

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**Electromechanical elementary relays –  
Part 1: General requirements**

**Relais électromécaniques élémentaires –  
Partie 1: Exigences générales**

IEC 61810-1:2008

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IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

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ELECTROTECHNICAL  
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**ELECTROMECHANICAL ELEMENTARY RELAYS –****Part 1: General requirements**

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International Standard IEC 61810-1 has been prepared by IEC technical committee 94: All-or-nothing electrical relays.

This third edition cancels and replaces the second edition published in 2003. This edition constitutes a technical revision.

The relevant modifications are:

- update of references;
- renumbering of clauses to bring them into a more logical order;
- inclusion of contact load categories (same as in IEC 61810-2 and IEC 61810-7);
- clarifications concerning electrical endurance (Clause 11);
- inclusion of provisions for insulation coordination in accordance with the basic safety standards IEC 60664-3, IEC 60664-4 and IEC 60664-5 (Clause 13);
- renumbering of all annexes in the order they are referenced in the body of the standard;
- inclusion of new Annex C (normative) for the test set-up, and new Annex D (informative) for special loads (based upon similar annexes in IEC 61810-2 and IEC 61810-7);

– improvement of Annex B covering inductive contact loads.

This bilingual version (2013-06) corresponds to the monolingual English version, published in 2008-02.

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

FDIS	Report on voting
94/267/FDIS	94/269/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.

The French version of this standard has not been voted upon.

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

A list of all parts of 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 publication will remain unchanged until the maintenance result 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;
- withdrawn;
- replaced by a revised edition, or
- amended.

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# ELECTROMECHANICAL ELEMENTARY RELAYS –

## Part 1: General requirements

### 1 Scope

This part of IEC 61810 applies to electromechanical elementary relays (non-specified time all-or-nothing relays) for incorporation into equipment. It defines the basic functional requirements and safety-related aspects for applications in all areas of electrical engineering or electronics, such as:

- general industrial equipment,
- electrical facilities,
- electrical machines,
- electrical appliances for household and similar use,
- information technology and business equipment,
- building automation equipment,
- automation equipment,
- electrical installation equipment,
- medical equipment,
- control equipment,
- telecommunications,
- vehicles,
- transportation (e.g. railways).

Compliance with the requirements of this standard is verified by the type tests indicated.

In case the application of a relay determines additional requirements exceeding those specified in this standard, the relay should be assessed in line with this application in accordance with the relevant IEC standard(s) (e.g. IEC 60730-1, IEC 60335-1, IEC 60950-1).

### 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 60038:1983, *IEC standard voltages*  
Amendment 1 (1994)  
Amendment 2 (1997)

IEC 60050, *International Electrotechnical Vocabulary*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-17:1994, *Basic environmental testing procedures – Part 2: Tests – Test Q: Sealing*

IEC 60068-2-20:1979, *Basic environmental testing procedures – Part 2: Tests – Test T: Soldering*  
Amendment 2 (1987)

IEC 60085:2004, *Electrical insulation – Thermal classification*

IEC 60112:2003, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60364-4-44:2007, *Low voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*

IEC 60417:2007, *Graphical symbols for use on equipment*

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60664-3:2003, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 60664-4:2005, *Insulation coordination for equipment within low-voltage systems – Part 4: Consideration of high-frequency voltage stress*

IEC 60664-5:2007, *Insulation coordination for equipment within low-voltage systems – Part 5: Comprehensive method for determining clearances and creepage distances equal to or less than 2 mm*

IEC 60695-2-10:2000, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

IEC 60695-2-11:2000, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products*

IEC 60695-2-12:2000, *Fire hazard testing – Part 2-12: Glowing/hot-wire based test methods – Glow-wire flammability test method for materials*

IEC 60695-2-13:2000, *Fire hazard testing – Part 2-13: Glowing/hot-wire based test methods – Glow-wire ignitability test method for materials*

IEC 60695-10-2:2003, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test*

IEC 60721-3-3:2002, *Classification of environmental conditions – Part 3-3: Classification of groups of environmental parameters and their severities – Stationary use at weatherprotected locations*

Amendment 1 (1995)

Amendment 2 (1996)

IEC 60999-1:1999, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm<sup>2</sup> up to 35 mm<sup>2</sup> (included)*

IEC 61210:1993, *Connecting devices – Flat quick-connect terminations for electrical copper conductors – Safety requirements*

IEC 61760-1:2006, *Surface mounting technology – Part 1: Standard method for the specification of surface mounting components (SMDs)*

IEC 61984:2001, *Connectors – Safety requirements and tests*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050, in particular IEC 60050-444 and the following apply.

An alphabetical list of terms can be found at the end of this standard.

NOTE In the text of this standard, the term *relay* is used instead of *elementary relay* to improve the readability.

### 3.1 Definitions related to general terms

#### 3.1.1

##### **marking**

identification of a relay which, when completely given to the manufacturer of this relay, allows the unambiguous indication of its electrical, mechanical, dimensional and functional parameters

EXAMPLE Through the indication of the trade mark and the type designation on the relay, all relay-specific data can be derived from the type code.

#### 3.1.2

##### **intended use**

use of a relay for the purpose for which it was made, and in the manner intended by the manufacturer

#### 3.1.3

##### **relay technology categories**

categorization of relays, based upon environmental protection

NOTE Six categories are in use (RT 0 to RT V).

[IEV 444-01-11, modified]

#### 3.1.4

##### **pulse width modulation**

##### **PWM**

pulse time modulation in which the pulse duration varies in accordance with a given function of the value of the modulating signal

[IEV 702-06-57]

### 3.2 Definitions of relay types

#### 3.2.1

##### **electrical relay**

device designed to produce sudden and predetermined changes in one or more output circuits when certain conditions are fulfilled in the electric input circuits controlling the device

[IEV 444-01-01]

NOTE 1 For the purpose of this standard, output circuits are contact circuits.

NOTE 2 For the purpose of this standard, the term "coil" is used to denote "input circuit", although other types of input circuits are possible.

#### 3.2.2

##### **all-or-nothing relay**

electrical relay, which is intended to be energized by a quantity, the value of which is either within its operative range or effectively zero

NOTE "All-or-nothing relays" include both "elementary relays" and "time relays".

[IEV 444-01-02]

#### 3.2.3

##### **elementary relay**

all-or-nothing relay which operates and releases without any intentional time delay

[IEV 444-01-03, modified]

#### 3.2.4

##### **electromechanical relay**

electrical relay in which the intended response results mainly from the movement of mechanical elements

[IEV 444-01-04]

### 3.2.5

#### **electromagnetic relay**

electromechanical relay in which the designed response is produced by means of electromagnetic forces

[IEV 444-01-05]

### 3.2.6

#### **monostable relay**

electrical relay which, having responded to an energizing quantity and having changed its condition, returns to its previous condition when that quantity is removed

[IEV 444-01-07]

### 3.2.7

#### **bistable relay**

electrical relay which, having responded to an energizing quantity and having changed its condition, remains in that condition after the quantity has been removed; a further appropriate energization is required to make it change its condition

[IEV 444-01-08]

NOTE Bistable relays are also called latching relays.

### 3.2.8

#### **polarized relay**

electrical relay, the change of condition of which depends upon the polarity of its DC energizing quantity

[IEV 444-01-09, modified]

### 3.2.9

#### **non-polarized relay**

electrical relay, the change of condition of which does not depend upon the polarity of its energizing quantity

[IEV 444-01-10]

## 3.3 Definitions related to conditions and operations

### 3.3.1

#### **release condition**

for a monostable relay, specified condition of the relay when it is not energized; for a bistable relay, one of the specified conditions, as declared by the manufacturer

[IEV 444-02-01]

NOTE See Figure A.1.

### 3.3.2

#### **operate condition**

for a monostable relay, specified condition of the relay when it is energized by the specified energizing quantity and has responded to that quantity; for a bistable relay, the condition other than the release condition as declared by the manufacturer

[IEV 444-02-02]

NOTE See Figure A.1.

### 3.3.3

#### **operate (verb)**

change from the release condition to the operate condition

[IEV 444-02-04]

NOTE See Figure A.1.

**3.3.4****release (verb)**

for a monostable relay, change from the operate condition to the release condition

[IEV 444-02-05]

NOTE See Figure A.1.

**3.3.5****reset (verb)**

for a bistable relay, change from the operate condition to the release condition

[IEV 444-02-06]

**3.3.6****cycle**

operation and subsequent release/reset

[IEV 444-02-11]

**3.3.7****frequency of operation**

number of cycles per unit of time

[IEV 444-02-12]

**3.3.8****continuous duty**

duty in which the relay remains energized for a period long enough to reach thermal equilibrium

[IEV 444-02-13]

**3.3.9****intermittent duty**

duty in which the relay performs a series of identical cycles, the durations in the energized and unenergized conditions being specified; the duration of energization of the relay is such as will not permit the relay to reach thermal equilibrium

[IEV 444-02-14, modified]

**3.3.10****temporary duty**

duty in which the relay remains energized for insufficient duration to reach thermal equilibrium, the time intervals of energization being separated by unenergized time intervals of duration sufficient to restore equality of temperature between the relay and the surrounding medium

[IEV 444-02-16]

**3.3.11****duty factor**

ratio of the duration of energization to the total period in which intermittent or continuous or temporary duty takes place

NOTE The duty factor can be expressed as a percentage of the total period.

[IEV 444-02-15]

**3.3.12****thermal resistance (of the coil)**

quotient of the temperature rise of the relay coil by the input power, measured after a period long enough to reach thermal equilibrium

NOTE The thermal resistance usually is given in K/W.

[IEV 444-02-17]

### 3.3.13

#### **ambient temperature**

temperature(s) prescribed for the air surrounding the relay under certain conditions, when the relay is mounted as indicated by the manufacturer

### 3.3.14

#### **limiting continuous thermal withstand power**

highest steady state value of the applied electric power that a relay can withstand continuously, and under specified conditions, while satisfying specified temperature rise requirements

[IEV 444-03-18, modified]

NOTE Comprises both the applied power at the coil(s) and the contact(s).

### 3.3.15

#### **thermal equilibrium**

variation of less than 1 K between any two out of three consecutive measurements made at an interval of 5 min

### 3.3.16

#### **rated value**

value of a quantity used for specification purposes, established for a specific set of operating conditions

[IEV 444-02-18, modified]

### 3.3.17

#### **test value**

value of a quantity for which the relay shall comply with a specified action during a test

[IEV 444-02-20]

### 3.3.18

#### **actual value**

value of a quantity determined by measurement on a specific relay, during performance of a specified function

[IEV 444-02-21]

### 3.3.19

#### **mechanical endurance**

number of cycles under specified conditions with unloaded contact(s)

[IEV 444-07-10, modified]

## 3.4 Definitions of operating values

### 3.4.1

#### **energizing quantity**

electrical quantity which, when applied to the coil(s) of a relay under specified conditions, enables it to fulfil its purpose

NOTE For relays, the energizing quantity is usually a voltage. Therefore, the input voltage as energizing quantity is used in the definitions given in 3.4. Where a relay is energized by a given current instead, the respective terms and definitions apply with "current" used instead of "voltage".

[IEV 444-03-01, modified]

### 3.4.2

#### **operate voltage**

#### **set voltage (for bistable relays only)**

value of the coil voltage at which a relay operates