BS EN IEC 61163-2:2020

BSI Standards Publication

Reliability stress screening

Part 2: Components

Documents
Document Sharing Hub

Full document details: BS EN IEC 61163-2:2020

National foreword

This British Standard is the UK implementation of EN IEC 61163-2:2020. It is identical to IEC 61163-2:2020. It supersedes BS IEC 61163-2:1998, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee DS/1, Dependability.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2020
Published by BSI Standards Limited 2020

ISBN 978 0 580 90395 3

ICS 03.120.01; 31.020

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 May 2020.

Amendments/corrigenda issued since publication

Date	Text affected

Documents
Document Sharing Hub

Full document details: BS EN IEC 61163-2:2020

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 61163-2

May 2020

ICS 03.120.01; 31.020

English Version

Reliability stress screening - Part 2: Components (IEC 61163-2:2020)

Déverminage sous contraintes - Partie 2: Composants (IEC 61163-2:2020)

Zuverlässigkeitsvorbehandlung durch Beanspruchung - Teil 2: Bauelemente (IEC 61163-2:2020)

This European Standard was approved by CENELEC on 2020-04-15. 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 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 CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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

© 2020 CENELEC All rights of exploitation in any form and by any means reserved worldwide for CENELEC Members.

Ref. No. EN IEC 61163-2:2020 E

Documents
Document Sharing Hub

Full document details: BS EN IEC 61163-2:2020

European foreword

The text of document 56/1875/FDIS, future edition 2 of IEC 61163-2, prepared by IEC/TC 56 "Dependability" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61163-2:2020.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2021-01-15
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2023-04-15

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

Endorsement notice

The text of the International Standard IEC 61163-2:2020 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61163-1	NOTE	Harmonized as EN 61163-1
IEC 62506	NOTE	Harmonized as EN 62506
IEC 61014	NOTE	Harmonized as EN 61014
IEC 62402	NOTE	Harmonized as EN IEC 62402
IEC 62506	NOTE	Harmonized as EN 62506
IEC 61709	NOTE	Harmonized as EN 61709
IEC 61649	NOTE	Harmonized as EN 61649
IEC 62740	NOTE	Harmonized as EN 62740

Documents
Document Sharing Hub

Full document details: BS EN IEC 61163-2:2020

CONTENTS

FOREWORD 4
INTRODUCTION 6
1 Scope 7
2 Normative references 7
3 Terms and definitions 7
4 Description of reliability stress screening (RSS) 8
5 Types of RSS 10
5.1 General 10
5.2 Constant stress screening 10
5.3 Step stress screening 10
5.4 Highly accelerated stress screening (HASS) 10
6 Managing RSS 11
6.1 Planning 11
6.2 Termination of RSS 12
7 Design of RSS 12
7.1 General 12
7.2 Physics of failure 12
7.3 Common screening procedures 13
7.4 Characteristics of a well-designed screening procedure 14
7.5 Screening evaluation 14
7.6 Selection of samples 14
7.7 Setting the duration of RSS 15
8 Managing an RSS programme 15
8.1 Resources 15
8.2 Monitoring during RSS 16
9 Analysis for RSS 16
9.1 General 16
9.2 Cost benefit analysis 16
9.3 Identifying early failures 16
9.4 Analysis of the outputs of RSS 17
Annex A (informative) Data analysis 18
A.1 Symbols 18
A.2 Weibull analysis 18
A.3 Design of a reliability stress screening 19
Annex B (informative) Examples of applications of reliability stress screening processes 23
B.1 General 23
B.2 Transformers 23
B.3 Connectors 25
Bibliography 28

Figure A.1 – Estimation of η and β 18
Figure A.2 – Nomograph of the cumulative binomial distribution (Larson) 20
Figure A.3 – Example of a Weibull plot 21

AVA Documents
Document Sharing Hub

Full document details: BS EN IEC 61163-2:2020

Figure B.1 – Weibull plot of the bump screening 25
Figure B.2 – Weibull plot of the pull test 27

Table 1 – Common screening types and typical defect types precipitated by RSS 13
Table A.1 – RSS test results 21
Table A.2 – Screening results for weak populations 22

Documents
Document Sharing Hub

Full document details: BS EN IEC 61163-2:2020

INTERNATIONAL ELECTROTECHNICAL COMMISSION

RELIABILITY STRESS SCREENING –

Part 2: Components

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61163-2 has been prepared by IEC technical committee 56: Dependability.

This second edition cancels and replaces the first edition published in 1998. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) this version of the document is a complete rewrite and restructure from the previous version.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
56/1875/FDIS	56/1887/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

AVA Documents
Document Sharing Hub

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61163 series, published under the general title *Reliability stress screening*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

Documents
Document Sharing Hub

Full document details: BS EN IEC 61163-2:2020

INTRODUCTION

Although first developed to stabilize the parameters of manufactured components (burn-in), reliability stress screening (RSS) can be used to remove from a component population the weaker components. This can be done at times where the manufacturing processes for components are difficult to control or for other reasons such as where the components need to be selected (re-qualified) to operate in harsher than usual operating conditions. This is also done where more narrow specifications are required for the application and no alternative courses of action are available.

The use of RSS is normally only a temporary measure when early failures need to be avoided under a specific set of conditions as outlined above.

RSS is an effective tool in identifying and removing flaws due to poor component design and manufacturing deficiencies.

Documents
Document Sharing Hub

Full document details: BS EN IEC 61163-2:2020

RELIABILITY STRESS SCREENING –

Part 2: Components

1 Scope

This part of IEC 61163 provides guidance on RSS techniques and procedures for electrical, electronic, and mechanical components. This document is procedural in nature and is not, and cannot be, exhaustive with respect to component technologies due to the rapid rate of developments in the component industry.

This document is:

a) intended for component manufacturers as a guideline;

b) intended for component users as a guideline to negotiate with component manufacturers on RSS requirements;

c) intended to allow the planning of an RSS process in house to meet reliability requirements or to allow the re-qualification of components for specific, upgraded, environments;

d) intended as a guideline to sub-contractors who provide RSS as a service.

This document is not intended to provide test plans for specific components or for delivery of certificates of conformance for batches of components.

The use of bi-modal Weibull analysis to select and optimize an RSS process without having to estimate the reliability and life time of all items is described.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
screen
conditions, for example stress level and duration, used for the removal of non-conforming items from a population

3.2
screening
process carried out to detect and remove non-conforming items, or those susceptible to early life failure

Note 1 to entry: Screening may employ representative or elevated stresses.

Documents
Document Sharing Hub

Full document details: BS EN IEC 61163-2:2020

[SOURCE: IEC 60050-192:2015, 192-09-11, modified – Deletion of “test” in the term, replacement of “test” with "process" in the definition and replacement of “The test” with "Screening" in the Note 1 to entry.]

3.3
RSS
reliability stress screening
process for detecting flaws by applying environmental and/or operational stresses to precipitate them as detectable failures

Note 1 to entry: RSS is designed with the intention of precipitating flaws into detectable failures. An ageing process designed specifically with the intention of stabilizing parameters is not an RSS process and is therefore outside the scope of this document.

Note 2 to entry: This note applies to the French language only.

[SOURCE: IEC 60050-192:2015, 192-09-19, modified – Addition of Note 1 to entry.]

3.4
flaw <of an item>
imperfection that could result in failure

Note 1 to entry: An imperfection in this case is a physical characteristic of the component that leads to a failure to perform in a required way.

[SOURCE: IEC 60050-192:2015, 192-04-03, modified – Addition of Note 1 to entry.]

3.5
early life failure period
infant mortality period
time interval of early life during which the instantaneous failure intensity of a repairable item, or the instantaneous failure rate of a non-repairable item, decreases significantly with time

Note 1 to entry: What is considered “significant” will depend upon the application.

[SOURCE: IEC 60050-192:2015, 192-02-28]

3.6
weak item
item which has a high probability of failure in the early life period due to a flaw

3.7
weak population
subset of the total population of items made up of only weak items

3.8
strong population
subset of the total population of items made up of non-weak items

4 Description of reliability stress screening (RSS)

The process of RSS is used to detect flaws in a population of items, usually components, leading to the subsequent removal of these flawed items from the population. The removal of such components facilitates rapid achievement of the reliability level expected for the population over the useful life.

This can often happen when problems with items are identified and it takes time to fix the design or the production process for the item but the existing items need to be used immediately. This is typically a sorting exercise where the RSS is used to fail the items with problems so they can be identified in the population or batches.

AVA Documents
Document Sharing Hub