

Aerospace series — Test methods — Titanium alloy wrought products — Determination of β transus temperature — Metallographic method

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British Standard

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**Aerospace series - Test methods - Titanium alloy wrought
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température de transus β - Méthode métallographique

Luft- und Raumfahrt - Prüfverfahren - Knetzeugnisse aus
Titanlegierungen - Bestimmung der β -Transus-Temperatur
- Metallographisches Verfahren

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Foreword

This document (EN 3684:2007) 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.

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1 Scope

This standard specifies the metallographic method for the determination of the β transus temperature of titanium alloy wrought products for aerospace applications.

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 3114-001, *Aerospace series — Test method — Microstructure of (α + β) titanium alloy wrought products — Part 001: General requirements.*

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

3 Terms and definitions

For the purposes of this standard, the terms and definitions given in EN 3114-001 apply.

4 Principle

The determination of β transus temperature is carried out by assessment of primary α content of several test samples heat treated at different temperatures around the assumed β transus temperature.

The β transus temperature lies between the heat treatment temperature of the test sample where the primary α content is 0 % and the next lower heat treatment temperature of the sample where the primary α content is > 0 %.

5 Procedure

5.1 Sampling

Sample material shall be as homogeneous as possible and with a fine grain distribution of α and β phases. If necessary, the sample material can be given additional deformation, e.g. by upsetting using normal forging temperatures in the (α + β) range.

5.2 Test pieces

Individual test pieces are preferably cylindrical with dimensions of 10 mm in diameter and 10 mm in length or a 10 mm cube. The area to be examined shall preferably represent a transverse section.

Their number shall be commensurate to the selected test temperatures (see 5.3).

5.3 Heat treatment

The temperatures shall be selected around the assumed β transus temperature.

NOTE For routine determination, three temperatures at 10 °C intervals are normally sufficient. A more precise determination may be possible by using smaller intervals.

Each test piece shall be heated at the specified temperature $\pm 5^{\circ}\text{C}$ and maintained at this temperature between 15 min to 30 min.

They shall then be immediately quenched in water. To improve microstructural contrast in $\alpha + \beta$ alloys during metallographic inspection, it is recommended that the test pieces be subsequently annealed.

5.4 Metallographic examination

The test pieces shall be cut in half and the sections shall be prepared and examined according to EN 3683.

5.5 Expression of results

Record the temperature at which the primary α content is 0 % and the next lower temperature at which the primary α content is > 0 %.

Express the β transus temperature as a range limited by the above temperatures e.g. (1010/1020) $^{\circ}\text{C}$.

NOTE The β transus temperature may also be expressed by a single value extrapolated from the diagram primary α content versus temperature.

6 Test report

The test report shall refer to this standard and shall include:

- complete identification of the tested product, including the manufacturer's name, designation and batch number;
- location of test sample;
- number and dimensions of test pieces;
- heat treatment temperatures;
- indication of any annealing;
- test results according to EN 3683;
- equipment used;
- date of test and traceability to individuals performing the test work;
- test results (see 5.5);
- any factor which may have affected the results and any deviation from the test method.

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