



IEC 61810-1

Edition 3.0 2008-02

INTERNATIONAL STANDARD

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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE **XB**

ICS 29.120.70

ISBN 2-8318-9586-3

CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	8
3.1 Definitions related to general terms	9
3.2 Definitions of relay types	9
3.3 Definitions related to conditions and operations.....	10
3.4 Definitions of operating values	10
3.5 Definitions related to contacts	13
3.6 Definitions related to accessories.....	16
3.7 Definitions related to insulation	16
4 Influence quantities	18
5 Rated values	18
5.1 Rated coil voltage/rated coil voltage range	18
5.2 Operative range	19
5.3 Release.....	19
5.4 Reset	19
5.5 Electrical endurance.....	19
5.6 Frequency of operation.....	19
5.7 Contact loads	20
5.8 Ambient temperature	20
5.9 Categories of environmental protection	20
5.10 Duty factor	20
6 General provisions for testing.....	20
7 Documentation and marking	22
7.1 Data	22
7.2 Additional data	23
7.3 Marking	23
7.4 Symbols	23
8 Heating	24
8.1 Requirements	24
8.2 Test procedure	25
8.3 Terminals	26
8.3.1 General	26
8.3.2 Solder terminals	26
8.3.3 Flat quick-connect terminations	26
8.3.4 Screw and screwless type terminals	27
8.3.5 Alternative termination types	27
8.3.6 Sockets	27
9 Basic operating function	27
9.1 General test conditions.....	27
9.2 Operate (monostable relays)	27
9.3 Release (monostable relays)	28
9.4 Operate/reset (bistable relays)	28
10 Insulation resistance and dielectric strength	28

10.1	Preconditioning	28
10.2	Insulation resistance	28
10.3	Dielectric strength	28
11	Electrical endurance	30
12	Mechanical endurance.....	32
13	Clearances, creepage distances and solid insulation	32
13.1	General provisions	32
13.2	Clearances and creepage distances	33
13.3	Solid insulation.....	37
13.4	Accessible surfaces.....	37
14	Terminations	37
14.1	Screw terminals and screwless terminals	38
14.2	Flat quick-connect terminations	38
14.3	Solder terminals	38
14.3.1	Resistance to soldering heat	38
14.3.2	Solder pins	38
14.3.3	Terminals for surface mounting (SMD).....	38
14.3.4	Other solder terminations (e.g. soldering lugs)	38
14.4	Sockets	38
14.5	Alternative termination types	39
15	Sealing.....	39
16	Heat and fire resistance.....	39
	Annex A (normative) Explanations regarding relays	40
	Annex B (informative) Inductive contact loads	43
	Annex C (normative) Test set-up	45
	Annex D (informative) Special loads	49
	Annex E (normative) Heating test arrangement.....	52
	Annex F (normative) Measurement of clearances and creepage distances.....	53
	Annex G (normative) Relation between rated impulse voltage, nominal voltage and overvoltage category	59
	Annex H (normative) Pollution degrees	60
	Annex I (normative) Proof of tracking test	61
	Annex J (informative) Schematic diagram of families of terminations	62
	Annex K (normative) Glow-wire test	63
	Annex L (normative) Ball pressure test	64
	Annex M (informative) Needle flame test.....	65
	Alphabetical list of terms.....	66
	Bibliography.....	67
	Figure A.1 – Diagram explaining terms related to monostable relays	40
	Figure A.2 – Example explaining terms relating to contacts.....	41
	Figure A.3 – Explanations regarding the operative range of the coil voltage.....	41
	Figure A.4 – Explanation regarding the preconditioning and testing of the operate voltage according to 5.2.1 (Class 1) and 9.2	42

Figure A.5 – Explanation regarding the preconditioning and testing of the operate voltage according to 5.2.2 and 9.2	42
Figure C.1 – Standard test circuit.....	45
Figure C.2 – Functional block diagram.....	46
Figure C.3 – Contact load categories	48
Figure D.1 – Circuit for cable load.....	49
Figure D.2 – Test circuit for inrush current loads (e.g. capacitive loads and simulated tungsten filament lamp loads) – AC circuits.....	50
Figure D.3 – Example for a tungsten filament lamp test for relays rated 10/100 A/250 V~/2,5 ms	50
Figure D.4 – Test circuit for inrush current loads (e.g. capacitive loads and simulated lamp loads) – DC circuits	51
Figure D.5 – Test circuit for inrush current loads (e.g. simulated fluorescent lamp loads) with power-factor correction	51
Figure E.1 – Test arrangement	52
Figure J.1 – Schematic diagram of families of terminations.....	62
Figure L.1 – Ball pressure test apparatus.....	64
Table 1 – Reference values of influence quantities	18
Table 2 – Categories of protection	20
Table 3 – Type testing	21
Table 4 – Required relay data.....	22
Table 5 – Symbols	24
Table 6 – Examples for indication of rated values	24
Table 7 – Thermal classification.....	24
Table 8 – Cross-sectional areas and lengths of conductors dependent on the current carried by the terminal	26
Table 9 – Minimum values of insulation resistance.....	28
Table 10 – Dielectric strength – AC	29
Table 11 – Dielectric strength – DC	30
Table 12 – Schematics for contact loading.....	31
Table 13 – Provisions for the dimensioning of clearances and creepage distances	34
Table 14 – Minimum clearances in air for insulation coordination	35
Table 15 – Material groups	35
Table 16 – Minimum creepage distances for equipment subject to long-term stresses	36
Table 17 – Rated insulation voltage according to supply system voltage.....	37
Table 18 – Test conditions for test Tb	38
Table B.1 – Verification of the making and breaking capacity (abnormal conditions)	43
Table B.2 – Verification of the making and breaking capacity (normal conditions)	44
Table B.3 – Electrical endurance test.....	44
Table C.1 – Characteristics of power sources for contact loads	46
Table C.2 – Standard contact load characteristics	47
Table G.1 – Rated impulse voltage for equipment energized directly from the low-voltage mains	59

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative References cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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.

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.

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.

A bilingual version of this document may be issued at a later date.

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 reference 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 mm² up to 35 mm² (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*