

This document is a preview generated by EVS

Space product assurance - Derating - EEE components

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN 16602-30-11:2021 sisaldab Euroopa standardi EN 16602-30-11:2021 ingliskeelset teksti.	This Estonian standard EVS-EN 16602-30-11:2021 consists of the English text of the European standard EN 16602-30-11:2021.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 22.12.2021.	Date of Availability of the European standard is 22.12.2021.
Standard on kättesaadav Eesti Standardimis- ja Akrediteerimiskeskusest.	The standard is available from the Estonian Centre for Standardisation and Accreditation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile [standardiosakond@evs.ee](mailto:standardiosakond@evs.ee).

ICS 49.140

**Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardimis- ja Akrediteerimiskeskusele**

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardimis- ja Akrediteerimiskeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autoriõiguse kaitse kohta, võtke palun ühendust Eesti Standardimis- ja Akrediteerimiskeskusega: Koduleht [www.evs.ee](http://www.evs.ee); telefon 605 5050; e-post [info@evs.ee](mailto:info@evs.ee)

**The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation and Accreditation**

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation and Accreditation.

If you have any questions about standards copyright protection, please contact the Estonian Centre for Standardisation and Accreditation: Homepage [www.evs.ee](http://www.evs.ee); phone +372 605 5050; e-mail [info@evs.ee](mailto:info@evs.ee)

EUROPEAN STANDARD

**EN 16602-30-11**

NORME EUROPÉENNE

EUROPÄISCHE NORM

December 2021

ICS 49.140

Supersedes EN 16602-30-11:2014

English version

## Space product assurance - Derating - EEE components

Assurance produit des projets spatiaux - Détarage des  
composants EEE

Raumfahrtproduktsicherung -  
Herabsetzen/Unterlastung von EEE-Komponenten

This European Standard was approved by CEN on 5 December 2021.

CEN and CENELEC 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-CENELEC Management Centre or to any CEN and CENELEC 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 and CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN and CENELEC members are the national standards bodies and national electrotechnical committees 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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



**CEN-CENELEC Management Centre:  
Rue de la Science 23, B-1040 Brussels**

## Table of contents

---

<b>European Foreword .....</b>	<b>6</b>
<b>Introduction .....</b>	<b>7</b>
<b>1 Scope.....</b>	<b>8</b>
<b>2 Normative references.....</b>	<b>9</b>
<b>3 Terms, definitions and abbreviated terms .....</b>	<b>10</b>
3.1 Terms from other standards .....	10
3.2 Terms specific to the present standard.....	10
3.3 Abbreviated terms .....	11
3.4 Nomenclature.....	12
<b>4 User responsibility .....</b>	<b>14</b>
<b>5 Derating.....</b>	<b>15</b>
5.1 Overview .....	15
5.2 Principles of derating.....	15
5.3 Applicability and component selection.....	16
5.4 Derating parameters .....	18
5.5 Additional rules and recommendations.....	19
<b>6 Tables for load ratios or limits .....</b>	<b>20</b>
6.1 Overview .....	20
6.2 Capacitors: ceramic - family-group code: 01-01 and 01-02 .....	21
6.3 Capacitors: solid tantalum - family-group code: 01-03 .....	22
6.4 Capacitors: non-solid tantalum - family-group code: 01-04.....	24
6.5 Capacitors: Plastic metallized - family-group code: 01-05 .....	25
6.6 Capacitors: glass and porcelain - family-group code: 01-06 .....	27
6.7 Capacitors: mica and reconstituted mica - family-group code: 01-07.....	28
6.8 Capacitors: feedthrough - family-group code: 01-10.....	29

6.9	Capacitors: semiconductor technology (MOS type) - family-group code: 01-11.....	30
6.10	Capacitors: miscellaneous (variable capacitors) - family-group code: 01-99.....	31
6.11	Connectors - family-group code: 02-01, 02-02, 02-03, 02-07 and 02-09.....	32
6.12	Connectors RF - family-group code: 02-05.....	34
6.13	Piezo-electric devices: crystal resonator - family-group code: 03-01 .....	35
6.14	Diodes - family-group code: 04-01, 04-02, 04-03, 04-04, 04-06, 04-08, 04-10 and 04-14.....	36
6.15	Diodes: RF/microwave - family-group code: 04-05, 04-11 to 04-13, 04-15, 04-16 and 04-17.....	38
6.16	Feedthrough filters - family-group code: 05-01 .....	39
6.17	Fuses: Cermet (metal film on ceramic) - family-group code: 06-01.....	40
6.18	Inductors and transformers - family-group code: 07-01 to 07-03 and 14-01.....	41
6.19	Integrated circuits: logic - family-group code: 08-10, 08-20, 08-21, 08-29 to 08-42, and 08-80.....	42
6.20	Integrated circuits: non-volatile memories - family-group code: 08-22, 08-23 and 08-24.....	44
6.21	Integrated circuits: linear - family-group code: 08-50 to 08-60 and 08-69 .....	46
6.22	Integrated circuits: linear converters - family-group code: 08-61 and 08-62.....	48
6.23	Integrated circuits: MMICs - family-group code: 08-95.....	49
6.24	Integrated circuits: miscellaneous - family-group code: 08-99 .....	51
6.25	Relays and switches - family-group code: 09-01, 09-02 and 16-01 .....	52
6.26	Resistors - family-group code: 10-01 to 10-11.....	55
6.27	Thermistors - family-group code: 11-01 to 11-03.....	59
6.28	Transistors: bipolar - family-group code: 12-01 to 12-04 and 12-09.....	60
6.29	Transistors: FET - family-group code: 12-05 and 12-06.....	62
6.30	Transistors: RF: bipolar - family-group code: 12-10 and 12-13.....	64
6.31	Transistors: RF: FET - family-group code: 12-12, 12-14, 12-15(FET) and 12-16(FET).....	67
6.32	Wires and cables - family-group code: 13-01 to 13-03.....	70
6.33	Opto-electronics - family-group code: 18-01 to 18-05.....	74
6.34	RF passive components: family-group code: 30-01, 30-07, 30-09, 30-10 and 30-99.....	75
6.35	Fibre optic components: fibre and cable: family-group-code: 27-01.....	77
6.36	Hybrids.....	78
<b>Bibliography .....</b>		<b>89</b>

## Figures

Figure 5-1: Parameter stress versus strength relationship .....	16
---	----

## Tables

Table 6-1: Derating of parameters for capacitors family-group code 01-01 and 01-02 .....	21
Table 6-2: Derating of parameters for capacitors family-group code 01-03 .....	22
Table 6-3: Derating of parameters for capacitors family-group code .....	24
Table 6-4: Derating of parameters for capacitors family-group code 01-05 .....	26
Table 6-5: Derating of parameters for capacitors family-group code 01-06 .....	27
Table 6-6: Derating of parameters for capacitors family-group code 01-07 .....	28
Table 6-7: Derating of parameters for capacitors family-group code 01-10 .....	29
Table 6-8: Derating of parameters for capacitors family-group code 01-11 .....	30
Table 6-9: Derating of parameters for capacitors family-group code 01-99 .....	31
Table 6-10: Derating of parameters for connectors family-group code 02-01, 02-02, 02-03, 02-07 and 02-09 .....	32
Table 6-11: Derating of parameters for connectors RF family-group code 02-05 .....	34
Table 6-12: Derating of parameters for piezo-electric devices family-group code 03- 01 .....	35
Table 6-13: Derating of parameters for Diode (signal/switching, rectifier including Schottky, pin).....	36
Table 6-14: Derating of parameters for Diode (Zener, reference, transient suppression).....	37
Table 6-15: Derating of parameters for Diodes family-group code 04-05, 04-11 to 04- 13, 04-15, 04-16 and 04-17 .....	38
Table 6-16: Derating of parameters for Feedthrough filters family-group code 05-01 .....	39
Table 6-17: Derating of parameters for Fuses family-group code 06-01.....	40
Table 6-18: Derating of parameters for Inductors and transformers family-group code 07-01 to 07-03 and 14-01 .....	41
Table 6-19: Derating of parameters for Integrated circuits family-group code: 08-10, 08-20, 08-21, 08-29 to 08-42, and 08-80 .....	42
Table 6-20: Derating of parameters for Integrated circuits family-group code: 08-22, 08-23 and 08-24 .....	44
Table 6-21: Derating of parameters for Integrated circuits family-group code 08-50 to 08-60 and 08-69 .....	47
Table 6-22: Derating of parameters for Integrated circuits family-group code 08-61 and 08-62 .....	48

Table 6-23: Derating of parameters for non-custom MMICs.....	50
Table 6-24: Derating of parameters for Relays and switches family-group code 09-01, 09-02 and 16-01 .....	53
Table 6-25: Derating of parameters for Metal film precision resistor (type RNC, except RNC 90) .....	55
Table 6-26: Derating of parameters for Metal film semi-precision resistor (type RLR) .....	55
Table 6-27: Derating of parameters for Foil resistor (type RNC 90).....	56
Table 6-28: Derating of parameters Wire-wound high precision resistor (type RBR 56) .....	56
Table 6-29: Derating of parameters for Wire-wound power resistor (type RWR, RER).....	57
Table 6-30: Derating of parameters for Chip resistor (RM), network resistor .....	57
Table 6-31: Derating of parameters for Carbon composition resistor .....	57
Table 6-32: Derating of parameters for Heaters .....	58
Table 6-33: Derating of parameters for Thick Film Power .....	58
Table 6-34: Derating of parameters for Thermistors family-group code 11-01 to 11-03.....	59
Table 6-35: Derating of parameters for Transistors family-group code 12-01 to 12-04 and 12-09 .....	60
Table 6-36: Derating of parameters for Transistors family-group code 12-05 and 12-06 .....	62
Table 6-37: Derating of parameters for Transistors family-group code 12-10 and 12-13 .....	65
Table 6-38: Derating of parameters for Transistors family-group code 12-12, 12-14, 12-15(FET) and 12-16(FET) .....	68
Table 6-39: <<deleted>> .....	70
Table 6-40: <<deleted>> .....	70
Table 6-41: Derating factor for bundles (fully loaded).....	72
Table 6-42: Additional factor for partially loaded bundles .....	72
Table 6-43: Derating of parameters for Opto-electronics family-group code 18-01 to 18-05 .....	74
Table 6-44: Derating of parameters for RF passive components from family-group code 30-01, 30-07, 30-09, 30-10 and 30-99 - Low power < 5 W .....	75
Table 6-45: Derating of parameters for RF passive components from family-group code 30-01, 30-07, 30-09, 30-10 and 30-99 - Low power $\geq$ 5 W .....	75
Table 6-46: Derating of parameters for Fibre optic components.....	77

## European Foreword

---

This document (EN 16602-30-11:2021) has been prepared by Technical Committee CEN/CLC/TC 5 "Space", the secretariat of which is held by DIN (Germany).

This document (EN 16602-30-11:2021) originates from ECSS-Q-ST-30-11C Rev.2.

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 June 2022, and conflicting national standards shall be withdrawn at the latest by June 2022.

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 supersedes EN 16602-30-11:2014.

The main changes with respect to EN 16602-30-11:2014 are listed below:

- Implementation of Change Requests,
- Addition of clause 6.26.2.9 "Thick Film Power"
- Informative Annex B "ESCC Exceptions" deleted
- Informative Annex C "Example of single wires rating currents calculation for the wires most commonly used for space applications" added

This document has been prepared under a standardization request 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 EN covering the same scope but with a wider domain of applicability (e.g. : aerospace).

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



## Introduction

---

This Standard specifies derating requirements applicable to electronic, electrical and electromechanical components.

Derating is a long standing practice applied to components used on spacecraft. Benefits of this practice are now proven, but for competitiveness reasons, it becomes necessary to find an optimized reliability. Too high a derating can lead to over-design, over-cost and over-sizing of components, the direct consequence being excess volume and weight. The aim is to obtain reliable and high performance equipment without over-sizing of the components. For this reason and if possible, this Standard provides derating requirements depending on mission duration and mean temperature, taking into account demonstrated limits of component capabilities.

# 1 Scope

---

This Standard applies to all parties involved at all levels in the realization of space segment hardware and its interfaces.

The objective of this Standard is to provide customers with a guaranteed performance and reliability up to the equipment end-of-life. To this end, the following are specified:

- Load ratios or limits to reduce stress applied to components;
- Application rules and recommendations.

This standard may be tailored for the specific characteristics and constraints of a space project, in accordance with ECSS-S-ST-00.

## 2

## Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this ECSS Standard. For dated references, subsequent amendments to, or revisions of any of these publications do not apply. However, parties to agreements based on this ECSS Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references the latest edition of the publication referred to applies.

EN reference	Reference in text	Title
EN 16601-00-01	ECSS-S-ST-00-01	ECSS system - Glossary of terms
EN 16602-60	ECSS-Q-ST-60	Space product assurance - Electrical, electronic and electromechanical (EEE) components
EN 16602-60-13	ECSS-Q-ST-60-13	Commercial electrical, electronic and electromechanical (EEE) components
EN 16602-60-15	ECSS-Q-ST-60-15	Radiation hardness assurance - EEE components
	ESCC 2269010	Evaluation test programme for monolithic microwave integrated circuits (MMICS)
	ESCC 2265010	Evaluation Test Programme for Discrete Microwave Semiconductors
	ESCC Derating deviations	Component Derating - Deviations to ECSS-Q-ST-30-11: <a href="https://escies.org/webdocument/showArticle?id=825&amp;groupid=6">https://escies.org/webdocument/showArticle?id=825&amp;groupid=6</a>