IEC/PAS 61811-55

Edition 1.0
2000-11

QC 160505

Electromechanical all-or-nothing relays –

Part 55: Blank detail specification – Electromechanical all-or-nothing telecom relays of assessed quality – Two change-over contacts, 11 mm × 7,5 mm (max.) base

PUBLICLY AVAILABLE SPECIFICATION

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

A PAS is a technical specification not fulfilling the requirements for a standard, but made available to the public.

IEC-PAS 61811-55 has been processed by IEC technical committee 94: All-or-nothing electrical relays.

The text of this PAS is based on the following document:	This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document:
Draft PAS	**Report on voting**
94/108/PAS	94/109/RVD

Following publication of this PAS, the technical committee or subcommittee concerned will investigate the possibility of transforming the PAS into an International Standard.

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).

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ELECTROMECHANICAL ALL-OR-NOTHING RELAYS –

Part 55: Blank detail specification – Electromechanical all-or-nothing telecom relays of assessed quality – Two change-over contacts, 11 mm × 7,5 mm (max.) base

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 the 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.

Detailed test schedules are contained in the detail specifications supplementary to this specification.

1.2 References

IEC 60068-1:1988, *Environmental testing – Part 1: General and guidance*
Amendment No. 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 No. 2 (1987)

IEC 60068-2-47:1982, *Environmental testing – Part 2: Tests: Test: Mounting of components, equipment and other articles for dynamic tests including shock (Ea), bump (Eb), vibration (Fc and Fd) and steady-state acceleration (Ga) and guidance*

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 61811-50:1997, *Electromechanical all-or-nothing relays – Part 50: Sectional specification – Electromechanical all-or-nothing telecom relays of assessed quality*

QC 001002-1:1998, *IEC Quality Assessment System for Electronic Components (IECQ) – Rules of Procedure – Part 1: Administration*

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

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

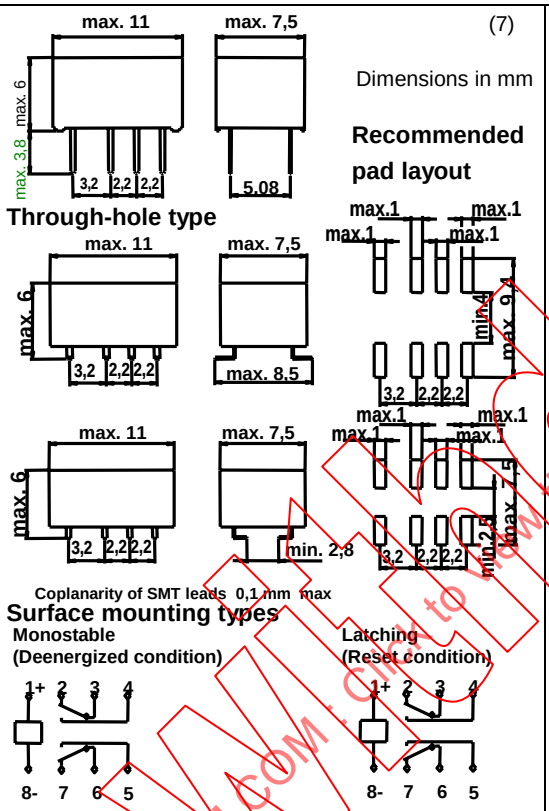
QC 001005:1996, *Register of Firms, Products and Services approved under the IECQ System, including ISO 9000*

CECC 00802:1990, *Guidance document: CECC Standard method for the specification of surface mounting components (SMDs) of assessed quality*

(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 detail specification

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

(1)	**QC xxxxxx** (2) Issue: Page 1 of
Electronic components of assessed quality in accordance with: (3) IEC 61810-7: 1997 IEC 61811-1: 1999 IEC 61811-50: 200X	(4)
Detail specification for electromechanical all-or-nothing telecom relays of assessed quality, two change-over contacts, with 11 mm x 7,5 mm (max.) base Type: ..... two change-over contacts (5) Construction: dual-in-line, with 11 mm × 7,5 mm (max.) base (6) plastic sealed case, overall height of 6 mm max. for assembling techniques of printed circuit boards using mounting holes and soldering or for surface mounting technology (as applicable)	
(7)  Dimensions in mm **Recommended pad layout** **Wiring diagram - Bottom view** Note – Drawings are examples ; the maximum outer dimensions, the wiring diagram of coil relay, the terminal arrangement and the same orientation of all rectangular terminals are mandatory.	Application: (8) Relays according to this standard are provided for the operation in telecommunication applications. However, as printed circuit board relays they are suitable also for control or switching functions in particular industrial and other applications.
Coil data (9) Rated voltages: 1,5 ... 12 V d.c. Rated power: 140 / 100 mW	
Contact data (10) Change-over break-before-make contacts Rated contact voltage: 120 V d.c. / 125 V a.c. Rated contact current: 1 A max Rated contact power: 30 W / 30 VA Limiting continuous current: 1 A max	
Component climatic category according to IEC 60068-1: 25/70/21 (11) Temperature range – operating ambient temperature: –25 °C to +70 °C – storage temperature: –40 °C to +85 °C	
Information about manufacturers who have components qualified according to this detail specification is available in the current QC 001005.	

Key to front page

The numbers between brackets of 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 which 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, two change-over contacts.

(6) Construction: sizes, e.g. dual-in-line, base and overall height, type of relay, based upon environmental protection (RT III), 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.

Location and dimensions of stand-offs (maximum relay height shall include stand-offs), position of terminal no. 1 relative to the outside shape, acceptable offset of the tip of a terminal relative to the nominal grid position, indication of the area on the top of the relay housing to enable automatic mounting using aspirators, suitable hole diameter for assembling on printed circuit board.

(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

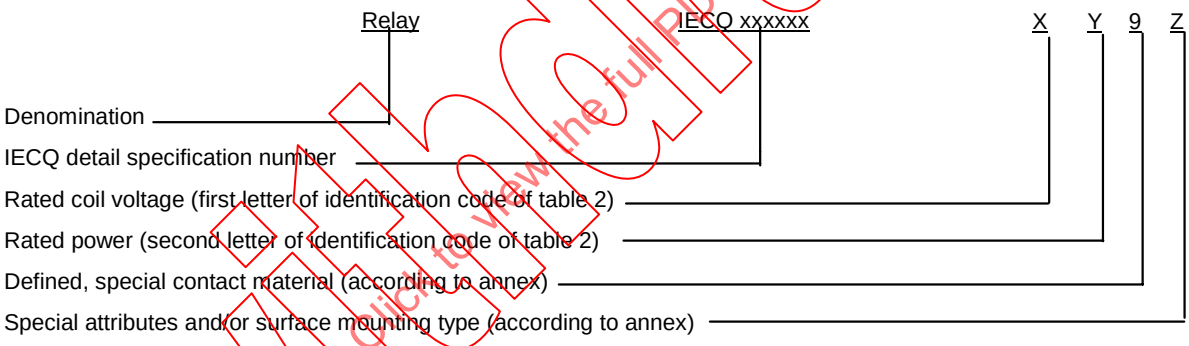
2.1 General data

- Thermal resistance: max. ... K/W
- Contact application: CA 0, CA 1, and CA 2
- Relay mass: max. ... g
- Finish of the terminals: presoldering; admissible non-presoldered part: max. 1 mm to the stand-off plane, if applicable
- Insulation resistance: 1000 MΩ min. at 500 V d.c. initial value
  2 MΩ min. at 500 V d.c. after tests
- Dielectric strength: see table 1

Table 1 – Dielectric test voltages

	Dielectric test V a.c. min.	Impulse voltage test V min. – pulse shape
Opened contact circuits	750	1 500 – 10/700 µs
Between adjacent contact circuits	1 000	1 500 – 10/700 µs
Coil to contact circuits	1 500	2 500 – 1,2/50 µs

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 two change-over 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.

2.3 Coil data

Table 2 – Coil data

Identification code	Rated voltage V	Coil resistance ohm ± 10 % at coil temperature of (23 ± 2) °C	Must not operate voltage V at coil temperature of 23 °C	Must operate voltage V at coil temperature of			Maximum coil voltage V at 70 °C	Must not release voltage V at coil temperature of 23 °C	Must release voltage V at coil temperature of			Rated power mW
				–25°C	23 °C	70 °C			–25 °C	23 °C	70 °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 10^5 cycles or for the minimum number of switching cycles stated, calculated for each single contact; or a contact fault due to non-opening with a short circuit between break and make contact (resistance value lower than 100 Ω), i.e. one contact fault is permissible for 100 000 switching cycles and seven contact faults are permissible for 700 000 switching cycles.

Example: at a given endurance of 10^6 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 ohm max.	Number of switching cycles min.	Switching frequencies cycles per s max.
Contact application 0	1	1 000 000	12,5
Resistive – max. contact voltage/max. power	1	100 000	3
Resistive – max. contact current/max. power	1	100 000	3
DC open-ended cable	1	1 000 000	12,5
Particular application-related, if required			
Overload	1 *	100	0,3
* Unless otherwise stated in the detail specification.			

2.4.2 Static contact-circuit resistance

100 mΩ max. initial value at rated voltage

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

2.4.3 Mechanical endurance

10^7 min. switching cycles.

2.4.4 Timing (without suppression device)

- Operate time: max. 5 ms
- Release time: max. 5 ms
- Bounce time when the contacts are closing: max. 5 ms
- Bounce time when the contacts are opening: max. 3 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): min. 0,05 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 (as applicable).

2.6 Environmental data

The relays shall withstand at least the following environmental stresses:

- shock, functional: 98,1 m/s^2 (10 *g*) half-sine acceleration, 11 ms duration;
- shock, survival: 981 m/s^2 (100 *g*) half-sine acceleration, 0,5 ms duration;
- vibration (sinusoidal): amplitude 0,75 mm or 98,1 m/s^2 (10 *g*), 10 Hz to 500 Hz;
- mechanical robustness of terminals
  - thrust: 1 N;
  - bending: 2 bends;
- soldering
  - if particular ageing is required, this shall be selected from procedure 1a, 1b, 2 or 3 of 4.2 of IEC 60068-2-20 and stated in the detail specification;
- through hole type:
  - solderability at 235 °C : 2 s;
  - resistance to soldering heat, terminal immersion time at 260 °C: 5 s;
- surface mounting type:
  - class A1, 6.2 of CECC 00802 (i.e. 260 °C / 5 s and 215 °C / 40 s);
  - category 3, 6.2 of CECC 00802 (i.e. vapour phase soldering or infrared soldering, if the temperature stress is adequate);
- enclosure leakage 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. 10 s.

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.
- Tests stated in table 6 are mandatory only if stated in detail specification.

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 special level of AQL is required, the AQL value regarding Subgroup 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 every six months.
- 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) according to 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) Manufacturer's batch identification code.
d) IECQ in letters or IECQ mark of conformity.
e) IECQ type designation (ordering information) according to 2.2.
f) Detail specification reference if not marked on the relay.
g) Quantity.

5.3 Documentation

For each delivery a declaration of conformity according to 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	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 3.14.2 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 time (see 4.4, note 4 of IEC 61811-50)
A0 – 6	Sealing (ND)	Subclause 3.20.2 Procedure 1, 2 or 4 for RT III and RT IV	Value according to 2.6

Table 4 (*continued*)

Subgroup A4 (period: inspection lot refers to the production volume of not more than 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 according to 2.4.2 for each contact closing
4	Functional tests (ND)	Subclause 3.13 Order of steps: 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 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 3.14.2 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 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

Table 4 (*continued*)

Group B
Subgroup B1 (period: inspection lot refers to the production volume of not more than one week)

Test no.	Test	Test conditions according to IEC 61810-7	IL	AQL	Performance requirements
7	Visual inspection – check of dimensions of stick magazines (ND) *	Subclauses 3.6.1 and 3.6.4, items a) and d)			According to 2.7
8	Visual inspection – other than marking, check of relay outside key dimensions (ND)	Subclauses 3.6.1 and 3.6.4, items c) and d) – encapsulation – body – terminals – dimensions	S3	2,5	Presoldering of terminals shall encircle the terminals without evidence of de-wetting or non-wetting; non-presoldered terminal part according to 2.1. Dimensions according to outline drawing on front page (1.3). For the plug-in capability of the relay on the printed circuit board a gauge with the respective tolerances shall be used.
9	Contact dynamic dielectric test (ND)	Subclause 3.50 Contact voltage: 500 V d.c. Test duration: 3 s or 10 s			No pulse detected shall exceed 80 µs
10	Electrical endurance missfree acceptance (ND)	Subclause 3.30.5 Coil voltage: rated voltage Number of cycles per s: 10 Test duration: 1 h No checking required during the test Final measurements: Test 3 – contact-circuit resistance			Values lower than 0,2 Ω

* Mandatory, if stated in detail specification.

Subgroup B2 (period: inspection lot refers to the production volume of not more than one week)

Test no.	Test	Test conditions according to IEC 61810-7	IL	AQL	Performance requirements
11	Solderability (D)	*Through-hole type:* Subclause 3.25.3, test 1 Test method 1 (test Ta, method 1) Number of terminals to be tested: all Temperature: (235 ± 5) °C Duration: (2 ± 0,5) s Immersion: up to 1,5 mm from body *Surface mounting type:* Subclause 3.25.3, test 3 Temperature: (215 ± 3) °C Duration of the immersion: (3 ± 0,3) s	S3	2,5	When inspected with a magnifying lens the dipped surface shall be 95 % covered with new solder coating, the remaining 5 % may contain only small pinholes (magnification of the lens: 4 to 10 times)
M*		Final measurements: Test 17 – insulation resistance			Value according to 2.1

NOTE M* if not tested in subgroup C1.

Table 4 (*continued*)

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
11a M**	Solderability (D)	*Through-hole type:* Subclause 3.25.3, test 1 Test method 1 (test Ta, method 1) Number of terminals to be tested: all Temperature: (235 ± 5) °C Duration: (2 ± 0,5) s Immersion: up to 1,5 mm from body *Surface mounting type:* Subclause 3.25.3, test 3 Temperature: (215 ± 3) °C Duration of the immersion: (3 ± 0,3) s Final measurements: Test 17 – insulation resistance	S3	2,5	When inspected with a magnifying lens the dipped surface shall be 95 % covered with new solder coating, the remaining 5 % may contain only small pinholes (magnification of the lens: 4 to 10 times) Value according to 2.1
12	Electrical endurance cable load (D)	Subclause 3.30.3, method 1 Contact load: open-end cable, 10 m telephony cable n × 4 mm × 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: one change-over contact Coil voltage: rated voltage Number of cycles per s: 12,5 max. Duty factor: 1:1 Ambient temperature: 70 °C Test contact voltage: max. 6 V test Test contact current: max. 10 mA Monitoring period: 70 ms after coil (de)-energization Final measurements: Test 3 – contact-circuit resistance Test 4 – functional tests Test 5 – timing tests Test 15 – dielectric test	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 at 23 °C Checking the relay function by monitoring the contacts Values according to 2.4.4 No breakdown or flashover Maximum leakage current: 1 mA

NOTE M** for relays manufactured with automatic facilities only, if not tested in subgroup B2 and if stated in 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
13	Electrical endurance contact application 0 (D)	Subclause 3.30 Number of contacts loaded/tested: one change-over contact Coil voltage: rated voltage Number of cycles per s: 12,5 max. Duty factor: 1:1 Ambient temperature: 70 °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 15 – dielectric test	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 at 23 °C Checking the relay function by monitoring the contacts Values according to 2.4.4 No breakdown or flashover Maximum leakage current: 1 mA
14	Electrical endurance particular application related condition if required (D)	Subclause 3.30.3 method 1 Contact load and further conditions as specified in detail specification Contact voltage: rated voltage Number of cycles per s: 3 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 15 – dielectric test	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 at 23 °C Checking the relay function by monitoring the contacts Values according to 2.4.4 No breakdown or flashover Maximum leakage current: 1 mA

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
15	Dielectric test (ND)	Subclause 3.9 Application points and test voltage: according to 2.1, table 1 of this specification (±15 V) Duration of test: 60 s	20	0	No breakdown or flashover Maximum leakage current: 1 mA
16	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 17 – insulation resistance	5	0	 Value according to 2.4.2 Values according to table 2 at 23 °C Checking the relay function by monitoring the contacts Value according to 2.1
17	Insulation resistance (ND)	Subclause 3.11 Application points: all terminals as specified in subclause 3.11.2 Test voltage: according to 2.1 of this specification Duration of test: 60 s or when steady value has been reached	20	0	Value according to 2.1
18	Sealing (ND)	Subclause 3.20.2 Procedure 1 (test Qc, method 2) Test liquid temperature: (73 ± 2) °C Immersion time: 1 min			Failure criteria according to 3.5.5 of IEC 60068-2-17

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
19	Electrical endurance, cable load, extended assessment (D)	Subclause 3.30.6 or 3.30.3, method 1 Contact load: open-ended cable, 10 m telephony cable n × 4 mm × 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: one change-over contact Coil voltage: rated voltage Number of cycles per s: 12,5 Duty factor: 1:1 Ambient temperature: 70 °C Test contact voltage: max. 6 V Test contact current: max. 10 mA Monitoring period: 70 ms after coil (de)-energization Final measurements: Test 3 – contact-circuit resistance Test 4 – functional tests Test 5 – timing tests	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 at 23 °C Checking the relay function by monitoring the contacts Values according to 2.4.4
20	Electrical endurance, rated contact voltage, resistive load (D)	Subclause 3.30.3, method 1 Contact load according to 4.1 of IEC 60255-14: 125 V d.c./0,24 A Number of contacts loaded/tested: one change-over contact Coil voltage: rated voltage Number of cycles per s: 3 Duty factor: 1:1 Ambient temperature: 70 °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	5	1	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 at 23 °C Checking the relay function by monitoring the contacts Values according to 2.4.4

Table 4 (*continued*)

Subgroup C4 (*concluded*)

Test no.	Test	Test conditions according to IEC 61810-7	Sample size	Acceptable number of defectives	Performance requirements
21	Electrical endurance, rated contact current, resistive load (D)	Subclause 3.30.3, method 1 Contact load according to 4.1 of IEC 60255-14: 24 V d.c./1,25 A Number of contacts loaded/tested: one change-over contact Coil voltage: rated voltage Number of cycles per s: 3 Duty factor: 1:1 Ambient temperature: 70 °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	5	1	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 at 23 °C Checking the relay function by monitoring the contacts Values according to 2.4.4
22	Electrical endurance, application 0, extended assessment (D)	Subclause 3.30.6 or 3.30.4 Number of contacts loaded/tested: one change-over contact Coil voltage: rated voltage Number of cycles per s: 12,5 Duty factor: 1:1 Ambient temperature: 70 °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	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 at 23 °C Checking the relay function by monitoring the contacts Values according to 2.4.4

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
23	Thermal endurance (D)	Subclause 3.32 Duration: 21 days Ambient temperature: 70 °C Coil voltage: rated voltage Recovery: 1 h Final measurements: Test 3 – contact-circuit resistance Test 4 – functional tests	5	0	 Value according to 2.4.2 Values according to table 2 at 23 °C Checking the relay function by monitoring the contacts
24	Climatic sequence (D)	Subclause 3.15 Dry heat, subclause 3.15.2 Temperature: 70 °C Duration: 16 h Recovery: 4 h During the last two hours 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	10	0	 Value according to 2.4.2 Values according to table 2 at 23 °C, must operate voltage at 70 °C Checking the relay function by monitoring the contacts Values according to table 2 at 23 °C Checking the relay function by monitoring the contacts

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	Climatic sequence *(continued)*	Final measurements: Test 17 – insulation resistance Test 3 – contact-circuit resistance Test 4 – functional tests Test 8 – visual inspection, subclause 3.6.4, item d)			 Value according to 2.1 Value according to 2.4.2 Values according to table 2 at 23 °C Checking the relay function by monitoring the contact No cracks or other deterioration
25	Damp heat, steady state (D)	Subclause 3.16 Conditioning time: 21 days Final measurements: Test 17– insulation resistance Test 3 – contact-circuit resistance Test 8 – visual inspection, subclause 3.6.4 item d)	10	0	 Value according to 2.1 Value according to 2.4.2 No cracks or other deterioration
26	Robustness of terminals (D)	Subclause 3.24 Procedure: test Ua2 – thrust; and test Ub – bending, method 1 Final measurements: Test 8 – 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 No cracks or other deterioration Values according to table 2 Value according to 2.4.2 (initial) Values according to table 2 at 23 °C Checking the relay function by monitoring the contacts

Table 4 (*continued*)

Subgroup C5 (*continued*)

Test no.	Test	Test conditions according to IEC 61810-7	Sample size	Acceptable number of defectives	Performance requirements
27	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 released condition in the two directions of the three main axes 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 released condition in the two directions of the three main axes Final measurements: Test 8 – visual inspection, subclause 3.6.4, item d) Test 3 – contact-circuit resistance Test 4 – functional tests Test 5 – timing tests	10	0	No opening of any closed contact circuit or no closing of any opened contact circuit shall exceed 100 µs No cracks or other deterioration Value according to 2.4.2 (initial) Values according to table 2 at 23 °C Checking the relay function by monitoring the contacts Value according to 2.4.4
28	Vibration (D)	Subclause 3.28.2.1, method 1, functional Amplitude: 0,75 mm, 10 *g* Frequency: 10 Hz to 55 Hz Application: three directions Number of sweeps per direction: 3 Sweep rate: 1 octave/min ±10 % (Total duration: approx. 3 × 30 min) Test contact voltage: max. 6 V d.c. Test contact current: max. 10 mA Final measurements: Test 8 – visual inspection, subclause 3.6.4, item d) Test 3 – contact-circuit resistance Test 4 – functional tests Test 17 – 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 at 23 °C 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
29	Mechanical endurance (D)	Subclause 3.31.3, method 2 Coil voltage: rated voltage Number of cycles per s: 10 Duty factor: 1:1 Ambient temperature: 70 °C Final measurements: Test 3 – contact-circuit resistance Test 4 – functional tests Test 5 – timing tests	20	1	Number of cycles according to 2.4.3 There shall be no broken parts or other deterioration Value according to 2.4.2 Value according to table 2 at 23 °C Checking the relay function by monitoring the contacts Value according to 2.4.4
30	Overload current (contact circuits) (D)	Subclause 3.34 Ambient temperature: 70 °C All contacts loaded Contact voltage: 24 V d.c. Contact current: 2,5 A Coil voltage: rated voltage Number of cycles per s: 0,3 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 There shall be no permanent deterioration Value according to 2.4.2 Values according to table 2 at 23 °C Checking the relay function by monitoring the contacts
31	Overload voltage (contact circuits) (D)	Subclause 3.34 Ambient temperature: 70 °C All contacts loaded Contact voltage: 250 V d.c. Contact current: 0,24 A Coil voltage: rated voltage Number of cycles per s: 0,3 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 at 23 °C Checking the relay function by monitoring the contacts
32	Magnetic interference (ND)	Subclause 3.37, methods 1 and 2 Method 1: dimensions of the test coil as stated in the detail specification Method 2: mounting grid pattern as stated in the detail specification	5	0	Method 1, relay in critical position Deviation of: – operate voltage less than 20 % – release voltage less than 40 % Method 2: must operate and must release voltage according to table 2

Table 4 (*continued*)

Subgroup C5 (*concluded*)

Test no.	Test	Test conditions according to IEC 61810-7	Sample size	Acceptable number of defectives	Performance requirements
33	Resistance to cleaning solvents (D)	Subclause 3.47.2 Final measurements: Test 8 – visual inspection, subclause 3.6.4 item d) Test 17 – insulation resistance Test 4 – functional tests Test 18 – sealing	10	0	 Absence of defects on markings or other deterioration Value according to 2.1 Value according to table 2 at 23 °C Checking the relay function by monitoring the contacts Failure criteria according to 3.5.5 of IEC 60068-2-17
34	Fire hazard (D)	Subclause 3.48.2, procedure according to IEC 60695-2-2 Mounting of the relay and position of flame application: critical position Duration of flame application: 10 s	10	0	Evaluation of test results according to clause 10 of IEC 60695-2-2