

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Electromechanical elementary relays –  
Part 2: Reliability**

**Relais électromécaniques élémentaires –  
Partie 2: Fiabilité**



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International Standard IEC 61810-2 has been prepared by IEC technical committee 94: All-or-nothing electrical relays.

This second edition cancels and replaces the first edition published in 2005. This edition constitutes a technical revision.

The main changes with respect to the previous editions are listed below:

- inclusion of both numerical and graphical methods for Weibull evaluation;
- establishment of full coherence with the second edition of the basic reliability standard IEC 61649;
- deletion of previous Annex A and Annex D since both annexes are contained in IEC 61810-1.

The text of this standard is based on the following documents:

FDIS	Report on voting
94/316/FDIS	94/325/RVD

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

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

A list of all parts of the IEC 61810 series can be found, under the general title *Electromechanical elementary relays*, on the IEC website.

This International Standard is to be used in conjunction with IEC 61649:2008.

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

- reconfirmed,
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## INTRODUCTION

Within the IEC 61810 series of basic standards covering elementary electromechanical relays, IEC 61810-2 is intended to give requirements and tests permitting the assessment of relay reliability. All information concerning endurance tests for type testing have been included in IEC 61810-1.

NOTE According to IEC 61810-1, a specified value for the electrical endurance under specific conditions (e.g. contact load) is verified by testing 3 relays. None is allowed to fail. Within this IEC 61810-2, a prediction of the reliability of a relay is performed using statistical evaluation of the measured cycles to failure of a larger number of relays (generally 10 or more relays).

Recently the technical committee responsible for dependability (TC 56) has developed a new edition of IEC 61649 dealing with Weibull distributed test data. This second edition contains both numerical and graphical methods for the evaluation of Weibull-distributed data.

On the basis of this basic reliability standard, 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 mean cycles to failure (MCTF).

Commonly, equipment reliability is calculated from mean time to failure (MTTF) 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 failures)) values for equipment into which these relays are incorporated.

Generally it is not appropriate to state that a specific MCTF value is “high” or “low”. The MCTF figures are used 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. It should be used in conjunction with IEC 61649.

This International 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 IEC 61649, this term should be understood to mean “cycles”. However, with a given frequency of operation, the number of cycles can be transformed into respective times (e.g. times to failure (TTF)).

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 both numerical and graphical 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 61649:2008, *Weibull analysis*

IEC 61810-1:2008, *Electromechanical elementary relays – Part 1: General requirements*