IEC 61810-4

Edition 1.0 2020-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Electromechanical elementary relays –
Part 4: General and safety requirements for reed relays

Relais électromécaniques élémentaires –
Partie 4: Exigences générales et de sécurité relatives aux relais à lames souples

IEC 61810-4:2020-11(en-fr)

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ELECTROMECHANICAL ELEMENTARY RELAYS –

Part 4: General and safety requirements for reed relays

FOREWORD

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International Standard IEC 61810-4 has been prepared by IEC technical committee 94: All-or-nothing electrical relays.

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

FDIS	Report on voting
94/482/FDIS	94/484/RVD

Full information on the voting for the approval of this document can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of IEC 61810 series, published under the general title *Electromechanical elementary relays*, can be found on the IEC website.

This document is to be read in conjunction with IEC 61810-1.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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- withdrawn,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

INTRODUCTION

Reed relays have been used in wide fields such as household and similar appliances, security control systems for appliances, measuring instruments, medical equipment, semiconductor and chip test equipment, information and communication equipment, power distribution facilities and transit vehicles, etc.

IEC 61810-4 provides technical deviations/additions to IEC 61810-1 in order to specify general and safety requirements for reed relays, as a result of component safety standards for relevant systems.

The reed switches are used as the switching contacts of the reed relays, all the requirements for reed contacts (reed switches) within the reed relay are read in conjunction with IEC 62246 (all parts).

ELECTROMECHANICAL ELEMENTARY RELAYS –

Part 4: General and safety requirements for reed relays

1 Scope

This part of IEC 61810 applies to electromechanical elementary relays with reed switches (reed contacts) incorporated into general control circuits. It defines the basic functional and safety requirements in all areas of electrical engineering or electronics in accordance with the parts of IEC 61810 series and IEC 62246 series.

This document defines technical deviations/additions to IEC 61810-1. It specifies type tests, routine tests, special tests and environmental tests to confirm the service conditions for applications.

NOTE The terms reed switch(es) and reed contact(s) are both in use for the description of the contact set in reed relays.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60068-2-17:1994, *Basic environmental testing procedures – Part 2-17: Tests – Test Q: Sealing*

IEC 60077-1:2017, *Railway applications – Electric equipment for rolling stock – Part 1: General service conditions and general rules*

IEC 60077-2:2017, *Railway applications – Electric equipment for rolling stock – Part 2: Electrotechnical components – General rules*

IEC 60571:2012, *Railway applications – Electric equipment used on rolling stock*

IEC 61373:2010, *Railway applications – Rolling stock equipment – Shock and vibration tests*

IEC 61810-1:2015, *Electromechanical elementary relays – Part 1: General and safety requirements*
IEC 61810-1:2015/AMD1:2019

IEC 61810-2:2017, *Electromechanical elementary relays – Part 2: Reliability*

IEC 61810-2-1:2017, *Electromechanical elementary relays – Part 2-1: Reliability – Procedure for the verification of B_{10} values*

IEC 61810-7:2006, *Electromechanical elementary relays – Part 7: Test and measurement procedures*

IEC 61810-10:2019, *Electromechanical elementary relays – Part 10: Additional functional aspects and safety requirements for high-capacity relays*

IEC 62246-1:2015, *Reed switches – Part 1: Generic specification*

IEC 62246-1-1:2018, *Reed switches – Part 1-1: Generic specification – Blank detail specification*

IEC 62497-1:2010, *Railway applications – Insulation coordination – Part 1: Basic requirements – Clearances and creepage distances for all electrical and electronic equipment*
IEC 62497-1:2010/AMD1:2013

IEC 62498-1:2010, *Railway applications – Environmental conditions for equipment – Part 1: Equipment on board rolling stock*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61810-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.2 Terms and definitions of relay types

3.2 of IEC 61810-1:2015 is applicable with the following addition:

3.2.7
reed relay
electromechanical control circuit devices with connecting terminals, consisting of reed switch sets (reed contact sets) and coil fitting with/without a housing which could be plastic or metal

Note 1 to entry: See Figure A.1.

3.4 Terms and definitions of operating values

3.4 of IEC 61810-1:2015 is applicable with the following addition:

3.4.7
magnetic interference
tendency of a relay to be influenced by the magnetic field from an adjacent energized relay or any other surrounding solenoid

Note 1 to entry: This influence can result in depression or elevation of the operate and release voltage of the affected relay, possibly causing them to fall outside their specification.

Note 2 to entry: Magnetic interference can be minimized by alternating the polarity of adjacent relay coils, by magnetic shielding, or by placing two relays at right angles to each other.

3.8 Terms and definitions related to high frequency characteristics

3.8.1
frequency range
<of an equipment> set of frequencies over which an equipment can be adjusted to operate satisfactorily

Note 1 to entry: The frequency range of a relay can be subdivided into switched subranges which may or may not be contiguous.

[SOURCE: IEC 60050-702:1992, 702-09-68, modified – “an equipment“ has been replaced with “a relay” in the “Note 1 to entry”]

3.8.2
capacitance
<between open contacts> ability to store an electric charge between contacts

3.8.3
capacitance
<between coil and contacts> ability to store an electric charge between contact and coil

Note 1 to entry: It can have adverse effects for use in high frequency signal transmission circuits of information and communication equipment.

3.8.4
impedance
<of a relay> quotient of a voltage by a current for a passive linear two-terminal element or two-terminal circuit with terminals A and B under sinusoidal conditions

[SOURCE: IEC 60050-131:2013, 131-12-43, modified – The definition has been replaced]

3.8.5
isolation
<of a relay> ratio of the power delivered to the output port of a relay, with open contacts, at a specific frequency, compared to the power emitted from the corresponding output port

3.8.6
insertion loss
resulting from the insertion of a network into a transmission system, the ratio of the power delivered to that part of the system following the network, before insertion of the network, to the power delivered to that same part after insertion of the network

Note 1 to entry: The insertion loss is generally expressed in decibels.

[SOURCE: IEC 60050-726:1982, 726-06-07]

3.8.7
return loss
modulus of the reciprocal of the reflection factor, generally expressed in decibels

Note 1 to entry: When impedances can be defined, the return loss is given by the formula:

$$-20\lg\left|r\right| = 20\lg\left|\frac{\underline{Z}-\underline{Z}'}{\underline{Z}+\underline{Z}'}\right|$$

where Z is the characteristic impedance of a transmission line ahead of a discontinuity, or the impedance of a source, and Z' is the impedance after the discontinuity or the load impedance seen from the junction between the source and the load.

[SOURCE: IEC 60050-702:1992, 702-07-25]

3.8.8
repeatability
<of results of measurements> closeness of agreement between the results of successive measurements of the same measurand, carried out under the same conditions of measurement, i.e.:

– by the same measurement procedure;

– by the same observer;
– with the same measuring instruments, used under the same conditions;
– in the same laboratory;
– at relatively short intervals of time.

[SOURCE: IEC 60050-311:2001, 311-06-06, modified – The Note has been omitted.]

4 Influence quantities

Clause 4 of IEC 61810-1:2015 is applicable.

5 Rated values

Clause 5 of IEC 61810-1:2015 is applicable with the following deviations/additions.

5.2 Rated coil voltage/rated coil voltage range

b) DC voltage, recommended values:

15 V; 32 V; 36 V; 50 V; 55 V; 64 V; 72 V; 87 V; 96 V.

5.8 Contact loads

a) Resistive loads, recommended values

Current: 0,1 A; 0,2 A; 0,3 A; 0,5 A; 1 A; 2 A; 3 A; 5 A; 6 A; 8 A; 10 A; 12 A; 16 A; 20 A; 25 A; 30 A and submultiples thereof.

Voltage: 1 V; 3 V; 4,5 V; 5 V; 12 V; 24 V; 36 V; 42 V; 48 V; 110 V; 125 V; 230 V; 250 V; 300 V; 400 V; 480 V; 500 V; 690 V; 1 000 V (AC/DC); 1 500 V DC, 2 000 V DC, 3 000 V DC, 5 000 V DC, 7 000 V DC, 8 000 V DC, 10 000 V DC, 12 000 V DC and submultiples thereof.

b) Recommended inductive loads: see Annex F of IEC 62246-1:2015.

NOTE 1 IEC 61810-4 considers values higher than 1 500 V DC which is the scope of IEC 61810-1.

NOTE 2 Special requirement on withstand voltage for blocking inductive surge can be applied.

NOTE 3 The voltage values are based on 4.4 of IEC 62246-1:2015.

5.12 Withstand voltage

Recommended withstand voltages: 30 V; 60 V; 125 V; 200 V; 330 V; 500 V; 800 V; 1 500 V; 2 500 V; 4 000 V; 7 000 V; 10 000 V; 15 000 V; 18 000 V.

NOTE The voltage values are based on 4.4 of IEC 62246-1:2015.

5.13 Insulation resistance

Recommended insulation resistance values are listed in Table 1.

Table 1 – Insulation resistance

Insulation resistance (Ω)							
$>10^8$	$> 10^9$	$> 10^{10}$	$> 10^{11}$	$> 10^{12}$	$> 10^{13}$	$> 10^{14}$	$> 10^{15}$

NOTE Test and measurement procedures for insulation resistance are accordance with 4.11 of IEC 61810-7:2006.

5.14 Frequency range

Recommended contact load frequency range can be specified according to Table 2.

Table 2 – Frequency range

Frequency range (Hz)								
3×10^5 to 3×10^6	3×10^6 to 30×10^6	30×10^6 to 300×10^6	DC to 1×10^8	DC to 2×10^9	DC to 4×10^9	DC to 7×10^9	DC to $1{,}5 \times 10^{10}$	DC to 2×10^{10}

6 General provisions for testing

Clause 6 of IEC 61810-1:2015 is applicable with the following additions:

6.1 General

Tests shall be made to prove compliance with the requirements laid down in this document.

Tests are as follows:

– type tests which shall be made on representative samples of each particular reed relays;
– routine tests which shall be made on each individual piece of reed relays manufactured to this document;
– special tests which shall be made following a technical specification, according to agreement between manufacturer and user;

6.2 Type tests

The specimens shall be grouped in 11 inspection lots, and the related tests shall be taken from Table 3 of this document.

Table 3 of this document replaces Table 3 of IEC 61810-1:2015.

Table 3 – Type testing

Inspection lot	Tests	Clause	Additional references
1	Documentation and marking	7	IEC 60417
	Heating (typical coil voltage)	8	IEC 60085
	Basic operating function (all coil voltages)	9	
2	Dielectric strength	10	
3	Electrical endurance (per contact load and contact material)	11	
4	Mechanical endurance	12	
5	Clearances, creepage distances and distances through solid insulation	13	IEC 60664-1
6	Terminations	14	
	Sealing (if applicable)	15	IEC 60068-2-17
7	Heat and fire resistance	16	IEC 60695-2-10
8	Short-circuit capacity (if applicable)	17	
9	Vibration test (if applicable)	18	IEC 60068-2-6
10	Shock test (if applicable)	19	IEC 60068-2-27
11	High frequency characteristics (if applicable)	Annex P	

In the relevant clauses, the requirements to be checked as well as the related tests are specified. The routine tests shall be taken from Table 4.

6.3 Routine tests

Table 4 of this document replaces Table 4 of IEC 61810-1:2015/AMD1:2019.

Table 4 – Routine tests

Inspection lot	Test	Clause	Additional references
all [e]	Marking and documentation	7	Table 6 of IEC 61810-1:2015, 1a; 1b; 1c
all [e]	Basic operating functions	9 [a]	Mode II applies [b]
all [e]	Sealing (option)	15 [c]	IEC 60068-2-17 or IEC 62246-1-1
all [e]	Dielectric strength	10.2 [d]	–

[a] The preconditioning within Table 11 of IEC 61810-1:2015 for operate as well as release does not apply.

For routine testing 9.2.2 of IEC 61810-1:2015 could be handled via 9.2.1 of IEC 61810-1:2015.

As these tests is usually carried out at room temperature, the manufacturer has to specify an appropriate level for the operate or release voltage to ensure that the relay will work at the maximum (operate) and minimum (release) permissible ambient temperature within the defined values.

[b] 9.3 of IEC 61810-1:2015 for bistable relays applies accordingly.

[c] The manufacturer specifies the detail conditions.

[d] Dielectric test for routine test could be carried out for duration of 1 s in accordance with IEC 61810-7:2006, 4.9. The test voltage shall not have any negative impact on the insulation (further use). Other parameters like current limit or specification of the high-voltage transformer shall be specified by the manufacturer at an appropriate value.

10.3 of IEC 61810-1:2015 may apply as alternate to 10.2 of IEC 61810-1:2015 especially for existing designs.

[e] For routine tests by definition, all products are tested.

6.4 Special tests

6.4.1 General requirements

The conducting of special tests is at the discretion of the manufacturer.

The samples shall pass the type tests and routine tests which Table 3 and Table 4 specify accordingly.

6.4.2 Environmental tests

In cases where it is necessary to verify the behaviour of products under special environmental conditions (e.g. damp heat, salt mist, vibration and shock), the tests shall be conducted according to Annex Q.

7 Documentation and marking

Clause 7 of IEC 61810-1:2015 is applicable with the following deviations/additions.

Table 5 of this document adds to Table 6 of IEC 61810-1:2015.

Table 5 – Special relays data

N°	Data	Notes	Place of indication
2 Coil data			
2d	Category or class (Optional) Voltage changes Overvoltage	Values of the limits (see Q.5.1)	Relay or catalogue or instruction sheet
3 Contact data			
3h	Capacitance (Optional) (Between open contacts and between coil and contacts)	Value of the limits	Catalogue or instruction sheet
4 Insulation data			
4f	Withstand voltage (Optional) (Between open contacts and between coil and contacts)	Values of the limits or class (see 5.12)	Catalogue or instruction sheet
4g	Insulation resistance (Optional) (Between open contacts and between coil and contacts)	Values of the limits or class (see 5.13)	Catalogue or instruction sheet
5 General data			
5l	Vibration	Category or class (Optional, see Q.5.3)	Relay or catalogue or instruction sheet
5m	Shock	Category or class (Optional, see Q.5.3)	Relay or catalogue or instruction sheet
6 High frequency characteristics (Optional)			
6a	Frequency range	Values of the limits or class (see 5.13)	Catalogue or instruction sheet
6b	Isolation	Values of the limits	Catalogue or instruction sheet
6c	Insertion loss	Values of the limits	Catalogue or instruction sheet
6d	Return loss	Values of the limits	Catalogue or instruction sheet

NOTE 1 For special data, if typical applications (high frequency characteristic, etc.) are applicable, these relays data in Table 5 are added.

NOTE 2 For special data, if railway applications are applicable, these relays data for category or class (battery voltage, vibration and shock, etc.) in Table 5 are added.