INTERNATIONAL STANDARD

IEC 61811-51

QC 160501

Second edition
2002-03

Electromechanical all-or-nothing relays –

Part 51:
Blank detail specification – Electromechanical all-or-nothing telecom relays of assessed quality – Non-standardized types and construction

Relais électromécaniques de tout-ou-rien –

Partie 51:
Spécification particulière cadre – Relais électromécaniques de tout-ou-rien télécom soumis au régime d'assurance de la qualité – Types et construction non normalisés

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTROMECHANICAL ALL-OR-NOTHING RELAYS –

Part 51: Blank detail specification – Electromechanical all-or-nothing telecom relays of assessed quality – Non-standardized types and construction

FOREWORD

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International Standard IEC 61811-51 has been prepared by IEC technical committee 94: All-or-nothing electrical relays.

This second edition of IEC 61811-51 cancels and replaces the first edition published in 1997 and constitutes a technical revision.

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

FDIS	Report on voting
94/145/FDIS	94/159/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 QC number that appears on the front cover of this publication is the specification number in the IEC Quality Assessment System for Electronic Components (IECQ).

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

The committee has decided that the contents of this publication will remain unchanged until 2007. At this date, the publication will be

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- withdrawn;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

ELECTROMECHANICAL ALL-OR-NOTHING RELAYS –

Part 51: Blank detail specification – Electromechanical all-or-nothing telecom relays of assessed quality – Non-standardized types and construction

1 General

1.1 Scope

This part of IEC 61811 is a blank detail specification applicable to electromechanical all-or-nothing telecom relays of assessed quality. Relays according to this standard are provided for operation in telecommunication applications. However, as electromechanical all-or-nothing relays, they are also suitable for particular industrial and other applications.

This standard selects from IEC 61810-7 and other sources the appropriate methods of test to be used in detail specifications derived from this specification, and contains basic test schedules to be used in the preparation of such specifications in accordance with IEC 61811-1.

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 60068-1:1988, *Environmental testing – Part 1: General and guidance*
Amendment 1 (1992)

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 60068-2-47:1999, *Environmental testing – Part 2-47: Test methods – Mounting of components, equipment and other articles for vibration, impact and similar dynamic tests*

IEC 60255-14:1981, *Electrical relays – Part 14: Endurance test for electrical relay contacts – Preferred values for contact loads*

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

IEC 61709:1996, *Electronic components – Reliability – Reference conditions for failure rates and stress models for conversion*

IEC 61810-7:1997, *Electromechanical all-or-nothing relays – Part 7: Test and measurement procedures*

IEC 61811-1:1999, *Electromechanical non-specified time all-or-nothing relays of assessed quality – Part 1: Generic specification*

IEC 61811-50:2002, *Electromechanical all-or-nothing relays – Part 50: Sectional specification – Electromechanical all-or-nothing telecom relays of assessed quality*

QC 001002-2:1998, *Rules of Procedure for the IEC Quality Assessment System for Electronic Components (IECQ) – Part 2: Documentation*

QC 001002-3:1998, *Rules of Procedure for the IEC Quality Assessment System for Electronic Components (IECQ) – Part 3: Approval Procedures*

QC 001005:2000, *Register of Firms, Products and Services approved under the IECQ System, including ISO 9000*

(National authorized institutions will complete this clause by making reference to any documents or specifications directly referred to in their national equivalent of this standard.)

1.3 Front page of the detail specification

The layout of the front page of the detail specification is as follows.

<table>
<tr><td>(1)</td><td>QC xxxxxx
Edition: 200X
Page 1 of x (2)</td></tr>
<tr><td>Electronic components of assessed quality in accordance with: (3)

IEC 61810-7:1997
IEC 61811-50:2002</td><td>(4)</td></tr>
<tr><td colspan="2">Detail specification for electromechanical all-or-nothing telecom relays of assessed quality

Type: (5)
Construction: (6)</td></tr>
<tr><td>Outline drawing and wiring diagram (7)

Dimensions in millimetres</td><td>Application: (8)</td></tr>
<tr><td colspan="2">Coil data (9)
Rated voltages: … V d.c.
Rated power: … mW</td></tr>
<tr><td colspan="2">Contact data (10)
Number(s) and type(s) of contacts
Rated contact voltage:
Rated contact current:
Rated contact power:</td></tr>
<tr><td colspan="2">Component climatic category according to IEC 60068-1: (11)
Temperature range – operating ambient temperature: …°C to …°C
– storage temperature: …°C to …°C</td></tr>
<tr><td colspan="2">Information about manufacturers who have components qualified according to this detail specification is available in the current QC 001005.</td></tr>
</table>

Key to front page:

The numbers between brackets on the front page correspond to the following indications which should be given.

Identification of the detail specification

(1) The name of the national standards organization under whose authority the detail specification is published and, if applicable, the organization from whom the detail specification is available.

(2) The IECQ symbol and the number allotted to the completed detail specification by the IECQ secretariat.

(3) The number and the year of availability of the IEC standard concerning test and measurement procedures for electromechanical all-or-nothing relays and/or sectional specification; also national reference, if different.

(4) If different from the IECQ number, the national number of the detail specification, date of issue and any further information required by the national system, together with any amendment numbers.

Identification of the relay

(5) Type: monostable or bistable, non-polarized or polarized, number and types of contacts.

(6) Construction: sizes, for example dual-in-line, base and overall height, type of relay, based upon environmental protection (RT I to RT IV), mounting variants and other typical construction details.

(7) An outline drawing with main dimensions which are of importance for interchangeability, and/or reference to the appropriate national or international document for outlines. Alternatively, this drawing may be given in an annex to the detail specification, but (7) should always contain an illustration of the general outer appearance of the component.

(8) Typical field of applications.

(9) Available rated coil voltages and rated power.

(10) Available contact arrangements, defined special contact materials and contact voltage, current and power. The respective code digit for contact materials shall be listed in an annex, if applicable.

(11) Component climatic category according to clause 8 and annex A of IEC 60068-1, and temperature range.

2 Characteristic values of the relay

2.1 General data

– Thermal resistance: max. … K/W

– Contact application: CA 0, CA 1, CA 2 and CA 3

– Relay mass: max. … g

– Finish of the terminals: presoldering; admissible non-presoldered part, for example max. distance to the relay body, if applicable

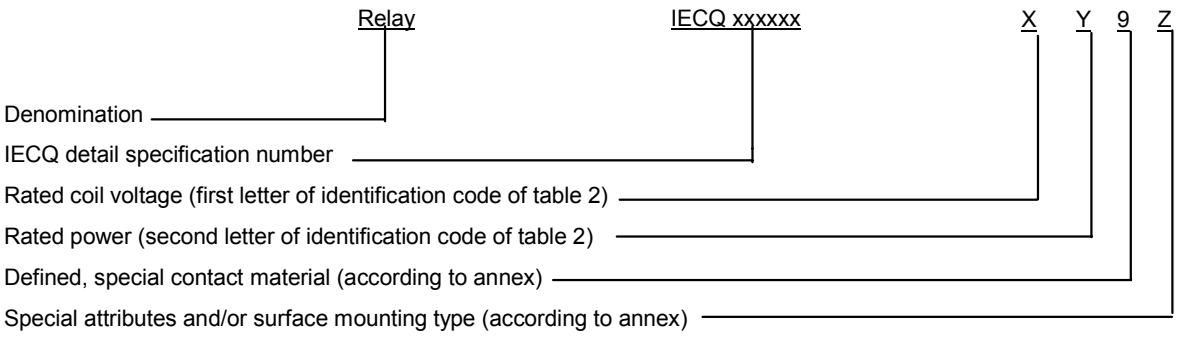
– Insulation resistance: … MΩ min. at 500 V d.c. initial value

– Dielectric strength: see table 1

Table 1 – Dielectric test voltages

	Dielectric test V a.c. min.	**Impulse voltage test** 10/700 µs and/or 1,2/50µs V min.
Opened contact circuits		
Between separate contact circuits		
Coil to contact circuits		
All parts to case		

2.2 Construction of IECQ type designation (ordering information)



The coding of the monostable or bistable relay type shall be combined with the rated power of the coil, if applicable. The reference to the number and types of contacts shall be given on the front page of the specification.

Use code 0 as the last digit if no special attributes apply. If one of the attributes in the example for a detail specification shall not be considered, the corresponding code number or letter shall be deleted; there shall be no special marks or open space for non-applicable attributes (see also 2.5).

The manufacturer may use his own numbering system, provided that a conversion list with the IECQ type designations and the manufacturer's part numbers is given in an annex to the detail specification.

2.3 Coil data

Table 2 – Coil data

Identification code	**Rated voltage** V	**Coil resistance at (23 ± 2) °C** Ω ± 10 %	**Must operate voltage V at coil temperature of**			**Maximum coil voltage V at coil temperature of**	**Must not release voltage V at coil temperature of**	**Must release voltage V at coil temperature of**			**Rated power** mW
			°C	23 °C	°C	°C	23 °C	°C	23 °C	°C	

2.4 Contact data

2.4.1 Electrical endurance and switching frequency

Contact failure: contact-circuit resistance of a closed contact higher than the value stated in 2.4.2, or resistance of an open contact-circuit lower than 100 kΩ, both more than once per 10^6 cycles or for the minimum number of switching cycles stated (if lower than 10^6), calculated for each single contact.

Example: at a given endurance of 10^7 operations, the total number of faults, as described above, shall not exceed 10.

Table 3 – Loads, contact-circuit resistance limits, switching cycles and frequencies for electrical endurance and overload tests

Loads	Contact-circuit resistance Ω max.	Number of switching cycles min.	Switching frequencies cycles per s max.
Contact application 0			
Resistive max. contact voltage/max. power			
Resistive max. contact current/max. power			
DC open-ended cable			
Overload			

2.4.2 Static contact-circuit resistance

100 mΩ max. initial condition at rated voltage;

10 mΩ max. difference of contact-circuit resistance at other coil voltages (e.g. at must operate voltage for make contacts), initial value;

1 Ω max. during/after electrical endurance and environmental tests at rated voltage.

2.4.3 Mechanical endurance

Min. … switching cycles.

2.4.4 Timing (without suppression device)

– Operate time: max. …ms

– Release time: max. …ms

– Bounce time when the contacts are closing: max. …ms

– Bounce time when the contacts are opening: max. …ms

– Transfer time on operation and release (last break contact opens before first make contact closes respectively last make contact opens before first break contact closes – each contact monitored) or bridging time on operation and release (last make contact closes before first break contact opens respectively last break contact closes before first make contact opens – each contact monitored): min. …ms

2.5 Mounting

The relay terminals are designed to be directly soldered onto the printed circuit board using conventional assembling techniques or for surface mounting technology (if applicable).

2.6 Environmental data

The relays shall withstand at least the following environmental stresses:

– shock, functional: …m/s^2 (*g*) half-sine acceleration, …ms duration;

– shock, survival: …m/s^2 (*g*) half-sine acceleration, …ms duration;

– vibration (sinusoidal): …amplitude mm or …m/s^2 (*g*), to …Hz;

– mechanical robustness of terminals
  - thrust: …N;
  - bending: …bends;

– soldering:
  - if particular ageing is required, this shall be selected from procedures 1a, 1b, 2 or 3 of 4.2 of IEC 60068-2-20 and stated in the detail specification;
  - solderability at 235 °C: 2 s;
  - resistance to soldering heat, terminal immersion time at 260 °C: 5 s or 10 s;

– enclosure (if relevant): leak rate: max. 100 Pa · cm^3/s;

– resistance to cleaning solvents when rubbed with tissue paper: demineralized or distilled water at 55 °C: 5 min;

– fire hazard, needle flame: min. …s;

– acoustic noise level (optional requirement shall be stated in detail specification): max. …dB.

2.7 Package of relays for automatic handling (if applicable)

If stick magazines or tape and reel packaging for automatic handling (to facilitate automatic relay insertion) are used, their outline drawing (profile and length), storage capacity and possible marking shall be given in an annex.

3 Qualification approval procedures

– As stated in 3.1.4 a) of QC 001002-3, fixed sample.

– Sampling and test schedule are specified in table 5.

– The tests specified and their order are mandatory.

4 Quality conformance inspection

Quality conformance inspection contains the tests stated in table 4:

– groups A and B: lot-by-lot tests;

– group C: periodic tests.

Unless otherwise stated in this blank detail specification, all tests of table 4 are mandatory. Where a subgroup contains cumulative tests, the order of the tests is mandatory. Specimens subjected to tests denoted as destructive (D) shall not be released for delivery.

NOTE If a special level of AQL is required, the AQL value regarding subgroups A4, B1 and B2 in table 4 should be provided between the manufacturer and user of a relay.

4.1 Formation of inspection lots

According to 3.2.3 of QC 001002-3, the basis for determination of sample size for the quality conformance inspection is the relay quantity produced during one week.

4.2 Intervals between tests

– Subgroups A4, B1 and B2: minimum once a week.
– Subgroups C1 and C2: at least once a year.
– Subgroups C4 to C6: at least once every two years.

5 Marking and documentation

Relays and their package shall be marked as follows.

5.1 Marking of the relay

The marking shall be durable and easily legible, the following items shall be present:

a) manufacturer's name, logo or trade mark;
b) relay type and variant code;
c) coded date of manufacture, in terms of year/week according to 1.5.3 of IEC 61811-50;
d) IECQ in letters or IECQ mark of conformity;
e) IECQ type designation (ordering information), if not implicit in b), see also 2.2;
f) identification of terminal No. 1.

NOTE IECQ type designation in item e) may be omitted in an unavoidable case.

5.2 Marking of the package

a) Manufacturer's name, logo or trade mark.
b) Relay type and variant code.
c) Manufacture’s batch identification code.
d) IECQ in letters or IECQ mark of conformity;
e) IECQ type designation(ordering information), if not implicit in b), see also 2.2;
f) Detail specification reference if not marked on the relay.
g) Quantity.

NOTE IECQ type designation in item e) may be omitted in an unavoidable case.

5.3 Documentation

For each delivery, a declaration of conformity according to 2.4 of QC 001002-2 shall be added.

6 Annexes

Annexes may be added if necessary, for example to show more details on relay mounting, terminal dimensions, etc.

7 Tests

7.1 Standard conditions for testing

If not otherwise stated, all tests shall be performed under standard conditions for testing according to 3.5 of IEC 61810-7.

7.2 Mounting of test specimens during the test

The following indications shall apply for mechanical dynamic tests (shock and vibration). The relay shall be mounted by its normal mounting method to the test fixture where inherent resonances have been minimized so as not to invalidate the test (see also IEC 60068-2-47).

7.3 General conditions for testing

Unless otherwise stated, the rated coil voltage specified in table 2 and its suitable polarity (if applicable) shall be used for all tests and its application to the relay.

8 Ordering information

See 2.2.

9 Relay reliability – failure rate data (optional)

The evaluation and indication of reliability data is not mandatory.

However, if required in a detail specification, this optional clause shall refer to, and be in line with, clause 5 of IEC 61811-50 and give a concise description of the methods and the set of parameters applied. Details shall be given in an appropriate annex to the detail specification, preferably based upon the provisions of IEC 61709 as indicated in annex A of IEC 61811-50.

Table 4 – Quality conformance inspection

Group A
Subgroup A0

For all tests in this subgroup: 100 % test. Discard all failed relays. Tests in this subgroup shall be carried out as a screening or sorting function, possibly on-line, prior to the formation of lots from which samples for the other subgroups are taken. The lot shall be rejected in case of a failure rate of more than 10 % cumulative.

Test No.	Test	Test conditions according to IEC 61810-7	Performance requirements
A0 – 1	Coil resistance (ND)	Subclause 3.8.1	Values according to table 2
A0 – 2	Dielectric test (ND)	Subclause 3.9 Application points and test voltage: according to 2.1, table 1 of this specification Duration of test: 1 s NOTE A shorter test with a higher voltage can be stated in the detail specification if its equivalence is proved by the manufacturer.	No breakdown or flashover Maximum leakage current 1 mA
A0 – 3	Contact-circuit resistance, static (ND)	Subclause 3.12 Application points: terminals of all closed contacts Test voltage max.: 30 mV d.c. or a.c. Test current max.: 10 mA	Initial value according to 2.4.2 for each contact closing
A0 – 4	Functional tests (ND)	Subclause 3.13 Order of steps for monostable non-polarized relays: 1) 1,5 × rated voltage for conditioning 2) zero voltage 3) must operate voltage 4) rated voltage 5) must not release voltage 6) must release voltage Order of steps for other relay types: analogous according to figures 2 to 5 One cycle Contact voltage: max. 6 V Mounting: optional	Values according to table 2 Checking the relay function by monitoring the contacts
A0 – 5	Timing tests (ND)	Subclause 3.14 Coil voltage: rated voltage Application points: all contacts Contact voltage: max. 6 V Mounting: optional	Values according to 2.4.4 Checking of contact sequencing by measuring the transfer/bridging time (see 4.4, note 4 of IEC 61811-50)
A0 – 6 R	Sealing (ND)	Subclause 3.20.2 Procedure 1, 2 or 4 for RT III and RT IV	Value according to 2.6
A0 – 33 R	Acoustic noise (ND)	Subclause 3.44, method 1 Suppression diode, microphone distance, measuring dynamic characteristics and other conditions, if required, shall be stated in the detail specification	Value according to 2.6
R recommended test.			

Table 4 (*continued*)

Subgroup A4 (period: inspection lot refers to the production volume of one week)

Test No.	Test	Test conditions according to IEC 61810-7	IL	AQL	Performance requirements
1	Visual inspection – relay marking (ND)	Subclause 3.6.4, items a) and b)			Marking as specified in 5.1
2	Coil resistance (ND)	Subclause 3.8.1			Values according to table 2
3	Contact-circuit resistance, static (ND)	Subclause 3.12 Application points: terminals of all closed contacts Test voltage max.: 30 mV d.c. or a.c. Test current max.: 10 mA			Initial value and the difference according to 2.4.2 for each contact closing
4	Functional tests (ND)	Subclause 3.13 Order of steps for monostable non-polarized relays: 1) 1,5 × rated voltage for conditioning 2) zero voltage 3) must operate voltage 4) rated voltage 5) must not release voltage 6) must release voltage Order of steps for other relay types: analogous according to figures 2 to 5 One cycle Contact voltage: max. 6 V Mounting: optional	S4	1,0	Values according to table 2 Checking the relay function by monitoring the contacts
5	Timing tests (ND)	Subclause 3.14 Coil voltage: rated voltage Application points: all contacts Contact voltage: max. 6 V Mounting: optional			Values according to 2.4.4 Checking of contact sequencing by measuring the transfer/bridging time (see 4.4, note 4 of IEC 61811-50)
6	Sealing (ND)	Subclause 3.20.2 Procedure 1, 2 or 4 for RT III and RT IV			Value according to 2.6
33 R	Acoustic noise (ND)	Subclause 3.44, method 1 Suppression diode, microphone distance, measuring dynamic characteristics and other conditions, if required, shall be stated in the detail specification			Value according to 2.6
R recommended test.					

Group B

Subgroup B1 (period: inspection lot refers to the production volume of one week)

Test No.	Test	Test conditions according to IEC 61810-7	IL	AQL	Performance requirements
7	Visual inspection – other than marking, check of outside key dimensions (ND)	Subclauses 3.6.1 and 3.6.4, items c) and d) – correct housing – terminals – dimensions	S3	2,5	Dimensions according to outline drawing on front page

Table 4 (*continued*)

Subgroup B2 (period: inspection lot refers to the production volume of one week)

Test No.	Test	Test conditions according to IEC 61810-7	IL	AQL	Performance requirements
8 M*	Solderability (D)	Subclause 3.25, test 1 Ageing, if applicable – see 2.6 of this specification Test method 1 (test Ta, method 1) Number of terminals to be tested: all	S3	2,5	
M* mandatory if not tested in C1.					

Group C

Subgroup C1 (period: one year)

Test No.	Test	Test conditions according to IEC 61810-7	Sample size	Acceptable number of defectives	Performance requirements
34 R	Magnetic interference (ND)	Subclause 3.37, method 1, 2 or 3 If required, test conditions shall be stated in detail specification	20	0	Failure criteria according to the detail specification
8 a M**	Solderability (D)	Subclause 3.25, test 1 Ageing, if applicable – see 2.6 of this specification Test method 1 (test Ta, method 1) Number of terminals to be tested: all	10	0	
9	Electrical endurance, cable load (D)	Subclause 3.30.3, method 1 Contact load: open-end cable, 10 m telephony cable n × 4 × 0,6 mm, one wire connected to the contact tested and the other three wires to ground, 48 V d.c. according to 4.5 of IEC 60255-14 Number of contacts loaded/tested: two contact circuits or one change-over contact respectively Coil voltage: rated voltage Number of cycles per s: Duty factor: 1:1 Ambient temperature: °C Test contact voltage: max. 6 V Test contact current: max. 10 mA	20	0	Number of cycles according to table 3 Contact failure according to 2.4.1
R recommended test. M** mandatory for relays manufactured with automatic facilities only, if not tested in subgroup B2 and if stated in the detail specification.					

Table 4 (*continued*)

Subgroup C1 (*concluded*)

Test No.	Test	Test conditions according to IEC 61810-7	Sample size	Acceptable number of defectives	Performance requirements
9	Electrical endurance, cable load (D) (*continued*)	Final measurements: Test 3 – contact-circuit resistance Test 4 – functional tests Test 5 – timing tests Test 13 – insulation resistance			 Value according to 2.4.2 Values according to table 2 Checking the relay function by monitoring the contacts Values according to 2.4.4 Value according to 2.1
10	Electrical endurance, contact application 0 (D)	Subclause 3.30.4 Number of contacts loaded/tested: two contact circuits or one change-over contact respectively Coil voltage: rated voltage Number of cycles per s: Duty factor: 1:1 Ambient temperature: °C Test contact voltage: max. 30 mV Test contact current: max. 10 mA Final measurements: Test 3 – contact-circuit resistance Test 4 – functional tests Test 5 – timing tests Test 13 – insulation resistance	20	0	Number of cycles according to table 3 Contact failure according to 2.4.1 Value according to 2.4.2 Values according to table 2 Checking the relay function by monitoring the contacts Values according to 2.4.4 Value according to 2.1

Table 4 (*continued*)

Subgroup C2 (period: one year)

Test No.	Test	Test conditions according to IEC 61810-7	Sample size	Acceptable number of defectives	Performance requirements
33 R*	Acoustic noise (ND)	Subclause 3.44, method 1 Suppression diode, microphone distance, measuring dynamic characteristics and other conditions, if required, shall be stated in the detail specification	10	0	Value according to 2.6
11	Dielectric test (ND)	Subclause 3.9 Application points and test voltage: according to 2.1, table 1 of this specification Duration of test: 60 s	20	0	No breakdown or flashover Maximum leakage current: 1 mA
12	Impulse voltage test (ND)	Subclause 3.10 Application points and test voltage: according to 2.1, table 1 of this specification Consecutive pulses with the polarity reversed Frequency: 2 or 4 pulses/min Total number of pulses: 6 Final measurements: Test 3 – contact-circuit resistance Test 4 – functional tests Test 13 – insulation resistance	5	0	 Value according to 2.4.2 Values according to table 2 Checking the relay function by monitoring the contacts Value according to 2.1
13	Insulation resistance (ND)	Subclause 3.11 Application points: all terminals as specified in 3.11.2 Test voltage: according to 2.1 of this specification Duration of test: 60 s or when the steady value has been reached	20	0	Value according to 2.1
14	Sealing (ND)	Subclause 3.20.2 Procedure 1 (test Qc, method 2) for RT III and RT IV Test liquid temperature: °C Immersion time: 1 min			Failure criteria according to 3.5.5 of IEC 60068-2-17

R recommended test.
* Only if not tested in A0 or A4 respectively.

Table 4 (*continued*)

Subgroup C4 (period: two years)

Test No.	Test	Test conditions according to IEC 61810-7	Sample size	Acceptable number of defectives	Performance requirements
15	Electrical endurance, cable load, extended assessment (D)	Subclauses 3.30.6 or 3.30.3, method 1 Contact load: open-end cable, 10 m telephony cable n × 4 × 0,6 mm, one wire connected to the contact tested and the other three wires to ground, 48 V d.c. according to 4.5 of IEC 60255-14 Number of contacts loaded/tested: two contact circuits or one change-over contact respectively Coil voltage: rated voltage Number of cycles per s: Duty factor: 1:1 Ambient temperature: °C Test contact voltage: max. 6 V Test contact current: max. 10 mA Final measurements: Test 3 – contact-circuit resistance Test 4 – functional tests Test 5 – timing tests Test 13 – insulation resistance	20	0	Number of cycles according to table 3 Contact failure according to 2.4.1 Value according to 2.4.2 Values according to table 2 Checking the relay function by monitoring the contacts Values according to 2.4.4 Value according to 2.1
16	Electrical endurance, rated contact voltage resistive load (D)	Subclause 3.30.3, method 1 Contact load according to 4.1 of IEC 60255-14: V d.c./W Number of contacts loaded/tested: two contact circuits or one change-over contact respectively Coil voltage: rated voltage Number of cycles per s: Duty factor: 1:1 Ambient temperature: °C Test contact voltage: max. 6 V Test contact current: max. 10 mA Final measurements: Test 3 – contact-circuit resistance Test 4 – functional tests Test 5 – timing tests Test 13 – insulation resistance	20	0	Number of cycles according to table 3 Contact failure according to 2.4.1 Value according to 2.4.2 Values according to table 2 Checking the relay function by monitoring the contacts Values according to 2.4.4 Value according to 2.1

Table 4 (*continued*)

Subgroup C4 (*concluded*)

Test No.	Test	Test conditions according to IEC 61810-7	Sample size	Acceptable number of defectives	Performance requirements
17	Electrical endurance, rated contact current, resistive load (D)	Subclause 3.30.3, method 1 Contact load according to 4.1 of IEC 60255-14: A d.c./ W Number of contacts loaded/tested: two contact circuits or one change-over contact respectively Coil voltage: rated voltage Number of cycles per s: Duty factor: 1:1 Ambient temperature: °C Test contact voltage: max. 6 V Test contact current: max. 10 mA Final measurements: Test 3 – contact-circuit resistance Test 4 – functional tests Test 5 – timing tests Test 13 – insulation resistance	5	0	Number of cycles according to table 3 Contact failure according to 2.4.1 Value according to 2.4.2 Values according to table 2 Checking the relay function by monitoring the contacts Values according to 2.4.4 Value according to 2.1
18	Electrical endurance, contact application 0, extended assessment (D)	Subclauses 3.30.6 or 3.30.4 Number of contacts loaded/tested: two contact circuits or one change-over contact respectively Coil voltage: rated voltage Number of cycles per s: Duty factor: 1:1 Ambient temperature: °C Test contact voltage: max. 30 mV Test contact current: max. 10 mA Final measurements: Test 3 – contact-circuit resistance Test 4 – functional tests Test 5 – timing tests Test 13 – insulation resistance	20	0	Number of cycles according to table 3 Contact failure according to 2.4.1 Value according to 2.4.2 Values according to table 2 Checking the relay function by monitoring the contacts Values according to 2.4.4 Value according to 2.1

Table 4 (*continued*)

Subgroup C5 (period: two years)

Test No.	Test	Test conditions according to IEC 61810-7	Sample size	Acceptable number of defectives	Performance requirements
19	Thermal endurance (D)	Subclause 3.32 Duration: 21 days Ambient temperature: °C Coil voltage: rated voltage Contact current: A Final measurements: Test 3 – contact-circuit resistance Test 4 – functional tests Test 5 – timing tests Test 13 – insulation resistance	5	0	 Value according to 2.4.2 Values according to table 2 Checking the relay function by monitoring the contacts Values according to 2.4.4 Value according to 2.1
20	Climatic sequence (D)	Subclause 3.15 Dry heat, subclause 3.15.2 Temperature: 70 °C Duration: 16 h Recovery: 4 h During the last 2 h of dry heat exposure monitoring contact-circuit resistance of all contacts Number of cycles per s: 2 Duty factor: 1:1 Test contact voltage: max. 6 V d.c. or a.c. Test contact current: max. 10 mA Before the end of dry heat exposure: Test 4 – functional tests Damp heat cyclic, subclause 3.15.3, one cycle Temperature: 55 °C Recovery: 4 h Cold, subclause 3.15.4 Temperature: –25 °C Duration: 2 h Before the end of cold exposure: Test 4 – functional tests Damp heat cyclic, subclause 3.15.6, one cycle Temperature: 55 °C Recovery: 4 h Final measurements: Test 13 – insulation resistance Test 3 – contact-circuit resistance Test 4 – functional tests Test 7 – visual inspection, subclause 3.6.4, item d)	10	0	 Value according to 2.4.2 Values according to table 2 Values according to table 2 Value according to 2.1 Value according to 2.4.2 Values according to table 2 Checking the relay function by monitoring the contacts No cracks or other deterioration

Table 4 (*continued*)

Subgroup C5 (*continued*)

Test No.	Test	Test conditions according to IEC 61810-7	Sample size	Acceptable number of defectives	Performance requirements
21	Damp heat, steady state (D)	Subclause 3.16 Conditioning time: 21 days Final measurements: Test 13 – insulation resistance Test 4 – functional tests Test 3 – contact-circuit resistance	10	0	 Value according to 2.1 Values according to table 2 Checking the relay function by monitoring the contacts Value according to 2.4.2
22	Robustness of terminals (D)	Subclause 3.24 Procedure: test Ua_2 – thrust, and test Ub – bending, method 1 Final measurements: Test 7 – visual inspection, subclause 3.6.4, item d) Test 2 – coil resistance Test 3 – contact-circuit resistance Test 4 – functional tests	10	0	Values according to 2.6 No breaking or loosening of terminals Values according to table 2 Value according to 2.4.2 (initial) Values according to table 2 Checking the relay function by monitoring the contacts
23	Shock (D)	Subclause 3.26, method 1, functional Pulse shape and acceleration according to 2.6 of this specification Application: three shocks each in operate and release condition in the two directions of the three main axes Test coil voltage: the rated voltage (operate) and zero (release). Test contact voltage: max. 6 V d.c. Test contact current: max. 10 mA Subclause 3.26, method 2, survival Pulse shape and acceleration according to 2.6 of this specification Application: three shocks each in operate and release condition in the two directions of the three main axes Final measurements: Test 7 – visual inspection, subclause 3.6.4, item d) Test 3 – contact-circuit resistance Test 4 – functional tests Test 13 – insulation resistance	10	0	No opening of any closed contact circuit or no closing of any opened contact circuit shall exceed 10 µs No cracks or other deterioration Value according to 2.4.2 (initial) Values according to table 2 Checking the relay function by monitoring the contacts Value according to 2.1

Table 4 (*continued*)

Subgroup C5 (*continued*)

Test No.	Test	Test conditions according to IEC 61810-7	Sample size	Acceptable number of defectives	Performance requirements
24	Vibration (D)	Subclause 3.28.2.1, method 1, functional Amplitude and frequency according to 2.6 of this specification Application: three directions Number of sweeps per direction: 3 Sweep rate: 1 octave/min ± 10 % (Total duration: approx. 3 × 30 min) Test coil voltage: the rated voltage (operate) and zero (release) Test contact voltage: max. 6 V d.c. Test contact current: max. 10 mA Final measurements: Test 7 – visual inspection, subclause 3.6.4, item d) Test 3 – contact-circuit resistance Test 4 – functional tests Test 13 – insulation resistance	10	0	No opening of any closed contact circuit or no closing of any opened contact circuit shall exceed 10 μs No cracks or other deterioration Value according to 2.4.2 (initial) Values according to table 2 Checking the relay function by monitoring the contacts Value according to 2.1
25	Mechanical endurance (D)	Subclause 3.31.3, method 2 Number of cycles per s: Duty factor: 1:1 Final measurements: Test 11: dielectric test	20	1	Number of cycles according to 2.4.3 There shall be no broken parts or other deterioration Value according to table 1 The relay shall operate with operating voltage
26	Overload (contact circuits) (D)	Subclause 3.34 All contacts loaded Contact voltage: V d.c. Contact current: A Coil voltage: rated voltage Number of cycles per s: Duty factor: 1:1 Final measurements: Test 3 – contact-circuit resistance Test 4 – functional tests	5	0	Number of cycles according to table 3 Each operation shall be monitored Value according to 2.4.2 Values according to table 2 Checking the relay function by monitoring the contacts
34 R*	Magnetic interference (ND)	Subclause 3.37, method 1, 2 or 3 If required, test conditions shall be stated in detail specification	20	0	Failure criteria according to the detail specification
27	Resistance to cleaning solvents (D)	Subclause 3.47 Final measurements: Test 7 – visual inspection, subclause 3.6.4, item d)	10	0	Absence of defects on markings or other deterioration

R recommended test.
* Only if not tested in C1.

Table 4 (*continued*)

Subgroup C5 (*concluded*)

Test No.	Test	Test conditions according to IEC 61810-7	Sample size	Acceptable number of defectives	Performance requirements
28	Fire hazard (D)	Subclause 3.48, procedure according to IEC 60695-2-2 Mounting of the relay and position of flame application: critical position as specified in the detail specification Duration of flame application: s	5	0	Evaluation of test results according to clause 10 of IEC 60695-2-2

Subgroup C6 (period: two years)

Test No.	Test	Test conditions according to IEC 61810-7	Sample size	Acceptable number of defectives	Performance requirements
29	Weighing (ND)	Subclause 3.7.2	5	0	Relay mass according to 2.1
30	Thermal resistance (ND)	Subclause 3.17			Value according to 2.1
31	Rapid change of temperature (D)	Subclause 3.19 Upper temperature extreme: °C Lower temperature extreme: °C Duration at each extreme: min Number of cycles: Final measurements: Test 7 – visual inspection, subclause 3.6.4, item d) Test 13 – insulation resistance Test 4 – functional tests Test 3 – contact-circuit resistance	10	1	 No cracks or other deterioration Value according to 2.1 Values according to table 2 Checking the relay function by monitoring the contacts Value according to 2.4.2
32	Resistance to soldering heat (D)	Subclause 3.25, test 2 IEC 60068-2-20, test Tb, methods 1 A and 1 B Ageing: not required, unless otherwise stated in the detail specification – see 2.6 of this specification Number of terminals to be tested: all Temperature and immersion time according to 2.6 of this specification Final measurements: Test 2 – coil resistance Test 3 – contact-circuit resistance Test 11 – dielectric test Test 6 – sealing (if applicable)	10	0	 Values according to table 2 Value according to 2.4.2 (initial) No breakdown or flashover Maximum leakage current: 1 mA Value according to 2.6

NOTE Test 33 – see subgroups A0, A4 and C2
Test 34 – see subgroups C1 and C5

Table 5 – Qualification approval

Sample size: min. 160

Variants of samples: coil voltage

Test	Conditions and requirements of test				Sample size	Acceptable number of defectives
	Test conditions according to IEC 61810-7		Test No. and description in table 4	Subgroup in table 4		
	Subclause	Particular test conditions				
Group 0						
Visual inspection	3.6		1	A4	160	0
Coil resistance	3.8.1		2	A4		
Insulation resistance	3.11		13	C2		
Dielectric test	3.9		11	C2		
Contact-circuit resistance	3.12		3	A4		
Functional tests	3.13		4	A4		
Timing tests	3.14		5	A4		
Sealing	3.20.2	Procedure 1, 2 or 4	6	A4		
Group 1						
Check of dimensions	3.6.1		7	B1	10	0
Solderability	3.25	Test 1	8	B2		
Group 2						
Weighing	3.7.2		29	C6	5	0
Thermal resistance	3.17		30	C6		
Robustness of terminals	3.24		22	C5		
Group 3						
Impulse voltage test	3.10		12	C2	5	0
Fire hazard	3.48	IEC 60695-2-2	28	C5		
Group 4						
Climatic sequence	3.15		20	C5	10	0
Resistance to soldering heat	3.25	Test 2	32	C6		
Resistance to cleaning solvents	3.47		27	C5		
Group 5						
Damp heat, steady state	3.16		21	C5	10	0

Table 5 (*continued*)

Test	Conditions and requirements of test				Sample size	Acceptable number of defectives
	Test conditions according to IEC 61810-7		Test No. and description in table 4	Subgroup in table 4		
	Subclause	Particular test conditions				
Group 6						
Acoustic noise R*	3.44	Method 1	33	A4 and C2	5	0
Magnetic interference R*	3.37	Method 1, 2 or 3	34	C1 and C5		
Shock	3.26	Methods 1 and 2	23	C5		
Vibration	3.28.2.1	Method 1	24	C5	5	0
Rapid change of temperature	3.19		31	C6	10	
Sealing	3.20.2	Procedure 1	14	C2	20	
Group 7						
Electrical endurance, cable load	3.30.3	Method 1	15	C4	20	0
Group 8						
Electrical endurance, rated contact voltage	3.30.3	Method 1	16	C4	20	0
Group 9						
Electrical endurance, rated contact current	3.30.3	Method 1	17	C4	5	0
Group 10						
Electrical endurance, contact application 0	3.30.4		18	C4	20	0
Group 11						
Mechanical endurance	3.31.3	Method 2	25	C5	10	1
Group 12						
Thermal endurance	3.32		19	C5	20	0
Group 13						
Overload (contact circuits)	3.34		26	C5	5	0

R recommended test.

* If stated in detail specification only.

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