

# INTERNATIONAL STANDARD

**IEC**  
**61810-1**

Second edition  
2003-08

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## **Electromechanical elementary relays –**

### **Part 1: General and safety requirements**

*Relais électromécaniques élémentaires –*

*Partie 1:  
Exigences générales et de sécurité*

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTROMECHANICAL ELEMENTARY RELAYS –**

**Part 1: General and safety requirements**

FOREWORD

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

This second edition cancels and replaces the first edition published in 1998 and IEC 61810-5, published in 1998. This edition constitutes a technical revision.

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

FDIS	Report on voting
94/182/FDIS	94/186/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 bilingual version of this document may be issued at a later date.

This new edition has been completely revised in order to

- establish a stand-alone standard for the type testing of electromechanical elementary relays,
- incorporate and update the requirements and tests with regard to insulation coordination as contained in former IEC 61810-5:1998,
- improve the structure of the standard to achieve better readability,
- update various requirements and tests.

The committee has decided that the contents of this publication will remain unchanged until 2005. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

The contents of the corrigendum of October 2004 have been included in this copy.

Withdrawing

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IEC 61810-1:2003  
<https://standards.iteh.ai/document/standards/iec/4374f0a-8eed-47c0-89a1-602b698dc0f6/iec-61810-1-2003>

# ELECTROMECHANICAL ELEMENTARY RELAYS –

## Part 1: General and safety requirements

### 1 Scope

This part of IEC 61810 applies to electromechanical elementary relays (non-specified time all-or-nothing relays) for incorporation. It defines the basic safety-related and functional requirements 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,
- etc.

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) (for example 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 60068-2-17:1994, *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 60085:1984, *Thermal evaluation and classification of electrical insulation*

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

IEC 60364-4-44:2001, *Electrical installations of buildings – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*

IEC 60417-DB:2002, *Graphical symbols for use on equipment*<sup>1</sup>

IEC 60664-1:1992, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*  
Amendment 1 (2000)  
Amendment 2 (2002)

IEC 60695-2-2:1991, *Fire hazard testing – Part 2: Test methods – Section 2: Needle flame test*  
Amendment 1 (1994)

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 60695-10-2:1995, *Fire hazard testing – Part 10-2: Guidance and test methods for the minimization of the effects of abnormal heat on electrotechnical products involved in fires – Method for testing products made from non-metallic materials for resistance to heat using the ball pressure test*  
Amendment 1 (2001)

IEC 60721-3-3:1994, *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 60730-1:1999, *Automatic electrical controls for household and similar use – Part 1: General requirements*

IEC 60947-5-1:1997, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices*  
Amendment 1 (1999)  
Amendment 2 (1999)

IEC 60950-1:2001, *Information technology equipment – Safety – Part 1: General requirements*

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*

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<sup>1</sup> "DB" refers to the IEC on-line database.

IEC 61760-1:1998, *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 purpose of this part of IEC 61810, the following terms and definitions apply.

NOTE 1 Definitions of terms not stipulated in this standard are given in IEC 60050, in particular in IEC 60050(444).

NOTE 2 Some definitions taken from IEC 60050(444) have been modified for the application to this standard.

NOTE 3 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

[IEV 444-01-11, modified]

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

#### 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

[IEV 444-01-02]

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

**3.2.3****elementary relay**

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

[IEV 444-01-03]

**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]

**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

[IEV 444-02-15]

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

**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

[IEV 444-02-17]

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

**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**

steady state condition of the relay when the temperature does not change by more than  $\pm 2$  K within 10 minutes

**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 fulfill its purpose

[IEV 444-03-01, modified]

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".

### 3.4.2

#### **operate voltage**

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

value of the coil voltage at which a relay operates

[IEV 444-03-06, modified]

### 3.4.3

#### **operate voltage**

#### **$U_1$**

value of the coil voltage at which a relay operates, having previously been energized at that same voltage

NOTE Thermal equilibrium has to be achieved.

### 3.4.4

#### **limiting voltage**

#### **$U_2$**

value of the coil voltage, taking into account the effect of heating due to the power dissipated by the coil(s), which when exceeded may result in a relay failure caused by thermal overload

NOTE Thermal equilibrium has to be achieved.

### 3.4.5

#### **operative range**

range of values of coil voltage for which a relay is able to perform its specified function

[IEV 444-03-05, modified]

### 3.4.6

#### **release voltage**

value of the coil voltage at which a monostable relay releases

[IEV 444-03-08, modified]