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Standards

Irish Standard  
I.S. EN 61810-2:2017

# Electromechanical elementary relays - Part 2: Reliability

**I.S. EN 61810-2:2017**

*Incorporating amendments/corrigenda/National Annexes issued since publication:*

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## National Foreword

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EUROPEAN STANDARD

**EN 61810-2**

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2017

ICS 29.120.70

Supersedes EN 61810-2:2011

English Version

## Electromechanical elementary relays - Part 2: Reliability (IEC 61810-2:2017)

Relais électromécaniques élémentaires - Partie 2: Fiabilité  
(IEC 61810-2:2017)

Elektromechanische Elementarrelais -  
Teil 2: Funktionsfähigkeit (Zuverlässigkeit)  
(IEC 61810-2:2017)

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Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

**EN 61810-2:2017****European foreword**

The text of document 94/415/FDIS, future edition 3 of IEC 61810-2, prepared by IEC/TC 94 "All-or-nothing electrical relays" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61810-2:2017.

The following dates are fixed:

- latest date by which the document has to be (dop) 2018-04-06  
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In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61810-2-1	NOTE	Harmonized as EN 61810-2-1.
IEC 61810-3	NOTE	Harmonized as EN 61810-3.
IEC 62061	NOTE	Harmonized as EN 62061.
ISO 13849-1:2015	NOTE	Harmonized as EN ISO 13849-1:2015 (not modified).

## **Annex ZA**

(normative)

### **Normative references to international publications with their corresponding European publications**

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NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61649	2008	Weibull analysis	EN 61649	2008
IEC 61810-1	2015	Electromechanical elementary relays - Part 1: General and safety requirements	EN 61810-1	2015

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**IEC 61810-2**

Edition 3.0 2017-05

# **INTERNATIONAL STANDARD**

# **NORME INTERNATIONALE**



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

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



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**IEC 61810-2**

Edition 3.0 2017-05

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE



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

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

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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### **ELECTROMECHANICAL ELEMENTARY RELAYS –**

#### **Part 2: Reliability**

#### **FOREWORD**

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

This third edition cancels and replaces the second edition published in 2011. This edition constitutes a technical revision.

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

- a) not only graphical but also numerical methods are added;
- b) reduction of number of samples in specified cases;
- c) new subclauses of confidence intervals are added;
- d) the WeiBayes approach is added to facilitate compliance tests (routine test) with lower effort;

- e) annexes have been restructured into an Annex A for data analysis (normative) and Annex B (informative) where various examples of the data analysis are given;
- f) the former Annex C has been incorporated into the modified Annex B;
- g) a new Annex C replaces the old Annex D.

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

FDIS	Report on voting
94/415/FDIS	94/418/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.

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

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

A list of all parts in the IEC 61810 series, published under the general title *Electromechanical elementary relays*, 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

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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 1 or 3 relays. None is allowed to fail. Within this document, 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).

This document is the base for IEC 61810-2-1 to determine reliability values for relays where enhanced requirements for the verification of reliability ( $B_{10}$  and  $B_{10D}$ ) apply.

The technical committee responsible for dependability has developed IEC 61649 dealing with Weibull-distributed test data. It contains both numerical and graphical methods for the evaluation of Weibull-distributed data as well as WeiBayes estimation.

On the basis of this basic reliability standard, this document was developed. It comprises test conditions and an evaluation method to obtain characteristic reliability values 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 a piece of 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.

This document applies to electromechanical elementary relays considered as non-repaired items (i.e. items which are not repaired after failure).

The lifetime of a relay is usually expressed in number of cycles (CTF). Therefore, whenever the terms “time” or “duration” are used in IEC 61649, they carry the meaning “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 document. 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 cycles to failure of tested items typically show a Weibull distribution. This document provides numerical and graphical methods to calculate approximate values for the two-parameter Weibull distribution, as well as lower confidence limits and a method for confirmation of reliability values with the WeiBayes method.

This document does not cover procedures for electromechanical elementary relays where enhanced requirements for the verification of reliability apply.

NOTE 1 Such reliability test procedures are specified in IEC 61810-2-1. In particular, when electromechanical elementary relays are intended to be incorporated in safety-related control systems of machinery in accordance with IEC 62061 and ISO 13849-1, IEC 61810-2-1 defines procedures for the manufacturer to provide  $B_{10D}$  values.

NOTE 2 Electromechanical elementary relays with forcibly guided (mechanically linked) contacts according to IEC 61810-3 offer the possibility of a high diagnostic coverage according to 4.5.3 of ISO 13849-1:2015.

#### 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 61649:2008, *Weibull analysis*

IEC 61810-1:2015, *Electromechanical elementary relays – Part 1: General and safety requirements*

#### 3 Terms and definitions

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

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