



SLOVENSKI STANDARD

SIST EN 4800-001:2011

01-november-2011

Aeronavtika - Titan in titanove zlitine - Tehnična specifikacija - 001. del: Plošče, pločevina in trakovi

Aerospace series - Titanium and titanium alloys - Technical specification - Part 001: Plate, sheet and strip

Luft- und Raumfahrt - Titan und Titanlegierungen Knetzeugnisse - Technische Lieferbedingungen - Teil 001: Platten, Bleche und Bänder

Série aérospatiale - Titane et alliages de titane - Spécification technique - Partie 001: Plaques, tôles et bandes

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ICS:

49.025.30 Titan Titanium

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EUROPEAN STANDARD

EN 4800-001

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2010

ICS 49.025.30

English Version

Aerospace series - Titanium and titanium alloys - Technical specification - Part 001: Plate, sheet and strip

Série aérospatiale - Titane et alliages de titane -
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001: Platten, Bleche und Bänder

This European Standard was approved by CEN on 20 February 2010.

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 CEN Management Centre 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 CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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Contents

Page

Foreword.....	3
Introduction	4
1 Scope	5
2 Normative references	5
3 Terms and definitions	7
4 Wording of order	7
5 Health and safety	7
6 Technical requirements	7

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Foreword

This document (EN 4800-001:2010) 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 Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, prior to its presentation to CEN.

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 May 2011, and conflicting national standards shall be withdrawn at the latest by May 2011.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: 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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

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EN 4800-001:2010 (E)

Introduction

This standard 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 standard defines the requirements for the ordering, manufacture, testing, inspection and delivery of titanium and titanium alloy plate, sheet and strip. It shall 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 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.

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 2002-6, *Aerospace series — Test methods for metallic materials — Part 6: Bend testing*¹⁾

EN 2003-009, *Aerospace series — Test methods — Titanium and titanium alloys — Part 009: Determination of surface contamination*

EN 2032-1, *Aerospace series — Metallic materials — Part 1: 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 2955, *Aerospace series — Recycling of titanium and titanium alloy scrap*

EN 3114-001, *Aerospace series — Test method — Microstructure of ($\alpha + \beta$) titanium alloy wrought products — Part 001: General requirements*

EN 3114-003, *Aerospace series — Test method — Microstructure of ($\alpha + \beta$) titanium alloy wrought products — Part 003: Microstructure of plate*

EN 3114-004, *Aerospace series — Test method — Microstructure of ($\alpha + \beta$) titanium alloy wrought products — Part 004: Microstructure of sheet for superplastic forming*

EN 3683, *Aerospace series — Test methods — Titanium alloy wrought products — Determination of primary alpha content — Point count method and line intercept method*

EN 3684, *Aerospace series — Test methods — Titanium alloy wrought products — Determination of beta transus temperature — Metallographic method*

EN 3873, *Aerospace series — Test methods for metallic materials — Determination of fatigue crack growth rates using Corner-Cracked (CC) test pieces*

1) Published as ASD-STAN Prestandard at the date of publication of this standard.

EN 4800-001:2010 (E)

EN 3874, *Aerospace series — Test method for metallic materials — Constant amplitude force-controlled low cycle fatigue testing* ²⁾

EN 3976, *Aerospace series — Titanium and titanium alloys — Test method — Chemical analysis for the determination of hydrogen content*

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

EN 3988, *Aerospace series — Test method for metallic materials — Constant amplitude strain-controlled low cycle fatigue testing* ²⁾

EN 4050-1, *Aerospace series — Test method for metallic materials — Ultrasonic inspection of bars, plates, forging stock and forgings — Part 1: General requirement* ²⁾

EN 4050-4, *Aerospace series — Test method for metallic materials — Ultrasonic inspection of bars, plates, forging stock and forgings — Part 4: Acceptance criteria* ²⁾

EN 4258, *Aerospace series — Metallic materials — General organization of standardization — Links between types of EN standards and their use*

EN 4259, *Aerospace series — Metallic materials — Definition of general terms* ²⁾

EN 9100, *Quality Management Systems — Requirements for Aviation, Space and Defense Organizations*

EN ISO 643, *Steels — Micrographic determination of the apparent grain size (ISO 643:2003)*

EN ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature (ISO 6892-1:2009)*

prEN ISO 6892-2, *Metallic materials — Tensile testing — Part 2: Method of test at elevated temperature (ISO/DIS 6892-2:2009)*

EN ISO 12737, *Metallic materials — Determination of plane-strain fracture toughness (ISO 12737:2005)*

EN ISO 4288, *Geometrical product specifications (GPS) — Surface texture: Profile method — Rules and procedures for the Assessment of surface texture (ISO 4288:1996)*

TR 2410, *Aerospace series — Metallic materials — Relationship between dimensional standards and material standards* ³⁾

AMS 2750, *Pyrometry* ⁴⁾

2) Published as ASD-STAN Prestandard at the date of publication of this standard.

3) Published as ASD-STAN Technical Report at the date of publication of this standard.

4) Published by: American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428-2959 USA.

3 Terms and definitions

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

4 Wording of order

The order shall clearly indicate:

- quantities to be supplied;
- dates of delivery;
- material standard number;
- delivery condition and metallurgical code of products;
- dimensions and tolerances or reference to an appropriate dimensional standard;
- product designation, when required;
- forwarding address;
- nature and type of packing, if required;
- 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 when and 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 defects 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.

EN 4800-001:2010 (E)

The requirements of the order and/or material standard shall over-ride the requirements of the technical specification.

6.2 Qualification requirements

Qualification requirements when invoked by the material standard and/or order are detailed in Tables 1 and 2. Unless otherwise agreed between the manufacturer and purchaser the qualification phase shall be run on the first three batches coming from three ingots.

6.3 Release requirements

6.3.1 Release tests

Release testing shall be the responsibility of the manufacturer.

The purchaser 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 the manufacturer shall inform the purchaser of the planned dates for extraction of samples and release testing in order that these operations may be witnessed.

Tables 1 and 2 detail the requirements for each line of the material standard. Unless otherwise specifically requested by the purchaser, 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.

6.3.2 Retests

If the test procedure or test piece preparation is faulty, testing shall be re-applied at the original frequency after rectification of the original cause of failure.

When failure cannot be attributed to faulty testing, or test piece preparation, further test samples shall be selected at twice the original frequency from the product, one of which shall be that on which the original results were obtained unless already withdrawn by the manufacturer after suitable identification of the cause of failure. If all retest results are satisfactory, the batch shall be accepted. If one or more tests are unsatisfactory, the batch shall be:

- rejected; or
- 100 % retested and the conforming products accepted; or
- partially or fully re-heat treated if heat treatment can rectify the cause of the failure and tested as a completely new batch except for chemical composition, for which redetermination of hydrogen content is required. No product or test sample shall be re-heat treated more than twice.

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 purchaser. 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 purchaser.

6.3.5 Capability clause

Where this is invoked and where sufficient evidence exists, the test shall not be carried out (unless specifically requested by the purchaser). 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 the purchaser.

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 purchaser 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:

- manufacturer's name and address and, if appropriate, identification of the plant;
- order number;
- material standard number;
- method of melting;
- delivery condition and metallurgical code of the product;
- quantity and dimensions;
- manufacturing and inspection schedule reference;
- cast and batch number;
- batch and/or test samples heat treatment condition;
- results of the tests and retests if any.

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.

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Table 1 — Technical requirements for lines 1 to 29, where appropriate

Material standard line reference		Requirements	Frequency of testing	
No.	Title		Qualification	Release
1	Material designation	See EN 2032-1.	—	—
2	Chemical composition	The test samples used for chemical analysis shall be representative of the product and shall be taken from location corresponding to top and bottom of each ingot produced after the final melting stage. The method of chemical analysis shall be at the discretion of the manufacturer unless otherwise stated in the material standard or order. In cases of dispute, the method of chemical analysis shall be agreed between the manufacturer and purchaser preferably using existing chemical analysis.	2 per cast	2 per cast
		Specific requirements for hydrogen content: The hydrogen content shall be determined on each batch in the delivery condition in accordance with EN 3976.	1 per batch	1 per batch
3	Method of melting	<p>Method of melting consists of multiple melt using combination of non-consumable electrode, consumable electrode and cold hearth (electron beam or plasma arc) melting practices. Some of the following requirements are dependent on the actual melting route non-consumable electrode melting should be used for consolidation purpose only.</p> <p>1 <u>Raw material:</u></p> <p>Raw materials shall be purchased only from suppliers approved by the manufacturer and registered in his list of approved suppliers.</p> <p>Approval of suppliers shall be made in accordance with written procedures contained within the quality assurance system of the manufacturer.</p> <p><u>Titanium sponge and alloying elements:</u></p> <p>The requirements shall be specified by the manufacturer who shall also establish the following procedures for the evaluation and acceptance testing of each batch.</p> <ul style="list-style-type: none"> — titanium sponge: manufacturing method, level of impurities, particle size, freedom from surface contamination; — alloying elements: chemical composition including level of impurities, particle size, freedom from foreign particles. 	—	—

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