BS EN 4700-002:2021

BSI Standards Publication

Aerospace series — Steel and heat resisting alloys — Wrought products — Technical specification

Part 002: Bars and sections

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National foreword

This British Standard is the UK implementation of EN 4700-002:2021. It supersedes BS EN 4700-002:2016, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ACE/61, Metallic materials for aerospace purposes.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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EUROPÄISCHE NORM

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English Version

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Série aérospatiale - Acier et alliages résistant à chaud - Produits corroyés - Spécification technique - Partie 002: Barres et profilés

Luft- und Raumfahrt - Stahl und hochwarmfeste Legierungen - Umgeformte Erzeugnisse - Technische Lieferbedingungen - Teil 002: Stangen und Profile

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European foreword

This document (EN 4700-002:2021) has been prepared by the Aerospace and Defence Industries Association of Europe — Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this document has received the approval of the National Associations and the Official Services of the member countries of ASD-STAN, prior to its presentation to CEN.

This document shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2021, and conflicting national standards shall be withdrawn at the latest by November 2021.

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 4700-002:2017.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this document: 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.

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Introduction

This document is part of the series of EN metallic material standards for aerospace applications. The general organization of this series is described in EN 4258.

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1 Scope

This document defines the requirements for the ordering, manufacture, testing, inspection and delivery of steel and heat resisting alloy bars and sections. It is presupposed to be applied when referred to and in conjunction with the EN material standard unless otherwise specified on the drawing, order or inspection schedule.

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 2002-001, *Aerospace series — Metallic materials — Test methods — Part 001: Tensile testing at ambient temperature*

EN 2002-002, *Aerospace series — Metallic materials — Test methods — Part 002: Tensile testing at elevated temperature*

EN 2002-005, *Aerospace series — Test methods for metallic materials — Part 005: Uninterrupted creep and stress-rupture testing*

EN 2002-16, *Aerospace series — Metallic materials — Test methods — Part 16: Non-destructive testing — Penetrant testing*

EN 2032-001, *Aerospace series — Metallic materials — Part 001: Conventional designation*

EN 2032-2, *Aerospace series — Metallic materials — Part 2: Coding of metallurgical condition in delivery condition*

EN 2078, *Aerospace series — Metallic materials — Manufacturing schedule, inspection schedule, inspection and test report — Definition, general principles, preparation and approval*

EN 2950, *Aerospace series — Test method — Wrought heat resisting alloys — Semi-finished products and parts — Conditions for macrographic and micrographic examination — Atlas of structures and defects*

EN 2951, *Aerospace series — Metallic materials — Micrographic determination of content of non-metallic inclusions*

EN 3874, *Aerospace series — Test methods for metallic materials — Constant amplitude force-controlled low cycle fatigue testing* [1)]

EN 3987, *Aerospace series — Test methods for metallic materials — Constant amplitude force-controlled high cycle fatigue testing*

EN 3988, *Aerospace series — Test methods for metallic materials — Constant amplitude strain-controlled low cycle fatigue testing* [1)]

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1) Published as ASD-STAN Standard at the date of publication of this document by AeroSpace and Defence industries Association of Europe — Standardization (ASD-STAN), http://www.asd-stan.org/

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EN 4050-1, *Aerospace series — Test method for metallic materials — Ultrasonic inspection of bars, plates, forging stock and forgings — Part 1: General requirements*

EN 4050-4, *Aerospace series — Test method for metallic materials — Ultrasonic inspection of bars, plates, forging stock and forgings — Part 4: Acceptance criteria*

EN 4259, *Aerospace series — Metallic materials — Definition of general terms* [1)]

EN 10027-1, *Designation systems for steels — Part 1: Steel names*

EN 10079, *Definition of steel products*

EN ISO 148-1, *Metallic materials — Charpy pendulum impact test — Part 1: Test method*

EN ISO 642, *Steel — Hardenability test by end quenching (Jominy test)*

EN ISO 643, *Steels — Micrographic determination of the apparent grain size*

EN ISO 3651-1, *Determination of resistance to intergranular corrosion of stainless steels — Part 1: Austenitic and ferritic-austenitic (duplex) stainless steels — Corrosion test in nitric acid medium by measurement of loss in mass (Huey test)*

EN ISO 3651-2, *Determination of resistance to intergranular corrosion of stainless steels — Part 2: Ferritic, austenitic and ferritic-austenitic (duplex) stainless steels — Corrosion test in media containing sulfuric acid*

EN ISO 3887, *Steels — Determination of depth of decarburization*

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

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

EN ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method*

EN ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature*

EN ISO 6892-2, *Metallic materials — Tensile testing — Part 2: Method of test at elevated temperature*

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

ISO 4967, *Steel — Determination of content of non-metallic inclusions — Micrographic method using standard diagrams*

AMS 2315, *Determination of Delta Ferrite Content* [2)]

AMS 2750, *Pyrometry* [2)]

ASTM A604, *Standard Practice for Macroetch Testing of Consumable Electrode Remelted Steel Bars and Billets* [3)]

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2) Published by SAE international (US) Society of Automotive Engineers, http://www.sae.org/

3) Published by ASTM international (US) American Society for Testing and Materials, http://www.astm.org/

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ASTM E45, *Standard Test Methods for Determining the Inclusion Content of Steel* [3)]

ASTM E340, *Standard Practice for Macroetching Metals and Alloys* [3)]

ASTM E381, *Standard Method of Macroetch Testing Steel Bars, Billets, Blooms and Forgings* [3)]

ASTM E399, *Standard Test Method for Linear-Elastic Plane-Strain Fracture Toughness KIc of Metallic Materials* [3)]

ASTM E407, *Standard Practice for Microetching Metals and Alloys* [3)]

ASTM E1444, *Standard Practice for Magnetic Particle Testing* [3)]

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 4259 apply.

For definitions specific to steel, see EN 10079.

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

- ISO Online browsing platform: available at http://www.iso.org/obp
- IEC Electropedia: available at http://www.electropedia.org/

3.1
term

- for the general case, see EN 4259;
- for heat treatment using a continuous furnace, a continuous run of less than or equal to eight h may be considered as the same heat treatment charge.

4 Wording of order

The order shall clearly indicate:

a) quantities to be supplied;

b) dates of delivery;

c) material standard number;

d) delivery condition and metallurgical code of products;

e) dimensions and tolerances or reference to an appropriate dimensional standard;

f) product designation, when required;

g) forwarding address;

h) nature and type of packing, if required;

i) surface protection, if appropriate;

j) definition and frequency of any special tests and their retest procedures, if required.

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5 Health and safety

The product in the delivery condition shall fulfil the current health and safety laws of the area of the country where it is to be delivered.

A product safety data sheet shall be available.

6 Technical requirements

6.1 General

The product shall be manufactured in accordance with the requirements of the relevant material standard and the applicable requirements of this specification. A manufacturing schedule shall be established and applied in accordance with EN 2078.

Product shall satisfy the requirements of the material standard and/or order and shall be free from irregularities prejudicial to the subsequent manufacture or use of this product.

Notwithstanding previous acceptance complying with this material standard, any product that is found, at a later stage, to contain such imperfection shall be rejected.

Unless otherwise specified, the requirements in Tables 1 and 2 shall apply in conjunction with those of the relevant material standard. Table 1 relates to lines 1 to 29 (inclusive) of the material standard and Table 2 relates to lines 30 onwards in which the sub-line format is also used. Lines 2 to 98 may also be opened in line 100 if the material standard details specific qualification requirements. If a specific line number is not shown in Tables 1 and 2, the requirement is stated in the material standard and/or order.

6.2 Qualification requirements

Qualification requirements when invoked by the material standard and/or order are detailed in Tables 1 and 2. The number of batches and casts shall be agreed between the manufacturer and the customer.

6.3 Release requirements

6.3.1 Release tests

Release testing shall be the responsibility of the manufacturer.

The customer reserves the right to perform any of the inspections and/or tests required by the material standard and/or order.

The test samples shall be representative of the product.

When required by the order, the manufacturer shall inform the customer of the planned dates for extraction of samples and release testing in order that these operations may be witnessed.

Table 1 and Table 2 detail the requirements for each line of the material standard. Unless otherwise specifically requested by the customer, a particular inspection and/or test for release shall be carried out if corresponding acceptance criteria and/or values are stated in the applicable material standard but see also in 6.3.5.

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6.3.2 Retests

If any requirement is not met, retests shall be carried out following an agreement between manufacturer and customer. Products shall be:

a) rejected; or

b) 100 % retested and the conforming products accepted; or

c) partially or fully re-heat treated if heat treatment can rectify the cause of the failure and retested. For condition of use material the number if re-heat treatments shall not exceed the number specified in Table 1 (line 7). The reheat treatment shall be stated on the release test certificate.

6.3.3 Rejection

Any failure to meet the requirements of the material standard shall be cause for rejection.

6.3.4 Special tests

Special tests may be required by the customer. In such cases, the nature of the test, method, frequency and technical requirements shall be specified on the order or inspection schedule and shall be mutually agreed by the manufacturer and the customer.

6.3.5 Capability clause

Where the capability clause is invoked and where sufficient statistical evidence exists, the test need not be carried out (unless specifically requested by the customer).

However, this in no way reduces the obligations of the manufacturer to fulfil the requirements. If subsequent testing indicates that the product does not comply with the requirements, the batch shall be rejected.

If sufficient statistical evidence does not exist, the test shall be carried out at a frequency agreed between the manufacturer and customer.

6.3.6 Statistical process control

Reduction in the extent of release testing, other than that defined in 6.3.5 above, may be negotiated with the customer on the basis of appropriate statistical process control and/or statistical data.

6.3.7 Inspection and test report

The manufacturer shall furnish, with each delivery, a report conforming to the requirements of EN 2078 stating the following:

a) manufacturer's name and address and, if appropriate, identification of the plant;

b) order number;

c) material standard number;

d) method of melting;

e) delivery condition and metallurgical code of the product;

f) quantity and dimensions;

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g) manufacturing and inspection schedule reference if required by the customer;

h) cast and batch number;

i) all heat treatment, including re-heat treatment and, where appropriate, straightening and stress relieving parameters, applied to the batch;

j) test samples heat treatment;

k) results of the tests and any retests if required by the customer.

6.4 Traceability

Each product shall be traceable to the cast, production batch and/or heat treatment batch at all stages of manufacture, testing and delivery.

7 Requirements

See Table 1 and Table 2.

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