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**Raumfahrttechnik –
Strukturelle Sicherheitsfaktoren für Raumflughardware;
Englische Fassung EN 16603-32-10:2014**

Space engineering –
Structural factors of safety for spaceflight hardware;
English version EN 16603-32-10:2014

Ingénierie spatiale –
Facteurs de sécurité pour les structure spatiales;
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Nationales Vorwort

Dieses Dokument (EN 16603-32-10:2014) wurde vom Technischen Komitee CEN/CLC/TC 5 „Raumfahrt“ erarbeitet, dessen Sekretariat vom DIN (Deutschland) gehalten wird.

Das zuständige deutsche Normungsgremium ist der Arbeitsausschuss NA 131-10-01AA „Interoperabilität von Informations-, Kommunikations- und Navigationssystemen“ im DIN-Normenausschuss Luft- und Raumfahrt (NL).

Dieses Dokument wurde speziell zur Behandlung von Raumfahrtsystemen erarbeitet und hat daher Vorrang vor jeglicher Europäischer Norm, da es denselben Anwendungsbereich hat, jedoch über einen größeren Geltungsbereich (z. B. Luft- und Raumfahrt) verfügt.

Nationaler Anhang NA

(informativ)

Begriffe und Abkürzungen

3 Begriffe und Abkürzungen

3.1 Begriffe

Für die Anwendung dieses Dokuments gelten die Begriffe nach ECSS-ST-00-01, ECSS-E-ST-10-02, ECSS-ST-E-10-03 und ECSS-E-ST-32.

3.2 Für diese Norm spezifische Begriffe

3.2.1

lokaler Bemessungsfaktor

K_{LD}

Faktor, der lokale Unregelmäßigkeiten berücksichtigt und zusammen mit FOSU oder FOSY angewendet wird

3.2.2

Reservenpolitik-Faktor

K_{MP}

für Trägerrakten spezifischer Faktor, der die vom Projekt festgelegte Reservenpolitik einschließt

3.2.3

Modellfaktor

K_M

Faktor, der die Repräsentativität von mathematischen Modellen berücksichtigt

3.2.4

Projektfaktor

K_P

Faktor, der zu Projektbeginn die "Reife" der Konstruktion und deren mögliche Entwicklung sowie programmatische Reserven berücksichtigt, die gegebenenfalls Projektunsicherheiten oder Wachstumspotenziale abdecken

3.2.5

Prototyp-Test

Test, der an einem gesonderten für einen Strukturtest gefertigten Objekt unter flugähnlichen Bedingungen durchgeführt wird

3.2.6

Erstflug-Test

Test, der an Flug-Hardware durchgeführt wird

3.2.7

Testfaktoren

K_A und K_Q

Faktoren, die verwendet werden, um jeweils die Lasten für den Abnahmetest und den Qualifikationstest festzulegen

3.2.8

Sicherheitsfaktor für Bemessungsbruchlast

FOSU

Multiplikator, der auf die Bemessungsgrenzlast angewendet wird, um die Bemessungsbruchlast zu berechnen

3.2.9

Sicherheitsfaktor für Bemessungsfließlast

FOSY

Multiplikator, der auf die Bemessungsgrenzlast angewendet wird, um die Bemessungsfließlast zu berechnen

3.3 Abkürzungen

Für die Anwendung dieser Norm gelten die Abkürzungen nach ECSS-S-ST-00-01 und die folgenden Abkürzungen.

Abkürzung	Bedeutung	
AL	Last für den Abnahmetest	(en: acceptance test load)
DLL	Bemessungsgrenzlast	(en: design limit load)
DUL	Bemessungsbruchlast	(en: design ultimate load)
DYL	Bemessungsfließlast	(en: design yield load)
FOS	Sicherheitsfaktor	(en: factor of safety)
FOSU	Sicherheitsfaktor für Bemessungsbruchlast	(en: ultimate design factor of safety)
FOSY	Sicherheitsfaktor für Bemessungsfließlast	(en: yield design factor of safety)
FRP	Faserverstärkter Kunststoff	(en: fibre reinforced plastics)
GSE	Bodengeräte	(en: ground support equipment)
KA	Faktor für den Abnahmetest	(en: acceptance test factor)
KQ	Faktor für den Qualifikationstest	(en: qualification test factor)
LCDA	Mit der Trägerrakete verbundene dynamische Analyse	(en: launch vehicle coupled dynamic analysis)
LL	Grenzlast	(en: limit load)
N/A	Nicht anwendbar	(en: not applicable)
QL	Last für den Qualifikationstest	(en: qualification test load)
S/C	Raumfahrzeug	(en: spacecraft)

English version

Space engineering - Structural factors of safety for spaceflight hardware

Ingénierie spatiale - Facteurs de sécurité pour les structure spatiales

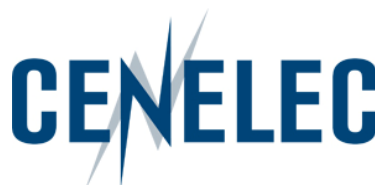
Raumfahrttechnik - Strukturelle Sicherheitsfaktoren für Raumflughardware

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Foreword

This document (EN 16603-32-10:2014) has been prepared by Technical Committee CEN/CLC/TC 5 "Space", the secretariat of which is held by DIN.

This standard (EN 16603-32-10:2014) originates from ECSS-E-ST-32-10C Rev.1.

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 February 2015, and conflicting national standards shall be withdrawn at the latest by February 2015.

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

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1

Scope

The purpose of this Standard is to define the Factors Of Safety (FOS), Design Factor and additional factors to be used for the dimensioning and design verification of spaceflight hardware including qualification and acceptance tests.

This standard is not self standing and is used in conjunction with the ECSS-E-ST-32, ECSS-E-ST-32-02 and ECSS-E-ST-33-01 documents.

Following assumptions are made in the document:

- that recognized methodologies are used for the determination of the limit loads, including their scatter, that are applied to the hardware and for the stress analyses;
- that the structural and mechanical system design is amenable to engineering analyses by current state-of-the-art methods and is conforming to standard aerospace industry practices.

Factors of safety are defined to cover chosen load level probability, assumed uncertainty in mechanical properties and manufacturing but not a lack of engineering effort.

The choice of a factor of safety for a program is directly linked to the rationale retained for designing, dimensioning and testing within the program. Therefore, as the development logic and the associated reliability objectives are different for:

- unmanned scientific or commercial satellite,
- expendable launch vehicles,
- man-rated spacecraft, and
- any other unmanned space vehicle (e.g. transfer vehicle, planetary probe)

specific values are presented for each of them.

Factors of safety for re-usable launch vehicles and man-rated commercial spacecraft are not addressed in this document.

For all of these space products, factors of safety are defined hereafter in the document whatever the adopted qualification logic: proto-flight or prototype model.

For pressurized hardware, factors of safety for all loads except internal pressure loads are defined in this standard. Concerning the internal pressure, the factors