PD CEN/TR 17603-32-05:2022

BSI Standards Publication

Space engineering — Structural materials handbook

Part 5: New advanced materials, advanced metallic materials, general design aspects and load transfer and design of joints

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National foreword

This Published Document is the UK implementation of CEN/TR 17603-32-05:2022.

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

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Space engineering - Structural materials handbook - Part 5: New advanced materials, advanced metallic materials, general design aspects and load transfer and design of joints

Ingénierie spatiale - Manuel des matériaux structuraux - Partie 5 : Matériaux avancés nouveaux, matériaux métalliques avancés, aspects généraux de conception, transferts des charges et conception des jonctions

Raumfahrttechnik - Handbuch der Konstruktionswerkstoffe - Teil 5: Neue fortschrittliche Werkstoffe, fortschrittliche metallische Werkstoffe, allgemeine Konstruktionsaspekte und Lastabtragung und Auslegung von Verbindungen

This Technical Report was approved by CEN on 29 November 2021. It has been drawn up by the Technical Committee CEN/CLC/JTC 5.

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European Foreword

This document (CEN/TR 17603-32-05:2022) has been prepared by Technical Committee CEN/CLC/JTC 5 “Space”, the secretariat of which is held by DIN.

It is highlighted that this technical report does not contain any requirement but only collection of data or descriptions and guidelines about how to organize and perform the work in support of EN 16603-32.

This Technical report (CEN/TR 17603-32-05:2022) originates from ECSS-E-HB-32-20 Part 5A.

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.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

This document has been developed to cover specifically space systems and has therefore precedence over any TR covering the same scope but with a wider domain of applicability (e.g.: aerospace).

Introduction

The Structural materials handbook is published in 8 Parts.

A glossary of terms, definitions and abbreviated terms for these handbooks is contained in Part 8.

The parts are as follows:

TR 17603-32-01	Part 1	Overview and material properties and applications	Clauses 1 - 9
TR 17603-32-02	Part 2	Design calculation methods and general design aspects	Clauses 10 - 22
TR 17603-32-03	Part 3	Load transfer and design of joints and design of structures	Clauses 23 - 32
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TR 17603-32-05	Part 5	New advanced materials, advanced metallic materials, general design aspects and load transfer and design of joints	Clauses 46 - 63
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46 Aluminium alloys and their composites

46.1 Introduction

46.1.1 General

Aluminium alloys are established in aerospace, with many years of application and service experience.

Alloy developments are described that have aimed at improving the mechanical characteristics of basic aluminium alloys and the limitations on service temperature.

The ability to improve dimensional stability by combining alloys with low CTE materials is an advantage for space use.

The materials described are divided into the main groups:

- Conventional aluminium alloys.
- New aluminium alloys.
- MMC – metal matrix composites.
- FML – fibre metal laminates

46.1.2 Conventional aluminium alloys

In recent years it has become clear that many of the problems associated with conventional aluminium alloys, e.g. inconsistent fracture properties, were associated with the nature, size, morphology and distribution of intermetallic particles, both intended (as the strengthening phase) and unintended (from tramp elements). Attention has therefore focussed on improving both alloy chemistry and process technology to give more desirable structures in the finished material. In addition to alloy modifications, this has resulted in the introduction of modified thermo-mechanical treatments (combinations of heat treatments and hot or cold working) with new temper designations, which are expansions of the basic tempers, [See: 46.2].

Specific data on conventional aluminium alloys are not given in this handbook, [See: MMPDS-01 and PMP], Ref. [46-71], [46-72].

46.1.3 New aluminium alloys

These can be grouped as:

- Aluminium-lithium (Al-Li) alloys. [See: 46.4]
- Powder metallurgy (P/M) alloys: