

BS 2B 100:2009



BSI Standards Publication

AEROSPACE SERIES

Procedure for inspection, testing and acceptance of wrought copper alloys

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Foreword

Publishing information

This British Standard is published by BSI and came into effect on 31 December 2009. It was prepared by Panel ACE/61/-/16, *Copper and miscellaneous alloys*, under the authority of Technical Committee ACE/61, *Metallic materials for aerospace purposes*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This British Standard supersedes BS B 100:1992, which is withdrawn.

Information about this document

This is a full revision of BS B 100 and introduces the following principal changes:

Section 1:

- a) Tensile testing to BS 4A 4:1966, Part 1, Section 1 has been replaced by BS EN 2002-1.
- b) Hardness testing to BS 4A 4:1966, Part 5 has been replaced by BS EN ISO 6506-1, BS EN ISO 6507-1 and BS EN ISO 6508-1.
- c) Reference to Appendix A has been deleted and “application of values for numerical and other units” details have been added.
- d) Temperature control method has been amended.

Section 2: Inspection and testing requirements summary table has been deleted.

Section 3: Inspection and testing requirements summary table has been deleted.

Section 4:

- a) Reference to Appendix B has been deleted and reference to BS EN ISO 196, *Wrought copper and copper alloys – Detection of residual stress – Mercury(I) nitrate test* has been added.
- b) Inspection and testing requirements summary table has been deleted.

Section 5:

- a) For the eddy current test drilled hole sizes have been added. These hole sizes, formerly in BS B 27, were originally taken from ASTM B111 and were conversions from imperial sizes. They have been amended to align with BS EN 12451 (*Copper and copper alloys – Seamless, round tubes for heat exchangers*).
- b) Inspection and testing requirements summary table has been deleted.

Section 6: Inspection and testing requirements summary table has been deleted.

Section 7: Inspection and testing requirements summary table has been deleted.

Appendix A has been deleted.

Appendix B has been deleted.

Hazard warnings

WARNING. This British Standard calls for the use of substances and/or procedures that can be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

Use of this document

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed either as a set of instructions or in sentences in which the principal auxiliary verb is "shall".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

Section 1: General

1 Scope

This British Standard specifies procedures for the inspection, testing and acceptance of wrought copper alloys for aerospace purposes.

The standard is applicable to material specifications in the British Standard Aerospace B series and also to other British Standard material specifications for wrought copper alloys which are suitable for aerospace use.

2 Normative references

The following referenced documents are indispensable for the application 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.

BS EN 1971, *Copper and copper alloys – Eddy current test for tubes*

BS EN 2002-1, *Metallic materials – Test methods – Part 1: Tensile testing at ambient temperature*

BS EN 4179, *Qualification and approval of personnel for non-destructive testing*

BS EN ISO 196, *Wrought copper and copper alloys – Detection of residual stress – Mercury(I) nitrate test*

BS EN ISO 6506-1, *Metallic materials – Brinell hardness test – Part 1: Test method*

BS EN ISO 6507-1, *Metallic materials – Vickers hardness test – Part 1: Test method*

BS EN ISO 6508-1, *Metallic materials – Rockwell hardness test – Part 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T)*

BS EN ISO 7438, *Metallic materials – Bend test*

BS EN ISO 8492, *Metallic materials – Tube – Flattening test*

BS EN ISO 8493, *Metallic materials – Tube – Drift-expanding test*

AMS 2750, *Pyrometry*¹⁾

3 Terms and definitions

For the purposes of this British Standard the following terms and definitions apply.

3.1 batch

quantity of a product of the same nominal dimensions and treated as a set for quality control purposes

NOTE Where applicable, batch sizes for specific products are specified in the relevant sections of this standard.

¹⁾ Available from www.sae.org.

- 3.2 cast**
metal taken from the same melt in a furnace or crucible or from several melts mixed in the same furnace or crucible; or, when a continuous process is used, metal taken from the furnace before the next charge
- 3.3 design authority**
organization responsible for the detailed design of material and which has the responsibility for certifying designs and/or for sealing drawings and specifications
- 3.4 foil**
wrought material of uniform thickness of 0.15 mm or less, of any width over 10 times the thickness supplied flat, folded or in coil
[BS 6931]
- 3.5 forging**
shape produced by hammering or pressing between open or closed dies, including hammering between flat surfaces, normally when hot
NOTE The term "forging" includes the processes of forging, drop forging, hot stamping and hot pressing; the term "forgings" includes the products resulting from any of these processes of manufacture.
[BS 6931]
- 3.6 forging stock**
extruded, rolled, drawn or cast material intended for the production of forgings, usually in the form of rod, bar or sections
[BS 6931]
- 3.7 harmful defect**
defect prejudicial to the suitable and proper use of the material
- 3.8 hollow rod**
hollow wrought product of uniform cross-section with only one enclosed void along its whole length
- 3.9 manufacturer**
organization that produces the material in the form and condition in which it is supplied to the purchaser
- 3.10 pre-production forgings**
forgings produced to a particular design to qualify the method of manufacture and equipment configuration and to demonstrate that the requirements of the purchaser can be met
- 3.11 purchaser**
organization which orders and purchases the product
- 3.12 quality assurance authority**
body responsible for authorizing the manufacturer or supplier to issue certification, when to certify means to attest as meeting a standard
- 3.13 rod**
solid wrought product of uniform cross-section along its whole length, usually supplied in straight lengths
NOTE The term "bar" is often used to denote a rod of comparatively large cross-section, and, especially a heavy rectangular cross-section.
[BS 6931]

3.14 section

wrought product of uniform cross-section along its whole length with a cross-sectional shape other than that of a rod, bar, hollow rod, wire, tube, sheet or strip, usually supplied in straight lengths

[BS 6931]

3.15 sheet

flat wrought product of exact length and of rectangular cross-section with uniform thickness over 0.15 mm up to and including 10.0 mm, supplied in straight lengths (i.e. flat) and usually with sheared or sawn edges

NOTE The thickness does not exceed one-tenth of the width.

[BS 6931]

3.16 strip

product of rectangular cross-section with a uniform thickness over 0.15 mm, usually supplied in coils but may be flat or folded

NOTE The edges are usually slit to size but the length is not exact. The thickness does not exceed one-tenth of the width.

[BS 6931]

3.17 supplier

organization which has not necessarily made the product, but which supplies it to the purchaser

3.18 test piece

test sample, or a portion of a test sample, as finally prepared for testing

3.19 test sample

portion of the material selected for testing

3.20 tube

hollow wrought product of uniform cross-section with only one enclosed void along its whole length, and with a uniform wall thickness, supplied in straight lengths or in coiled form

[BS 6931]

3.21 wire

solid wrought product of uniform cross-section along its whole length supplied in coil form or on spools, reels or drums

[BS 6931]

4 General

This standard details the basic requirements for the inspection and testing of British Standard Aerospace B series *wrought copper alloys*.

In addition to the definitive requirements, this standard also requires the items detailed in Clause 5 to be documented. For compliance with this standard, both the definitive requirements and the documented items have to be satisfied.

If the purchaser wishes to specify an inspection, testing or acceptance procedure for any property of any product, which differs from that specified in this standard, this shall be agreed between the purchaser and the manufacturer and shall be fully documented on the order,

drawing or inspection schedule, provided that the purchaser is also the quality assurance authority. If the purchaser is not also the quality assurance authority, deviations from the requirements of this standard shall only be agreed and documented after written approval has been obtained from the quality assurance authority.

5 Information and requirements to be agreed and to be documented

5.1 Information to be supplied by the purchaser

The following information to be supplied by the purchaser, which is specified in the clauses referred to, shall be fully documented on the order, drawing or inspection schedule, on which the number of this British Standard shall also be given.

Both the definitive requirements specified throughout the standard and the following documented items shall be satisfied before a claim of compliance with the standard²⁾ can be made and verified:

a) General:

- 1) the number of the material specification with which this standard is to be used;
- 2) the required delivery condition of the material, if other than that specified in the material specification (see 6.2);
- 3) the maximum limits for elements not named in the material specification, if no limits for these elements are specified in the material specification (see 8.6);
- 4) if ultrasonic testing is required, in cases where this is not a requirement of the material specification (see 14.3, 18.3 and 23.5.1);
- 5) the dimensional tolerances required, if no tolerances are specified in the material specification or if tolerances other than those specified in the material specification are required for a particular use (see 14.4, 18.4, 26.4, 29.2 and 32.3);
- 6) the tensile properties required if other than those specified in the material specification (see 18.5.5 and 23.7.6);
- 7) the hardness required if other than that specified in the material specification (see 18.6.3).

b) Forgings only:

- 1) any particular procedure required for visual examination (see 23.4.1);
- 2) if ultrasonic testing is required, the stage of manufacture at which this is to be carried out (see 23.5.2);

²⁾ Marking a British Standard identifier (e.g. BS 2B 23:2009) on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is solely the claimant's responsibility. Such a declaration is not to be confused with third-party certification of conformity.

- 3) any dimensions which require checking on each forging (see 23.6.2);
 - 4) the procedure required for producing batch release tensile test samples (see 23.7.1);
 - 5) the required sampling frequency for tensile tests if other than specified in 23.7.2;
 - 6) the required location of the test pieces for tensile tests, if other than specified in 23.7.3;
 - 7) if grain flow examination is required, the type and frequency (see 23.9.1) and the required characteristics (see 23.9.2);
 - 8) any markings required in addition to those specified in 24.1;
 - 9) the required position of the markings (see 24.2).
- c) Sheet, strip and foil only:
- 1) if more than one sample is required from a coil (see 29.3.5).

5.2 Items to be agreed between the contracting parties

The following items to be agreed between the contracting parties, which are specified in the clauses referred to, shall be fully documented.

Both the definitive requirements specified throughout the standard and the following documented items shall be satisfied before a claim of compliance with the standard³⁾ can be made and verified:

- a) General:
- 1) the method of temperature control if other than AMS 2750 (see 7.2);
 - 2) the ultrasonic testing technique to be used and the acceptance level, where these are not specified in the material specification (see 14.3, 18.3, and 23.5.1).
- b) Forgings only:
- 1) the dimensional tolerances of the forgings (see 23.6.1);
 - 2) the sampling requirements for the residual stress test (see 23.10.2).
- c) Sheet, strip and foil only:
- 1) the method for taking one or more additional samples from a coil, where applicable (see 29.3.5).

6 Manufacture and freedom from defects

6.1 The method of manufacture shall conform to the material specification. If alternative methods are specified in the material specification, or if no method is specified, the selection of the method shall be at the discretion of the manufacturer.

³⁾ Marking a British Standard identifier (e.g. BS 2B 23:2009) on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is solely the claimant's responsibility. Such a declaration is not to be confused with third-party certification of conformity.