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February 1996

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Descriptors: Electromechanical all-or-nothing relays, test and measurement procedures

English version

**Generic specification: Electromechanical all-or-nothing relays
Part 3: Test and measurement procedures**

Spécification générale: Relais
électromécaniques de tout-ou-rien
Partie 3: Méthodes d'essai et de mesure

Fachgrundspezifikation:
Elektromechanische Schaltrelais
Teil 3: Prüf- und Meßverfahren

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

FOREWORD

This European Standard was prepared by the Technical Committee CENELEC TC/CECC SC 94, Relays.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 116000-3 on 1995-11-28.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 1996-12-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 1996-12-01

In order to make it obvious that the technical contents of this Generic Specification for electromechanical all-or-nothing relays can be used not only within the CECC quality assessment system, but also for any other appropriate purpose, the definitions and the test and measurement procedures are now issued separately in this Part 3 of the Generic Specification.

For application within the CECC quality assessment system, this specification has to be used in conjunction with EN 116000-1:1996.

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1 General

1.1 Scope

This Generic Specification applies to electromechanical all-or-nothing relays.

In conjunction with EN 116000-1:1996 this specification is the basis for qualification approval within the CECC quality assessment system in accordance with CECC 00 114.

However, it is not restricted to this purpose: this specification can also be used outside the CECC quality assessment system as a general technical reference for test and measurement procedures in the field of electromechanical all-or-nothing relays.

Where in this document the term "Detail Specification" is used, this either has the meaning defined in CECC 00 114 for application within the CECC system, or it means any appropriate document, e.g. manufacturer's data sheet, Test Specification, Customer Detail Specification.

1.2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

CCITT K.17	1988	Tests on power-fed repeaters using solid-state devices in order to check the arrangements for protection from external interference (Blue book, Volume IX)		
CECC 00 114		Rule of procedure 14: Quality assessment procedures		
CECC 00 802	1994	Guidance document: CECC standard method for the specification of surface mounting components (SMDs) of assessed quality		
IEC 27-1	1992	Letter symbols to be used in electrical terminology Part 1: General		
IEC 50		International Electrotechnical Vocabulary (IEV)		
IEC 50(446)	1983	International Electrotechnical Vocabulary (IEV) Chapter 446: Electrical relays		
IEC 60-1	1989	High voltage test techniques Part 1: General definitions and test requirements	HD 588.1 S1	1991
IEC 68-1	1988	Basic environmental testing procedures Part 1: General and guidance	EN 60068-1	1994
	1992	Amendment No 1		
IEC 68-2-1	1990	Basic environmental testing procedures Part 2: Tests - Test A: Cold	EN 60068-2-1	1993
IEC 68-2-2	1974	Basic environmental testing procedures Part 2: Tests - Test B: Dry heat	EN 60068-2-2	1993
	1976	Supplement: IEC 68-2-2A		
IEC 68-2-3	1969	Basic environmental testing procedures Part 2: Tests - Test Ca: Damp heat, steady state	HD 323.2.3 S2	1987
	1984	Amendment No 1		

IEC 68-2-6	1982	Basic environmental testing procedures Part 2: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	1995
	1983	Amendment No 1		
	1985	Amendment No 2		
IEC 68-2-7	1983	Basic environmental testing procedures Part 2: Tests - Test Ga: Acceleration, steady state	EN 60068-2-7	1993
	1986	Amendment No 1		
IEC 68-2-10	1988	Basic environmental testing procedures Part 2: Tests - Test J: Mould growth	HD 323.2.10 S3	1988
IEC 68-2-11	1981	Basic environmental testing procedures Part 2: Tests - Test Ka: Salt mist	HD 323.2.11 S1	1988
IEC 68-2-13	1983	Basic environmental testing procedures Part 2: Tests - Test M: Low air pressure	HD 323.2.13 S1	1987
IEC 68-2-14	1984	Basic environmental testing procedures Part 2: Tests - Test N: Change of temperature	HD 323.2.14 S2	1987
	1986	Amendment No 1		
IEC 68-2-17	1994	Basic environmental testing procedures Part 2: Tests - Test Q: Sealing	EN 60068-2-17	1994
IEC 68-2-20	1979	Basic environmental testing procedures Part 2: Tests - Test T: Soldering	HD 323.2.20 S3	1992
	1986	Amendment No 1		
	1987	Amendment No 2		
IEC 68-2-21	1983	Basic environmental testing procedures Part 2: Tests - Test U: Robustness of terminations and integral mounting devices	HD 323.2.21 S3	1988
	1991	Amendment No 1		
	1992	Amendment No 2		
IEC 68-2-27	1987	Basic environmental testing procedures Part 2: Tests - Test Ea: Shock	EN 60068-2-27	1993
IEC 68-2-29	1987	Basic environmental testing procedures Part 2: Tests - Test Eb: Bump	EN 60068-2-29	1993
IEC 68-2-30	1980	Basic environmental testing procedures Part 2: Tests - Test Db: Damp heat, cyclic	HD 323.2.30 S3	1988
	1985	Amendment No 1		
IEC 68-2-34	1973	Basic environmental testing procedures Part 2: Tests - Test Fd: Random vibration wideband, general requirements	HD 323.2.34 S1	1988
	1983	Amendment 1		

IEC 68-2-36	1973	Basic environmental testing procedures Part 2: Tests - Test Fdb: Random vibration wideband, reproducibility medium	HD 323.2.36 S1	1988
	1983	Amendment No 1		
IEC 68-2-45	1980	Basic environmental testing procedures Part 2: Tests - Test XA: Immersion in cleaning solvents	EN 60068-2-45	1992
	1993	Amendment No 1		
IEC 255-1-00	1975	All-or-nothing electrical relays		
IEC 255-5	1977	Electrical relays Part 5: Insulation tests for electrical relays		
IEC 255-14	1981	Electrical relays Part 14: Endurance tests for electrical relay contacts Preferred values for contact loads		
IEC 255-15	1981	Electrical relays Part 15: Endurance tests for electrical relay contacts Specification for the characteristics of test equipment		
IEC 255-23	1994	Electrical relays Part 23: Contact performance of electrical relays		
IEC 433	1980	Stabilized supply apparatus for measurement		
IEC 512-7	1993	Electromechanical components for electronic equipment - Basic testing procedures and measuring methods Part 7: Mechanical operating tests and sealing tests		
IEC 617		Graphical symbols for diagrams.		
IEC 695-2-1	1991	Fire hazard testing Part 2: Test methods - Glow-wire test and guidance		
IEC 695-2-2	1991	Fire hazard testing Part 2: Test methods - Needle-flame test	HD 444.2.2 S2	1992
IEC 749	1984	Semiconductor devices. Mechanical and climatic test methods		
	1991	Amendment No 1		
	1993	Amendment No 2		
IEC 947-1	1988	Low-voltage switchgear and controlgear Part 1: General rules	EN 60947-1	1991
ISO 1000	1973	SI units and recommendations for the use of their multiples and of certain other units		
ITU-T K.20	1993	Resistibility of telecommunication switching equipment to overvoltages and overcurrents		
MIL-STD-202		Test methods for electronic and electrical component parts		

2 Definitions

For the purposes of this standard, the following definitions apply.

NOTE: For the definition of additional terms used in this standard, reference is made to IEC 50(446) and IEC 255-23.

2.1 *Types of relays*

2.1.1 electromechanical relay: An electrical relay in which the designed response is developed by the relative movement of mechanical elements under the action of a current in the input circuit(s).

2.1.2 all-or-nothing relay: An electrical relay which is intended to be energized by a quantity, whose value is either:

- higher than that at which it operates
- or lower than that at which it releases.

NOTE: The adjective "all-or-nothing" can be deleted when no ambiguity may occur.

2.1.3 monostable relay: An electrical relay which, having responded to an input energizing quantity and having changed its condition, returns to its previous condition when the quantity is removed.

2.1.4 bistable relay: An electrical relay which, having responded to an input 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 over.

2.1.5 polarized relay: A relay, the change of condition of which depends upon the direction of its input energizing quantity.

2.1.6 non-polarized relay: A relay, the change of condition of which does not depend upon the direction of its input energizing quantity.

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2.2 *Types of relays, based upon environmental protection* (Relay Technology: RT)

2.2.1 RT 0: Unenclosed relay: A relay not provided with a protective case.

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

2.2.3 RT II: Flux proof relay: A 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: A 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: A relay provided with a case which has no venting to the outside atmosphere, and having a time constant better than 2×10^4 s according to IEC 68-2-17.

2.2.6 RT V: Hermetically sealed relay: A sealed relay having an enhanced level of sealing, assuring time constant better than 2×10^6 s according to IEC 68-2-17.

2.3 *Functions of a relay*

2.3.1 release condition: For a monostable relay, the specified condition of the relay when it is not energized. For a bistable relay, a specified condition, as declared by the manufacturer.

2.3.2 operate condition: For a monostable relay, the specified condition of the relay when it is energized in a specified manner. For a bistable relay, the condition other than the release condition as declared by the manufacturer.

2.3.3 to operate: A relay operates when it changes from its release condition to its operate condition.

2.3.4 to release: A relay releases when it changes from its operate condition to its release condition.

2.3.5 to change over: A relay changes over when it operates or releases.

2.3.6 to cycle: A relay cycles when it operates and then releases, or vice versa.

2.3.7 to revert: For a certain type of polarized (d.c.) relay being in an operate condition, to change from this condition to the release condition by increasing the value of the energizing quantity.

2.3.8 to revert reverse: For a certain type of polarized (d.c.) relay being in a release condition by an appropriate energization, to change from this condition to the operate condition by increasing the value of this energizing quantity.

2.4 *Types of contacts*

2.4.1 make contact: A contact which is closed when the relay is in its operate condition and which is opened when the relay is in its release condition.

2.4.2 break contact: A contact which is opened when the relay is in its operate condition and which is closed when the relay is in its release condition.

2.4.3 change-over contact: A combination of two contact circuits including three contact members, one of them being common to the two contact circuits. When one of these contact circuits is open, the other is closed and vice versa.

2.4.4 change-over make-before-break contact: A change-over contact, one contact circuit of which makes before the other breaks.

2.4.5 change-over break-before-make contact: A change-over contact, one contact circuit of which breaks before the other makes.

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 assigned, generally by a manufacturer, for a specified operating condition of a relay.

2.5.2 actual ("just") value: Value of a quantity determined by measurement on a single relay, when it just performs a specified function.

2.5.3 test ("must") value: Value of a quantity with which, during tests, the relay is required to perform or not to perform a specified function.

2.5.4 characteristic value: Value of a quantity with which, throughout its lifetime or a specified number of cycles, the relay is required to comply with a specified requirement.

2.6 Energization values

2.6.1 energizing quantity: An electrical quantity (either current or voltage or power) which alone, or in combination with other such quantities applied to a relay under specified conditions, enables it to fulfil its purpose.

2.6.2 rated value of an energizing quantity: Value of an energizing quantity which is assigned either by the standard or the manufacturer, for a specified condition..

2.6.3 actual ("just") value of an energizing quantity: Value of an energizing quantity determined by measurement on a single relay, when it just performs a specified function.

2.6.4 test ("must") value of an energizing quantity: Value of an energizing quantity at which, during tests, the relay is required to perform or not to perform a specified function.

2.6.5 characteristic value of an energizing quantity: Value of an energizing quantity at which, throughout its lifetime or a specified number of cycles, the relay is required to comply with a specified requirement.

2.6.6 operative range of an energizing quantity: The range of values of an energizing quantity for which the relay under specified conditions is able to perform its intended function(s) according to the specified requirements.

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

2.6.7 magnetic preconditioning value: Value of the energizing quantity at which the relay attains a defined magnetic condition. (standards.iteh.ai)

NOTE 1: For polarized relays, distinction is made between preconditioning in forward (operate) direction, and preconditioning in reverse direction.

NOTE 2: For bistable relays, preconditioning may also be used to set the relay to a defined position.

2.6.8 non-operate value: Value of the energizing quantity at which a relay does not operate.

2.6.9 operate value: Value of the energizing quantity at which a relay operates.

2.6.10 non-release value: Value of the energizing quantity at which a relay does not release.

2.6.11 release value: Value of the energizing quantity at which a relay releases.

2.6.12 non-revert value: For a certain type of polarized (d.c.) relay, the value of the energizing quantity at which the relay, being in an operate condition, does not release by increasing the value of this energizing quantity.

2.6.13 non-revert-reverse value: For a certain type of polarized (d.c.) relay, the value of the energizing quantity at which the relay, being in a release condition, does not operate by increasing the value of this energizing quantity.

2.6.14 reverse polarity value: Value of the energizing quantity of reverse polarity at which a polarized monostable relay does not operate.

2.7 *Electrical properties of contacts*

- 2.7.1 contact current:** The current which a relay contact carries before opening or after closing.
- 2.7.2 contact voltage:** The voltage between the contact members before closing or after opening.
- 2.7.3 limiting continuous current:** The highest value of the current (r.m.s. if a.c.), which a previously closed contact circuit is capable of carrying continuously.
- 2.7.4 contact noise:** The spurious voltage which appears across the terminals of a closed contact.

2.8 *Categories of application of contacts*

- 2.8.1 contact application 0 (CA 0):** A contact characterized by a maximum contact voltage of 30 mV, and a maximum contact current of 10 mA.
- 2.8.2 contact application 1 (CA 1):** A contact characterized by a contact voltage between 30 mV and 60 V, and a contact current between 10 mA and 0,1 A.
- 2.8.3 contact application 2 (CA 2):** A contact characterized by a contact voltage between 5 V and 250 V, and a contact current between 0,1 A and 1 A.
- 2.8.4 contact application 3 (CA 3):** A contact characterized by a contact voltage between 5 V and 600 V, and a contact current between 0,1 A and 100 A.
- 2.8.5 contact application 4 (CA 4):** A contact characterized by a contact voltage between 30 mV and 270 V, and a contact current between 5 A and 25 A (see note 2).
- 2.8.6 contact application 5 (CA 5):** A contact characterized by a contact voltage between 5 V and 270 V, and a contact current between 25 A and 1000 A (see note 2).

NOTE 1: A contact may be used in more than one category of application with intermediate values which shall be stated in the Detail Specification. <https://standards.globalspec.com/stden/61691/sist/a4512d3d-9d90-4a89-a0b2-bb0403927c0a/sist-en-116000-3-2001>

NOTE 2: The use of CA 4 and CA 5 is deprecated for use in future documents, as they can be replaced in most cases by an appropriate combination of CA 1, CA 2 and CA 3.

2.9 *Mechanical properties of contacts*

- 2.9.1 contact tip; contact point:** A conductive part of a contact member designed to co-act with another to close the contact circuit.
- 2.9.2 contact gap:** The gap between the contact tips (points) under specified conditions when the contact circuit is open.
- 2.9.3 contact force:** The force which two contact tips (points) exert against each other in the closed position under specified conditions.

2.10 *Terms relating to times*

The operate time, release time, transfer time and bridging time, as defined hereunder, do not include bounce times.

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

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

2.10.1 operate time: For a relay which is in the release condition the time interval between the instant a specified value of the input energizing value is applied and the first closing (or opening) of the contact circuit.

NOTE: When the relay has several output circuits, the timing should be taken for the last to break and/or last to make, unless otherwise specified.

2.10.2 release time: For a relay which is in the operate condition the time interval between the instant a specified value of the input energizing value is removed and the first opening (or closing) of the contact circuit.

NOTE: When the relay has several output circuits, the timing should be taken for the last to break and/or last to make, unless otherwise specified.

2.10.3 transfer time: For a break-before-make change-over contact, the time interval during which both contact circuits are open.

2.10.4 bridging time: For a make-before-break change-over contact, the time interval during which both contact circuits are closed.

2.10.5 bounce time: For a contact which is closing (opening) its circuit, the time interval between the instant when the contact circuit first closes (opens) and the instant when the circuit is finally closed (opened).

2.10.6 time to stable closed (open) condition; stabilization time: The time interval between the instant when a specified value of the input energizing quantity is applied and the instant when a contact is closed (open) and fulfils specified requirements.

2.10.7 minimum time of operate energization: Minimum duration of application of rated operate value required to ensure that the contact circuit fulfils specified requirements.

2.10.8 contact time difference: For a relay having several contacts of the same type, the difference between the maximum value of the operate (release) time and the minimum value of the operate (release) time.

2.11 coil transient suppression device: A device connected to the relay coil to limit its back e.m.f. to a prescribed value.

3 Test and measurement procedures

NOTE: National Committees may insert in their prefatory material accompanying the international text a warning for dangers which might occur during tests, as required by national legislation.

3.1 General

Specifications (e.g. Sectional or Blank Detail Specifications) for quality assessment purposes shall contain tables showing the tests to be made, which measurements are to be made before and after each test or subgroup of tests, and the sequence in which they shall be carried out.

3.2 Alternative test methods

Measurements shall preferably be carried out by using the methods specified. Any other method giving equivalent results may be used except in case of dispute.

NOTE: By "equivalent" is meant that the value of the characteristic established by such other method falls within the specified limits when measured by the specified method.

3.3 Precision of measurement

The limits quoted in Detail Specifications are true values. Measurement inaccuracies shall be taken into account when evaluating the results. Usual precautions should be taken to reduce measurement errors to a minimum.

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3.4 Requirements in Detail Specifications

If the requirements of this specification are not entirely suitable (either for technical reasons or because of a special application), the Detail Specification shall set out clearly the revised requirements.

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3.5 Standard conditions for testing

3.5.1 Unless otherwise specified, all tests shall be carried out under the standard atmospheric conditions for testing as specified in 5.3 of IEC 68-1, i.e.:

Temperature	15 °C	to	35 °C
Relative humidity	25 %	to	75 %
Air pressure	86 kPa	to	106 kPa
	(860 mbar to		1060 mbar)

In case of dispute, the referee conditions are:

Temperature	(23 ± 1) °C
Relative humidity	(50 ± 2) %
Air pressure	(96 ± 10) kPa
	(960 ± 100) mbar

unless otherwise specified (values chosen from 5.2 of IEC 68-1).

Before testing, the relays shall be subjected to the standard atmospheric conditions for a time sufficient to allow them to reach thermal equilibrium.