BRITISH STANDARD

BS EN ISO
196:1995

Wrought copper and copper alloys — Detection of residual stress — Mercury(I) nitrate test

The European Standard EN ISO 196:1995 has the status of a British Standard

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee NFE/34, Copper and copper alloys, upon which the following bodies were represented:

British Bathroom Council
British Cable Makers' Confederation
British Non-ferrous Metals Federation
British Refrigeration Association
British Valve and Actuator Manufacturers' Association
Copper Development Association
London Metal Exchange
Non-ferrous Metal Stockists
Transmission and Distribution Association (BEAMA Limited)
Coopted members

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

British Plumbing Fittings Manufacturers' Association
British Railways Board
British Turned-parts Manufacturers' Association
Institution of Incorporated Executive Engineers
London Regional Transport
National Association of Plumbing, Heating and Mechanical Services Contractors
Power Generation Contractors' Association [PGCA (BEAMA Ltd.)]
Spring Research and Manufacturers' Association

This British Standard, having been prepared under the direction of the Engineering Sector Board, was published under the authority of the Standards Board and comes into effect on 15 September 1995

The following BSI references relate to the work on this standard:
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National foreword

This British Standard has been prepared by Technical Committee NFE/34 and is the English language version of EN ISO 196:1995 *Wrought copper and copper alloys — Detection of residual stress — Mercury(I) nitrate test,* published by the European Committee for Standardization (CEN).

EN ISO 196 is identical with ISO 196:1978, published by the International Organization for Standardization (ISO). It was produced as a result of international discussions in which the United Kingdom took an active part.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN ISO title page, pages 2 and 3 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 196

May 1995

ICS 77.040.30

Descriptors: Non-ferrous alloys, copper, copper alloys, rolled products, chemical tests, stress-corrosion tests, corrosion tests, accelerated tests, mercury nitrates

English version

Wrought copper and copper alloys — Detection of residual stress — Mercury(I) nitrate test

(ISO 196:1978)

Cuivre et alliages de cuivre corroyés — Détection des contraintes résiduelles — Essai au nitrate de mercure(I) (ISO 196:1978)

Kupfer-und Kupfer-Knetlegierungen — Auffinden von Restspannungen — Quecksilber(I) Nitratversuch (ISO 196:1978)

This European Standard was approved by CEN on 1995-02-06. 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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Foreword

The text of the International Standard from ISO/TC 26, Copper and copper alloys, of the International Organization for Standardization (ISO) has been taken over as a European Standard by CEN/TC 133, Copper and copper alloys.

The 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 November 1995, and conflicting national standards shall be withdrawn at the latest by November 1995.

According to the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

1 Scope and field of application

This International Standard specifies an accelerated test, using mercury(I) nitrate, for the purpose of detecting the presence of residual (internal) stresses in wrought copper and copper alloy products that might bring about failure of the material in service or storage through stress corrosion cracking.

While this method has also been used for testing assemblies and partial assemblies, it is not intended for that purpose, and some modification may be required for such use.

2 Definitions

2.1
stress corrosion cracking

spontaneous failure of metals by cracking under combined action of corrosion and stress, residual or applied

2.2
applied stress

stress that is set up and exists in a body during application of an external load

2.3
residual stress

stress that remains within a body as the result of plastic deformation

3 Test solution

The test solution is an aqueous solution containing 10 g of mercury(I) nitrate and 10 ml of nitric acid per litre of solution.

This solution shall be prepared by the following procedure.

WARNING — Mercury(I) nitrate crystals should be handled with caution because of their highly toxic effects.

Dissolve 11,4 g of mercury(I) nitrate dihydrate ($HgNO_3.2H_2O$) or 10,7 g of mercury(I) nitrate monohydrate ($HgNO_3.H_2O$) in approximately 40 ml of distilled water acidified with 10 ml of nitric acid (ρ_{20} 1,40 to 1,42 g/ml). After the crystals are completely dissolved, dilute the solution with distilled water to 1 000 ml.

NOTE If heating is used for preparing the mercury(I) nitrate solution, care should be exercised to prevent loss of nitric acid.

4 Test piece

4.1 The length of the test piece shall be at least 150 mm for products of diameter less than or equal to 75 mm. For products of diameter greater than 75 mm, the length shall be subject to agreement.

4.2 Test pieces for the mercury(I) nitrate test shall not be marked for identification by stamping.

5 Procedure

5.1 First degrease the test piece. Then totally immerse it in an aqueous solution of sulphuric acid [15 % (*V*/*V*)] or in a mixture containing 60 parts by volume of distilled water and 40 parts by volume of concentrated nitric acid for a period not exceeding 30 s, to remove all traces of carbonaceous matter and oxide films. Remove the test piece from the pickling solution and wash it immediately in running water. Then drain the test piece free of excess water and totally immerse it in the test solution (clause **3**). Use at least 1,5 ml of test solution per square centimetre of exposed surface of the test piece.

5.2 After 30 min, remove the test piece from the test solution and wash it in running water. Wipe off any excess mercury from the surface of the test piece. Examine the test piece at once, unless otherwise specified in the material specification. The material specification may permit a lapse of time before examination, which may vary with the alloy being tested. In cases of doubt regarding the presence of cracks, volatilize (with caution) the mercury on the surface of the test piece by the application of heat on a hot-plate or in an oven. Then examine the specimen for cracks under suitable magnifying equipment at a magnification of 10 to 18 X.

WARNING — Mercury is a definite health hazard and therefore equipment for the detection and removal of mercury vapour produced in volatilization is recommended. The use of rubber gloves is advisable.

5.3 A solution the concentration of which is not in accord with that specified in clause **3** must not be used.

6 Test requirements

The interpretation of the visual appearance of the test pieces after testing is a matter for the material specification.

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