

Electromechanical elementary relays —

Part 2: Reliability

The European Standard EN 61810-2:2005 has the status of a
British Standard

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National foreword

This British Standard is the official English language version of EN 61810-2:2005. It is identical with IEC 61810-2:2005. It supersedes BS EN 60255-23:1997 which is withdrawn.

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CENELEC

European Committee for Electrotechnical Standardization
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Foreword

The text of document 94/214/FDIS, future edition 1 of IEC 61810-2, prepared by IEC TC 94, All-or-nothing electrical relays, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61810-2 on 2005-04-01.

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|--|-------|------------|
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Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61810-2:2005 was approved by CENELEC as a European Standard without any modification.

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INTRODUCTION

The superseded standard dealing with the lifetime and reliability characteristics of relays was IEC 60255-23. The basic content of that standard had been adopted from its predecessor IEC 60255-0-20. Therefore, the basic concepts of the standard reflected the “state of the art” of the 1970s.

Following the setting-up of a separate technical committee for all-or-nothing relays (TC 94), the IEC 61810 series, a new series of basic relay standards covering electromechanical elementary (non-specified time all-or-nothing) relays, was established.

Within this series, IEC 61810-2 is intended to give requirements and tests permitting the assessment of relay reliability. Whereas all information concerning endurance tests for type testing have been included in IEC 61810-1, all relevant contents of IEC 60255-23, as well as IEC 60255-14 and IEC 60255-15 have been taken into account in IEC 61810-2.

However, in the past decades, the technical committee responsible for dependability (TC 56) has considerably improved and extended its basic standards. In particular, IEC 60300-3-5 (application guide for determining reliability test conditions and statistical test principles) and IEC 61649 (which deals with Weibull distributed test data) are now available.

On the basis of these two publications, IEC 61810-2 was developed. It comprises test conditions and an evaluation method to obtain relevant reliability measures for electromechanical elementary relays. The life of relays as non-repairable items is primarily determined by the number of operations. For this reason the reliability is expressed in terms of MCTF (mean cycles to failure).

Commonly, equipment reliability is calculated from MTTF (mean time to failure) figures. With the knowledge of the frequency of operation (cycling rate) of the relay within an equipment it is possible to calculate an effective MTTF value for the relay in that application.

Such calculated MTTF values for relays can be used to calculate respective reliability, probability of failure, and availability (e.g. MTBF (mean time between failure)) values for equipment into which these relays are incorporated.

The MCTF figures can also be used as a basis to make comparative evaluations between relays with different styles of design or construction, and as an indication of product reliability under specific conditions.

ELECTROMECHANICAL ELEMENTARY RELAYS –

Part 2: Reliability

1 Scope

This part of IEC 61810 covers test conditions and provisions for the evaluation of endurance tests using appropriate statistical methods to obtain reliability characteristics for relays.

This standard applies to electromechanical elementary relays considered as non-repaired items (i.e. items which are not repaired after failure), whenever a random sample of items is subjected to a test of cycles to failure (CTF).

The lifetime of a relay is usually expressed in number of cycles. Therefore, whenever the terms “time” or “duration” are used in the basic standard IEC 61649, this term is to be understood to mean “cycles”. However, with a given frequency of operation, the number of cycles can be transformed into respective times (e.g. TTF, times to failure).

The failure criteria and the resulting characteristics of elementary relays describing their reliability in normal use are specified in this standard. A relay failure occurs when the specified failure criteria are met.

As the failure rate for elementary relays cannot be considered as constant, particularly due to wear-out mechanisms, the times to failure of tested items typically show a Weibull distribution. This standard provides numerical methods to calculate approximate values for the two-parameter Weibull distribution, as well as lower confidence limits.

2 Normative references

The following referenced documents are indispensable for the application 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 60050-191:1990, *International Electrotechnical Vocabulary (IEV) – Chapter 191: Dependability and quality of service*

IEC 60050-444:2002, *International Electrotechnical Vocabulary (IEV) – Part 444: Elementary relays*

IEC 60300-3-5:2001, *Dependability management – Part 3-5: Application guide – Reliability test conditions and statistical test principles*

IEC 61649:1997, *Goodness-of-fit tests, confidence intervals and lower confidence limits for Weibull distributed data*

IEC 61810-1:2003, *Electromechanical elementary relays – Part 1: General and safety requirements*

ISO 3534-1:1993, *Statistics – Vocabulary and symbols – Part 1: Probability and general statistical terms*

3 Terms and definitions

For the purposes of this document, the terms and definitions of IEC 60050-191 and IEC 60050-444, some of which are reproduced below, as well as the following, apply.

3.1

item

any component that can be individually considered

[IEV 191-01-01, modified]

NOTE For the purpose of this standard, items are elementary relays.

3.2

non-repaired item

item which is not repaired after a failure

[IEV 191-01-03, modified]

3.3

cycle

operation and subsequent release/reset

[IEV 444-02-11]

3.4

frequency of operation

number of cycles per unit of time

[IEV 444-02-12]

3.5

reliability

ability of an item to perform a required function under given conditions for a given number of cycles or time interval

[IEV 191-02-06, modified]

NOTE 1 It is generally assumed that the item is in a state to perform this required function at the beginning of the time interval.

NOTE 2 The term “reliability” is also used as a measure of reliability performance (see IEC 191-12-01).

3.6

reliability test

experiment carried out in order to measure, quantify or classify a reliability measure or property of an item

[3.1.27 of IEC 60300-3-5]

3.7

life test

test with the purpose of estimating, verifying or comparing the lifetime of the class of items being tested

[3.1.17 of IEC 60300-3-5]