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TECHNICAL REPORT

Electric components – Reliability – Failure rates at reference conditions

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IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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ELECTRIC COMPONENTS – RELIABILITY – FAILURE RATES AT REFERENCE CONDITIONS

FOREWORD

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IEC TR 63162 has been prepared by IEC technical committee 56: Dependability. It is a Technical Report.

The text of this Technical Report is based on the following documents:

Draft	Report on voting
56/2043/DTR	56/2082A/RVDTR

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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

- reconfirmed,
- withdrawn, or
- revised.

INTRODUCTION

This document is intended to support the reliability prediction of electric components as used in equipment and is aimed at organizations that do not have their own data. It can be used in conjunction with IEC 61709, which is its main purpose, but it can also be used as a supplement to any other reliability prediction technique.

Reliability prediction is most useful in the early design phase of equipment. It can be used, for example, to identify potential reliability problems, the planning of logistic support strategies and the evaluation of design alternatives.

It is important to appreciate that a failure rate is not an intrinsic and immutable property of a piece of equipment. It is important for an engineer involved either in collecting or using data to fully understand the factors that influence failure rate derivation and use.

When performing reliability prediction, data are used coming from the following sources in the given order of preference:

– user data;
– manufacturer's data;
– handbook data.

If user data are available for the prediction, then they are used. If no user data is available then the manufacturer’s data are examined and, if judged suitable, used. If no manufacturer’s data is available then handbook data or other data are examined and, if judged suitable, used.

IEC 61709:2017, H.5.3, provides a list of handbooks and standards containing failure rates data. Selected sources were considered for this document and are listed. Failure rate data stated in this document were set considering these selected sources.

The failure rates given in this document are assumed constant, either for an unlimited period of operation (general case) or for limited periods (see IEC 61709). This limitation of life is called useful life and it is assumed that, during this useful life, failure rate can be considered constant for practical purposes.

For the purposes of this document, the term "electric component" includes the commonly used terms "electronic component", "electrical component" and "electromechanical component".

This document is for guidance only. It provides a common basis for reliability predictions, for comparing and evaluating reliability predictions of related or competitive designs. However, like any tool, reliability prediction requires to be used with care, with due consideration of its limitations. Failure rates are in fact impacted by operational scenarios, operator characteristics, maintenance practices, measurement techniques and differences in definition of failure.

While preparing this document it was chosen to list all component categories considered relevant as "electric components", even when failure rate data were not yet available, in order to present a complete list of components for future updates.

ELECTRIC COMPONENTS – RELIABILITY – FAILURE RATES AT REFERENCE CONDITIONS

1 Scope

This document provides failure rates at reference conditions for electric components, considering reference conditions defined in IEC 61709.

Reference conditions are useful since they provide a known standard basis from which failure rates can be modified to account for differences in environment from the environments taken as reference conditions.

To perform reliability prediction, which is described in IEC 61709:2017, Annex C, failure rates, together with assumptions and limitations, are used.

IEC 61709 does not provide failure rates for components, but only provides models that allow failure rates obtained by other means to be converted from one operating condition to another operating condition.

This document provides generic failure rates considering those contained in the list of selected sources, calculated at reference conditions, as defined in IEC 61709. In fact, although models are different, calculated values at reference conditions do not appear to be so different, hence allowing a consistent converging process. See also IEC 61709:2017, 4.6.

Each user can easily calculate failure rates at any condition using IEC 61709.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

IEC 60050-192, *International Electrotechnical Vocabulary (IEV) – Part 192: Dependability,* available at https://www.electropedia.org/