
Elektromehanski osnovni releji – 7. del: Preskusni in merilni postopki

Electromechanical elementary relays – Part 7: Test and measurement procedures

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Introductory note:

The French National Committee will provide the French translation for a later date.

ATTENTION CDV soumis en parallèle au vote (CEI) et à l'enquête (CENELEC)	ATTENTION Parallel IEC CDV/CENELEC Enquiry
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTROMECHANICAL ELEMENTARY RELAYS –**Part 7: Test and measurement procedures**

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61810-7 has been prepared by IEC technical committee 94: All-or-nothing electrical relays.

This second edition cancels and replaces the first edition published in 1997. This second edition constitutes a technical revision.

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

FDIS	Report on voting
XX/XX/FDIS	XX/XX/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.

This new edition has been revised in order to

- update all normative references,
- adapt its contents to the newest issues of the other parts of this series of basic relay standards (IEC 61810-1 and IEC 61810-2),
- establish coherence with other IEC standards (e.g. of the IEC 60068-2 series),

- improve test and measurement procedures where appropriate,
- delete those tests no longer used in case of elementary relays for industrial application.

The committee has decided that the contents of this publication will remain unchanged until 2008. At this date, the publication will be

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- withdrawn;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

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ELECTROMECHANICAL ELEMENTARY RELAYS –

Part 7: Test and measurement procedures

1 General

1.1 Scope and object

This part of IEC 61810 states the test and measurement procedures for electromechanical elementary relays. It covers basic considerations which are, in general, common to all types of electromechanical elementary relays. Supplementary requirements may be necessitated by specific designs or application.

The test and measurement procedures of this standard are described as individual provisions covering a specific requirement. When combining them in a test programme, care must be taken (e.g. by suitable grouping of tested relays) to ensure that preceding tests do not devalue subsequent ones.

Where in this International Standard the term "specified" is used, this means a prescription in the appropriate documentation for the relay, e.g. manufacturer's data sheet, test specification, customer detail specification. For application within the IECQ system such prescriptions are contained in the detail specification as defined in A.7 of QC 001001.

NOTE 1 – To improve the readability of this standard, the term "relay" is generally used in place of "electromechanical elementary relay".

NOTE 2 – Requirements and tests related to the type testing of electromechanical elementary relays are contained in IEC 61810-1. For that purpose, the generally described test and measurement procedures of this standard have been prescribed in a more restricted and stringent form in IEC 61810-1.

NOTE 3 – Standards covering relays subjected to quality assessment in accordance with IECQ are compiled in the IEC 61811 series of publications.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

[Secretariat's note: The references indicated below will have to be checked and updated as necessary when preparing the FDIS.]

IEC 60050(444): 2002, *International Electrotechnical Vocabulary (IEV) – Chapter 444: Elementary relays*

IEC 60068-2-1: 1990, *Environmental testing – Part 2: Tests – Tests A: Cold*
Amendment 1 (1993)
Amendment 2 (1994)

IEC 60068-2-2: 1974, *Environmental testing – Part 2: Tests – Tests B: Dry heat*
Amendment 1 (1993)
Amendment 2 (1994)

IEC 60068-2-6: 1995, *Environmental testing – Part 2: Tests – Test Fc: Vibration (sinusoidal)*

- IEC 60068-2-7: 1983, *Environmental testing – Part 2: Tests – Test Ga and guidance: Acceleration, steady state*
Amendment 1 (1986)
- IEC 60068-2-10: 1988, *Environmental testing – Part 2: Tests – Test J and guidance: Mould growth*
- IEC 60068-2-11: 1981, *Environmental testing – Part 2: Tests – Test Ka: Salt mist*
- IEC 60068-2-13: 1983, *Environmental testing – Part 2: Tests – Test M: Low air pressure*
- IEC 60068-2-14: 1984, *Environmental testing – Part 2: Tests – Test N: Change of temperature*
Amendment 1 (1986)
- IEC 60068-2-17: 1994, *Environmental testing – Part 2: Tests – Test Q: Sealing*
- IEC 60068-2-20: 1979, *Environmental testing – Part 2: Tests – Test T: Soldering*
Amendment 2 (1987)
- IEC 60068-2-21: 1999, *Environmental testing – Part 2-21: Tests – Test U: Robustness of terminations and integral mounting devices*
- IEC 60068-2-27: 1987, *Environmental testing – Part 2: Tests – Test Ea and guidance: Shock*
- IEC 60068-2-29: 1995, *Environmental testing – Part 2: Tests – Test Eb and guidance: Bump*
- IEC 60068-2-30: 1980, *Environmental testing – Part 2: Tests – Test Db and guidance: Damp heat, cyclic (12 + 12-hour cycle)*
Amendment 1 (1985)
- IEC 60068-2-42: 2003, *Environmental testing – Part 2-42: Tests – Test Kc: Sulphur dioxide test for contacts and connections*
- IEC 60068-2-43: 2003, *Environmental testing – Part 2-43: Tests – Test Kd: Hydrogen sulphide test for contacts and connections*
- IEC 60068-2-45: 1980, *Environmental testing – Part 2: Tests – Test XA and guidance: Immersion in cleaning solvents*
Amendment 1 (1993)
- IEC 60068-2-58: 1999, *Environmental testing – Part 2-58: Tests – Test Td – Test methods for solderability, resistance to dissolution of metallization and to soldering heat of surface mounting devices (SMD)*
- IEC 60068-2-64: 1993, *Environmental testing – Part 2: Test methods – Test Fh: Vibration, broad-band random (digital control) and guidance*
- IEC 60068-2-68: 1994, *Environmental testing – Part 2: tests – Test L: Dust and sand*
- IEC 60068-2-78: 2001, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*
- IEC 60512-7: 1993, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods – Part 7: Mechanical operating tests and sealing tests*

IEC 60695-2-2: 1991, *Fire hazard testing – Part 2: Test methods – Section 2: Needle-flame test*

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 60749: 1996, *Semiconductor devices – Mechanical and climatic test methods*

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 electric copper conductors – Safety requirements*

IEC 61180-1: 1992, *High-voltage test techniques for low-voltage equipment – Part 1: Definitions, test and procedure requirements*

IEC 61180-2: 1994, *High-voltage test techniques for low-voltage equipment – Part 2: Test equipment*

IEC 61672-1: 2002, *Electroacoustics – Sound level meters – Part 1: Specifications*

IEC 61810-1: 2003, *Electromechanical elementary relays – Part 1: General and safety requirements*

2 Definitions

For the purpose of this part of IEC 61810, the following terms and definitions apply.

For the definitions of additional terms used in this standard, reference is made to IEC 60050(444).

2.1 Types of relays

2.1.1 **electromechanical relay**: electrical relay in which the intended response results mainly from the movement of mechanical elements [IEV 444-01-04]

2.1.2 **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]

2.1.3 **elementary relay**: all-or-nothing relay which operates and releases without any intentional time delay [IEV 444-01-03]

2.1.4 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]

2.1.5 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]

2.1.6 polarized relay: electrical relay, the change of condition of which depends upon the polarity of its energizing quantity [IEV 444-01-09]

2.1.7 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]

2.2 Types of relays, based upon environmental protection (relay technology RT)

2.2.1 RT 0 unenclosed relay: relay not provided with a protective case

2.2.2 RT I dust protected relay: relay provided with a case which protects its mechanism from dust

2.2.3 RT II flux proof relay: relay capable of being automatically soldered without allowing the migration of solder fluxes beyond the intended areas

NOTE – Where an enclosed construction is used, venting to the outside atmosphere is permissible.

2.2.4 RT III wash tight relay: relay capable of being automatically soldered and subsequently undergoing a washing process to remove flux residues without allowing the ingress of flux or washing solvents

NOTE – In service this type of relay is sometimes vented to the atmosphere after soldering or washing process.

2.2.5 RT IV sealed relay: relay provided with a case which has no venting to the outside atmosphere, and having a time constant better than 2×10^4 s (see IEC 60068-2-17)

2.2.6 RT V hermetically sealed relay: sealed relay having an enhanced level of sealing, assuring a time constant better than 2×10^6 s (see IEC 60068-2-17)

2.3 Functions of a relay

2.3.1 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]

2.3.2 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, other than the release condition as declared by the manufacturer [IEV 444-02-02]

2.3.3 operate (verb): change from the release condition to the operate condition [IEV 444-02-04]

2.3.4 release (verb): for a monostable relay, change from the operate condition to the release condition [IEV 444-02-05]

2.3.5 reset (verb): for a bistable relay, change from the operate condition to the release condition [IEV 444-02-06]

2.3.6 **change over** (verb): for a monostable relay, operate or release; for a bistable relay, operate or reset [IEV 444-02-07]

2.3.7 **cycle** (verb): for a monostable relay, operate and then release or vice versa; for a bistable relay, operate and then reset or vice-versa. [IEV 444-02-08]

2.3.8 **revert** (verb): for a specific type of polarized relay, release/reset again, or remain in the release condition, when supplied with a coil voltage in excess of that required for operation and of the same polarity as required for operation [IEV 444-02-09 modified]

2.3.9 **revert reverse** (verb): for a specific type of polarized bistable relay, operate again, or remain in the operate condition, when supplied with a coil voltage in excess of that required for resetting and of the same polarity as required for resetting [IEV 444-02-09 modified]

2.4 *Types of contacts*

2.4.1 **make contact**: contact which is closed when the relay is in its operate condition and which is open when the relay is in its release condition [IEV 444-04-17]

2.4.2 **break contact**: contact which is open when the relay is in its operate condition and which is closed when the relay is in its release condition [IEV 444-04-18]

2.4.3 **change-over contact**: combination of two contact circuits with three contact members, one of which is common to the two contact circuits; such that when one of these contact circuits is open, the other is closed [IEV 444-04-19]

2.4.4 **change-over make-before-break contact**: change-over contactin which the make contact circuit closes before the break contact circuit opens [IEV 444-04-20]

2.4.5 **change-over break-before-make contact**: change-over contactin which the break contact circuit opens before the make contact circuit closes [IEV 444-04-21]

2.5 *Prefixes for the values applicable to relays*

Values may be defined as rated, actual ("just"), test ("must") or characteristic value and identified as such by using one of these words as a prefix. The prefixes are also applicable to timing values.

2.5.1 **rated value**: value of a quantity used for specification purposes, established for a specified set of operating conditions of a relay [IEV 444-02-18 modified]

2.5.2 **actual ("just") value**: value of a quantity determined by measurement on a specific relay, during performance of a specified function [IEV 444-02-21]

2.5.3 **test ("must") value**: value of a quantity for which the relay shall comply with a specified action during a test [IEV 444-02-20]

2.5.4 **characteristic value**: value of a quantity with which, in the initial condition of arelay or for a specified number of cycles as specified, the relay shall comply with a specified requirement [IEV 444-02-19]

2.6 *Energization values*

2.6.1 **energizing quantity**: electrical quantity which, when applied to the coil(s) of a relay under specified conditions, enables it to fulfil its purpose [IEV 444-03-01 modified]

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

2.6.2 coil voltage: voltage applied as an energizing quantity [IEV 444-03-03]

2.6.3 operative range: range of values of coil voltage for which a relay is able to perform its specified function [IEV 444-03-05 modified]

NOTE – For the following terms, refer also to figures 1 to 5 which show the sequential functions of relays covered by the definitions.

2.6.4 magnetic preconditioning value: value of the coil voltage at which the relay attains a defined magnetic condition [IEV 444-03-19]

NOTES

- 1 For polarized relays, distinction is made between preconditioning in forward (operate) direction, and preconditioning in reverse direction.
- 2 For bistable relays, preconditioning may also be used to set the relay to a defined position.

2.6.5 non-operate voltage: value of the coil voltage at which a relay does not operate [IEV 444-03-07 modified]

2.6.6 operate voltage, set voltage (for bistable relays only): value of the coil voltage at which a relay operates [IEV 444-03-06 modified]

2.6.7 non-release voltage: value of the coil voltage at which a monostable relay does not release [IEV 444-03-09 modified]

2.6.8 release voltage: value of the coil voltage at which a monostable relay releases [IEV 444-03-08 modified]

2.6.9 non-reset voltage: value of the coil voltage at which a bistable relay does not reset [IEV 444-03-11 modified]

2.6.10 reset voltage: value of the coil voltage at which a bistable relay resets [IEV 444-03-10 modified]

2.6.11 revert voltage: for a specific type of polarized relay, value of the coil voltage greater than and with the same polarity as the operate voltage, at which the relay reverts [IEV 444-03-12 modified]

2.6.12 non-revert voltage: for a specific type of polarized relay, value of the coil voltage greater than and with the same polarity as the operate voltage, at which the relay does not revert [IEV 444-03-13 modified]

2.6.13 revert reverse voltage: for a specific type of polarized bistable relay, value of the coil voltage greater than and with the same polarity as the reset voltage, at which the relay reverts reverse [IEV 444-03-14 modified]

2.6.14 non-revert reverse voltage: for a specific type of polarized bistable relay, value of the coil voltage greater than and with the same polarity as the reset voltage, at which the relay does not revert reverse [IEV 444-03-15 modified]

2.6.15 reverse polarity voltage: for a polarized monostable relay, value of the coil voltage of reverse polarity at which the relay does not operate [IEV 444-03-16 modified]

2.6.16 active power: under periodic conditions, mean value, taken over one period T , of the instantaneous power p :

$$P = 1/T \int_0^T p \, dt$$

NOTE 1 – Under sinusoidal conditions, the active power is the real part of the complex power.

NOTE 2 – The SI unit for active power is the watt. [IEV 131-11-42]

2.6.17 apparent power: product of the rms voltage U between the terminals of a two-terminal element or two-terminal circuit and the rms electric current I in the element or circuit:

$$S = UI$$

NOTE 1 – Under sinusoidal conditions, the apparent power is the modulus of the complex power.

NOTE 2 – The SI unit for apparent power is the voltampere. [IEV 131-11-41]

2.7 Electrical properties of contacts

2.7.1 contact current: electric current which a relay contact carries before opening or after closing [IEV 444-04-26]

2.7.2 switching current: electric current which a relay contact makes and/or breaks [IEV 444-04-27]

2.7.3 switching voltage: voltage between the contact members before closing or after opening of a relay contact [IEV 444-04-25 modified]

2.7.4 limiting continuous current: greatest value of electric current which a closed contact is capable of carrying continuously under specified conditions [IEV 444-04-28 modified]

2.7.5 contact noise: spurious voltage which appears across the terminals of a closed contact [IEV 444-04-33]

2.8 Contact load categories

2.8.1 contact load category 0 (CC 0): load characterized by a maximum switching voltage of 30 mV and a maximum switching current of 10 mA

2.8.2 contact load category 1 (CC 1): low load without contact arcing

NOTE – Arcing with a duration of up to 1 ms is disregarded.

2.8.3 contact load category 2 (CC 2): high load where contact arcing can occur

2.9 Mechanical properties of contacts

2.9.1 contact tip; contact point: part of a contact member at which the contact circuit opens or closes [IEV 444-04-06]

2.9.2 contact gap: gap between the contact tips (points) when the contact circuit is open [IEV 444-04-09 modified]

2.9.3 contact force: force which two contact members exert against each other at their contact tips (points) in the closed position [IEV 444-04-10 modified]

2.9.4 contact member: conductive part designed to co-act with another to close or open the contact [IEV 444-04-05 modified]

2.10 Terms relating to times

2.10.1 operate time: time interval between the application of the specified coil voltage to a relay in the release condition and the change of state of the last contact circuit, bounce time not included [IEV 444-05-01 modified]

NOTE - The operate time covers the closing time of a make contact, and the opening time of a break contact.

2.10.2 release time: time interval between the removal of the specified coil voltage from a monostable relay in the operate condition and the change of state of the last contact circuit, bounce time not included [IEV 444-05-02 modified]

NOTE - The release time covers the opening time of a make contact and the closing time of a break contact.

2.10.3 reset time: time interval between the application of the specified coil voltage to a bistable relay in the operate condition and the change of state of the last contact circuit, bounce time not included [IEV 444-05-03 modified]

NOTE - The reset time covers the opening time of a make contact and the closing time of a break contact.

2.10.4 bounce time: for a contact which is closing/opening its circuit, time interval between the instant when the contact circuit first closes/opens and the instant when the circuit is finally closed/opened [IEV 444-05-04]

2.10.5 transfer time; transit time: for a change-over break-before-make contact, time interval during which both contact circuits are open. [IEV 444-05-06]

2.10.6 bridging time: for a change-over make-before-break contact, the time interval during which both contact circuits are closed. [IEV 444-05-05]

2.10.7 stabilization time: time interval between the instant when a specified coil voltage is applied and the instant when the last contact circuit is closed/opened and fulfils the specified requirements, bounce time included [IEV 444-05-07 modified]

2.10.8 minimum time of energization: minimum duration of application of the coil voltage to ensure that the relay operates or resets [IEV 444-05-08 modified]

2.10.7 contact time difference: for a relay having several contacts of the same type, difference between the maximum value of the operate (release/reset) time and the minimum value of the operate (release/reset) time

2.11 Miscellaneous terms

2.11.1 coil transient suppression device: device connected to the relay coil to limit its back electromotive force (e.m.f.) to a prescribed value

3 Test and measurement procedures

3.1 General

The test and measurement procedures specified in this part of IEC 61810 are recommended to be used for the testing of parameters given for a relay.

3.2 Deviations

Any test and measurement procedures deviating from those given in this standard may be applied but shall be indicated in the documentation of the relay.