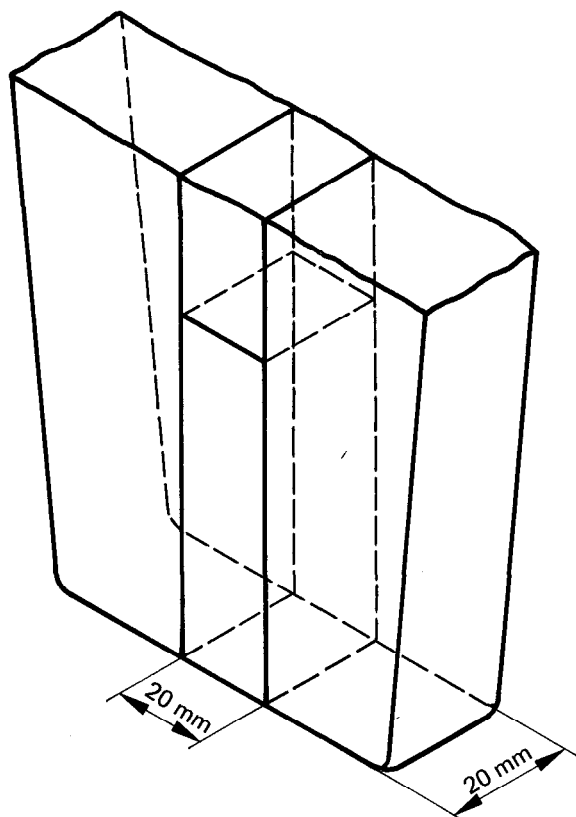


FIGURE 1 — Vertical sample cut from a horizontally cast wire bar

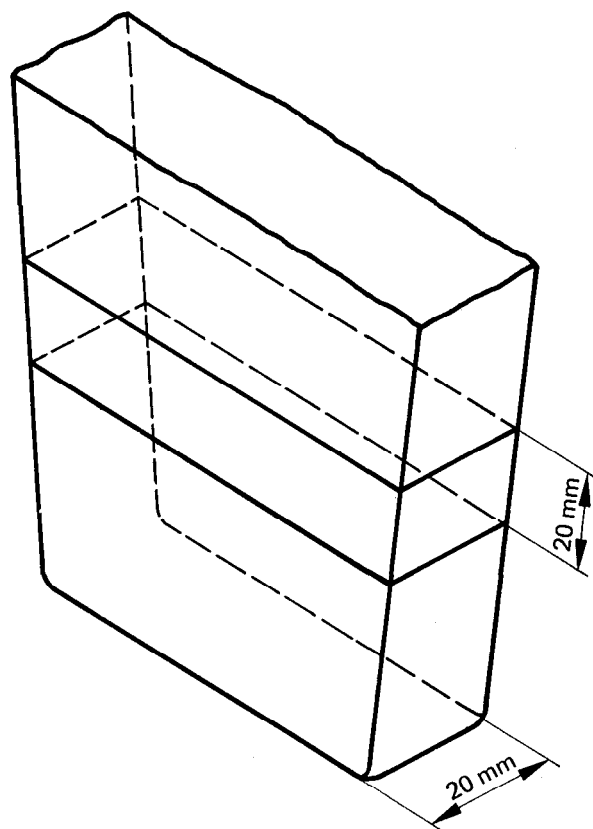


FIGURE 2 — Horizontal sample cut from a horizontally cast wire bar

3.2 Sample from hot-rolled wire bar

Take a sample rod of length suitable for cold drawing from approximately the centre of the length of rod representing a full wire bar. In the case of hot-rolled rod of diameter greater than 6,3 mm, process the sample to 6,3 mm diameter by cold drawing.