IEC 62246-1-1

Edition 2.0 2018-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Reed switches –
Part 1-1: Generic specification – Blank detail specification

Contacts à lames souples –
Partie 1-1: Spécification générique – Spécification particulière-cadre

IEC 62246-1-1:2018-02(en-fr)

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REED SWITCHES –

Part 1-1: Generic specification – Blank detail specification

FOREWORD

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International Standard IEC 62246-1-1 has been prepared by IEC technical committee 94: All-or-nothing electrical relays.

This second edition cancels and replaces the first edition published in 2013. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous editions:

a) update of the scope, references and terms and definitions;
b) inclusion of guidelines for the preparation of blank detail and detail specifications;
c) update of characteristics values including functional ratings for safety;
d) update of the quality conformance inspection procedures;
e) update of typical applications.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
94/426/FDIS	94/427/RVD

Full information on the voting for the approval of this International Standard 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.

This document is to be used in conjunction with IEC 62246-1:2015.

A list of all parts in the IEC 62246 series, published under the general title *Reed switches*, can be found on the IEC website.

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- withdrawn,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.

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INTRODUCTION

Reed switches which are in mass production and which are widely used, in practice could be classified by the following characteristics:

a) Size:

- Normal or standard reed switches with a tube more than 50 mm in length and more than 5 mm in diameter;
- Sub-miniature reed switches with a tube more than 20 mm and up to 50 mm in length and up to 5 mm in diameter;
- Miniature reed switches with a tube more than 10 mm and up to 20 mm in length and more than 2 mm and up to 5 mm in diameter;
- Micro-miniature reed switches with a tube up to 10 mm in length and up to 2 mm in diameter.

b) Type of switching of electric circuit:

- Closing or normally open – A type or NO;
- Opening or normally closed – B type or NC;
- Changeover – C type or CO.

c) Withstand voltage level:

- Low-voltage (up to 1 000 V);
- High-voltage (more than 1 000 V).

d) Switches power:

- Low-power (up to 60 W or 60 VA);
- Power (100 W to 1 000 W or 100 VA to 1 000 VA);
- High-power (more than 1 000 W or 1 000 VA).

e) Types of electric contacts:

- The tube is filled with dry air, gas mixture, vacuumized, or high pressurized.

Based on the general provisions of IEC 62246-1:2015, this document selects and specifies blank detail and detail specifications including safety contact ratings and test procedures for reed switches where enhanced requirements for the verification of quality assessment specification apply.

This document describes sampling and test schedules for qualification approval procedures, quality conformance inspection, formation of inspection lots and intervals between tests.

NOTE All type of reed switches exclude mercury reed switches.

REED SWITCHES –

Part 1-1: Generic specification – Blank detail specification

1 Scope

This part of IEC 62246 which is a blank detail specification defines requirements and tests for reed switches for use in general and industrial applications.

This document is intended to be used in conjunction with IEC 62246-1:2015 and specific products standards applying as switching elements.

This document selects from IEC 62246-1:2015 and from other sources the appropriate test procedures to be used in detail specifications derived from this specification.

Reed switch types are specified depending on characteristic values including functional ratings for safety and tests.

NOTE Mercury wetted reed switches are not covered by this document due to their possible environmental impact.

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 60068-2-6:2007, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-11:1981, *Basic environmental testing procedures – Part 2-11: Tests – Test Ka: Salt mist*

IEC 60068-2-14:2009, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-17:1994, *Environmental testing – Part 2-17: Tests – Test Q: Sealing*

IEC 60068-2-20:2008, *Environmental testing – Part 2-20: Tests – Test T: Test methods for solderability and resistance to soldering heat of devices with leads*

IEC 60068-2-21:2006, *Environmental testing – Part 2-21: Tests – Test U: Robustness of terminations and integral mounting devices*

IEC 60068-2-78:2012, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60127-2:2014, *Miniature fuses – Part 2: Cartridge fuse-links*

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

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

ISO 2859-1:1999, *Sampling procedures for inspection by attributes – Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

3 Terms and definitions

The terms and definitions given in IEC 62246-1:2015 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

3.1 reed switch types

3.1.1
type
products having similar design features and nominal dimensions manufactured by the same techniques and falling within a range of ratings specified by the manufacturer

Note 1 to entry: Mounting accessories are ignored, provided they have no significant effect on the test results.

3.1.2
variant
variation within a type having specific characteristics

3.1.3
reed switch
assembly containing contact blades, partly or completely made of magnetic material, hermetically sealed in an envelope and controlled by means of an externally generated magnetic field (e.g. an energizing quantity applied to a coil)

3.1.4
high voltage vacuum reed switch
reed switch, in which ability to switch high voltages is achieved by a high vacuum within the hermetically sealed envelope

3.1.5
heavy-duty reed switch
reed switch, in which greater switching capacity is achieved

Note 1 to entry: Blades having additional contact tips or a contact tip and spring which separate the magnetic path and electric path are typical examples of techniques to increase switching capacity.

3.2 tests

3.2.1
type test
test of one or more reed switches made to a certain design to show that the design meets certain specifications

3.2.2
routine test
conformity test made on each reed switch during or after manufacture

3.2.3
lot-by-lot test
test carried out periodically on a sample of reed switches drawn from running production at least once a month

3.2.4
periodic test
test carried out periodically on a sample of reed switches drawn from running production at least once a year and every two years

Note 1 to entry: The results from periodic tests are used to verify that the level of technical performance is maintained.

Note 2 to entry: Sub-groups intervals between tests A0, A4 and B1, C1 and C4 are specified in 4.8.

3.3 inspection

3.3.1
inspection
process of measuring, examining, testing, or otherwise comparing the unit of product with the specified requirements

3.3.2
IL
inspection level
specification of lower limits for lot-by-lot test

Note 1 to entry: See ISO 2859-1:1999, Clause 9.

3.3.3
AQL
acceptance quality limit

maximum percent of defects that can be tolerance as a risk, stated for purposes of sampling inspection

Note 1 to entry: Sample inspection with associated risk tolerance is employed only where all units of product within an inspection lot is expected to completely comply with specification requirements.

3.4 safety and failure modes

3.4.1
B_{10} value
point estimate of B_{10}, the time (in number of cycles) by which 10 % of the population will have failed

Note 1 to entry: When B_{10} values are specified in the detail specifications, the electrical endurance test should measure all failures according to IEC 61810-2.

Note 2 to entry: See Clause A.3 of IEC 61810-2:2017.

3.4.2
B_{10D} value
number of cycles until 10 % of the components fail dangerously

Note 1 to entry: B_{10D} values are calculated according to IEC 61810-2-1.

3.4.3
dangerous failure
failure of an element and/or subsystem and/or system that plays a part in implementing the safety function that decreases the probability that the safety function operates correctly when required

[SOURCE: IEC 61508-4:2010, 3.6.7, modified – item a) has been deleted.]

4 Test schedules

4.1 General

Test procedures of quality assessment are specified in Table 1 which is referenced in the corresponding subclauses of IEC 62246-1.

4.2 Order of tests

Quality conformance inspection is divided into two parts: that carried out lot-by-lot, on which the release of the individual lots is based, and that carried out on a periodic basis, which contains the time-consuming and more expensive tests.

When several tests are subsequently to be carried out on any one specimen or number of specimens, the following order shall apply, unless otherwise specified in the detail specification:

a) a 100 % test with

b) tests in groups.

4.3 Test groups and subgroups

For the 100 % test subgroup, a reed switch shall be rejected when it fails any test. For detection purposes, a contact can be considered closed when the voltage drop across it is less than one half of its open-circuit value. Conditions of test shall be specified in the detail specification.

4.4 Type test

- Sampling and test schedule are specified in Tables 2 and 3.
- The tests specified and their order is mandatory.
- Tests stated in Tables 2 and 3 are mandatory for the variants except when otherwise specified.

4.5 Quality conformance inspection

An initial conformity test has to be passed and then confirmed by routine tests, lot-by-lot tests and periodic tests.

Quality conformance inspection contains the tests stated in Table 4:

- Group A: routine tests;
- Groups A and B: lot-by-lot tests;
- Group C: periodic tests.

Unless otherwise stated in this document, all tests of Table 4 are mandatory.

Where a subgroup contains cumulative tests, the order of the tests is mandatory. Specimens that have been subjected to tests denoted as destructive (D) shall not be released for delivery. Specimens that have been subjected to tests denoted as non-destructive (ND) are permitted to be released for delivery.

4.6 Formation of inspection lots

The basis for the determination of sample size for the quality conformance inspection is the reed switch quantity produced during one month.

4.7 Periodic test

The periodic test shall be performed in regular intervals as specified by the manufacturer, as a minimum with the rated operating current I_e only.

For each periodic test, the evaluated $B10$ value shall be at least 80 % of the $B10$ value obtained from the conformity test.

Fixed sample sizes for group C inspection shall be taken from a lot (or lots) which has (have) passed groups A and B inspection during or at the end of the specified reference period.

4.8 Periodic test intervals between tests

- Subgroup A0: at shipment.
- Subgroups A4 and B1: manufacturer specifies the intervals.
- Subgroups C1: at least once a year.
- Subgroup C4: at least once every two years.

4.9 Standard conditions for testing

If not otherwise stated, all tests shall be performed under standard conditions for testing according to 6.3 of IEC 62246-1:2015.

4.10 Mounting of test specimens during the test

The following requirement shall apply for shock and vibration tests.

The reed switch 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.

4.11 General conditions for testing

Unless otherwise stated, the test coil number and when applicable its polarity specified in Table 5 shall be used for all tests. Unless otherwise stated in this document, the polarity shall be as specified by the manufacturer.

Table 1 – Test procedure of quality assessment

		Quality conformance inspection (inspection level / sampling quantities)					Test for qualification approval	Qualification approval (Sample size / acceptable number of failures during test)												
	Group	A		B	C			Gr. 1	Gr. 2	Gr.3	Gr. 4	Gr. 5	Gr. 6	Gr. 7	Gr. 8	Gr. 9	Gr. 10	Gr. 11	Gr. 12	Gr. 13	Gr. 14
	Sub-group	A0	A4	B1	C1	C4															
	Test interval	Routine test			Type test		At mass production														
		Lot-by-lot tests					First article inspection														
	Frequency (time)	At shipment	1/M	1/M	1/Y	1/2Y															
	Type test						Sample size														
	Routine test	100 %					170 switches min.														
	Sampling inspection		IL: S4	IL: S3																	
	Periodic tests				Yes	Yes															
Test number in Table 2	1. Visual inspection (6.4)	Yes	Yes				170 switches	170/0													
	2. Functional operation (6.5)	Yes	Yes																		
	3. Contact resistance (6.7)	Yes	Yes																		
	4. Dielectric test (6.8)	Yes	Yes																		
	5. Operating times (6.10)	Yes	Yes																		
	6. Sealing (6.21)	Yes	Yes																		
	7. Remanence test (6.6)						18 switches		6/0												
	8. Insulation resistance (6.9)								6/0												
	9. Contact sticking (6.11)								6/0												
	10. Robustness of terminals (6.12)				6		18 switches			6/0											
	11. Soldering (6.13)				5					6/0											
	12. Climatic sequence (6.14)				6					6/0											
	13. Damp heat, steady state (6.15)						18 switches				6/0										
	14. Rapid change of temperature (6.16)										6/0										

		Quality conformance inspection (inspection level / sampling quantities)					Test for qualification approval	Qualification approval (Sample size / acceptable number of failures during test)																
	15. Salt mist (6.17)										6/0													
	16. Vibration – functional, survival (6.18)				6		24 switches					12/0												
	17. Shock – functional, survival (6.19)					6						12/0												
	18. Electrical endurance (6.22)				5		10 switches						10/10											
	19. Mechanical endurance (6.23)					20	20 switches							20/1										
	20. Maximum cycling frequency (6.24)						6 switches								6/0									
	21. Contact reliability test (6.28)			S3			20 switches									20/0								
	A1. Vibration – functional (IEC 61373: 2010)						6 switches										6/0							
	A2. Shock (IEC 61373: 2010)						6 switches										6/0							
	A3. Making and breaking capacity (6.26)						3 switches											3/0						
	A4. Conditional short-circuit current test (6.27)						3 switches												3/0					
	A5. Temperature rise (6.29)						3 switches												3/0					
	A6. Making current capacity test (6.30)					6	6 switches													6/0				
	A7. Breaking current capacity test (6.31)					6	6 switches													6/0				
	B1. Surge withstand test (6.25)					3	3 switches														3/0			

NOTE 1 Applicable test number in Table 2, A1 to A7: Variant A of heavy-duty reed switches only, B1: Variant B of heavy-duty reed switches only.

NOTE 2 The inside number on the end of test number in Table 1 – Quality conformance inspection indicates the subclause number according to IEC 62246-1: 2015.