IEC 62246-4

Edition 1.0 2023-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Reed switches –
Part 4: Application in conjunction with magnetic actuator used for magnetic sensing devices

Contacts à lames souples –
Partie 4: Application en combinaison avec un actionneur magnétique utilisé pour les dispositifs de détection magnétiques



IEC 62246-4:2023-02(en-fr)



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CONTENTS

FOREWORD 7
INTRODUCTION 9
1 Scope 10
2 Normative references 10
3 Terms and definitions 12
3.1 Types of magnetic-sensing device (MSD) 12
3.2 Elements of an MSD 14
3.3 Connections 14
3.4 Operation of an MSD 14
4 Influence quantities 15
5 Rated values 16
5.1 General 16
5.2 Rated insulation voltage (U_i) 16
5.3 Rated operating voltage (U_e) 16
5.4 Rated operating current (I_e) 17
5.5 Contact ratings 17
5.6 Number of operations 17
5.7 Rated operating distance (S_n) 17
5.8 Climatic category 17
5.9 Environmental severities 17
5.10 Response speed 18
5.11 Frequency of operating cycles 18
5.12 Contact reliability 18
6 Types 18
7 General provisions for testing 20
7.1 General 20
7.2 Type tests 20
7.3 Routine tests 21
7.4 Special tests 22
8 Documentation and marking 22
8.1 Data 22
8.2 Marking 24
8.3 Symbols 24
9 Test and measurement procedures 25
9.1 General 25
9.2 Visual inspection and check of dimensions 25
9.2.1 Visual inspection 25
9.2.2 Outline dimensions 25
9.2.3 Mass 25
9.3 Functional tests 26
9.3.1 General 26
9.3.2 Operating distance 26
9.3.3 Deviation of operating distance 26
9.3.4 Differential travel (H) 26
9.3.5 Repeatability (R) 27

9.3.6 Magnetic interference 27
9.3.7 Response speed (if applicable) 27
9.3.8 Frequency of operating cycles (*f*) (if applicable) 29
9.3.9 Functional test by temperature change 31
9.3.10 Contact circuit resistance 32
9.3.11 Temperature rise 32
9.4 Insulation resistance 32
9.4.1 Procedures 32
9.4.2 Requirements 33
9.5 Dielectric test 33
9.5.1 Procedures 33
9.5.2 Requirements 34
9.6 Endurance tests 34
9.6.1 General 34
9.6.2 Procedures for electrical endurance test 34
9.6.3 Requirements 35
9.6.4 Procedures for mechanical endurance test (if applicable) 35
9.6.5 Requirements 35
9.7 External connections 35
9.7.1 General 35
9.7.2 Robustness of terminal with lead wire (if applicable) 36
9.7.3 Robustness of terminal (if applicable) 36
9.7.4 Soldering terminals (if applicable) 37
9.7.5 Connector (if applicable) 37
9.8 Mechanical stresses tests 37
9.8.1 General 37
9.8.2 Mounting 37
9.8.3 Vibration 37
9.8.4 Shock 38
9.8.5 Rough handling shocks (if applicable) 39
9.9 Environmental tests 39
9.9.1 General 39
9.9.2 Cold 40
9.9.3 Dry heat 40
9.9.4 Damp heat, steady state 40
9.9.5 Mould growth 41
9.9.6 Fluid contamination (if applicable) 41
9.9.7 Salt mist (if applicable) 42
9.10 Enclosure protection tests 42
9.10.1 General 42
9.10.2 Degree of enclosure 42
9.10.3 Pressurized water (if applicable) 42
9.11 Sealing (if applicable) 43
9.11.1 General 43
9.11.2 Procedures 43
9.11.3 Requirements 43
9.12 Heat and fire resistance 43
9.12.1 General 43
9.12.2 Glow-wire 43

9.12.3 Ball pressure 44
9.13 Making and breaking capacity (if applicable) 45
9.13.1 General 45
9.13.2 Procedures 45
9.13.3 Requirements 45
9.14 Conditional short-circuit current test (if applicable) 46
9.14.1 General 46
9.14.2 Procedures 46
9.14.3 Requirements 46
9.15 Contact reliability test 46
9.15.1 General 46
9.15.2 Procedures 46
9.15.3 Requirements 46
9.16 Electromagnetic compatibility (EMC) 46
Annex A (informative) Explanations relating to reed contact magnetic sensor – Example 47
Annex B (informative) Explanations relating to the operation of reed contact magnetic sensor – Example 48
Annex C (informative) Work principles regarding sensing distances 49
C.1 General 49
C.2 Reed contact magnetic sensor with magnetic actuator set (separate type) 49
C.2.1 Operation 49
C.2.2 Axial approach 49
C.2.3 Lateral approach 50
C.3 Reed contact magnetic sensor with magnetic actuator set (latching type) 51
C.3.1 Operation 51
C.3.2 Specified directions 51
C.4 Reed contact magnetic sensor with magnetic actuator set (fork type) 52
C.4.1 Operation 52
C.4.2 Specified directions 52
C.5 Reed contact magnetic sensor with magnetic actuator set (plunger type) 53
C.5.1 Operation 53
C.5.2 Specified directions 53
C.6 Reed contact magnetic sensor with magnetic actuator set (float type) 54
C.6.1 Operation 54
C.6.2 Specific directions 55
Annex D (informative) Risk assessment 56
D.1 General 56
D.2 Risk assessment procedure 56
D.3 Achieving tolerable risk 57
D.4 Application of risk assessment procedures (proposal for the user) 59
Annex E (informative) Test procedures regarding response speed 61
E.1 General 61
E.2 Test circuit 61
E.3 Test sequence 61
Annex F (informative) Special tests 63
F.1 General 63
F.2 Functional tests 63
F.3 Functional tests and mechanical durability 63

F.4 Vibration and shock tests for special requirements of applications 63
F.5 Explosion proofness 63
F.5.1 General 63
F.5.2 Procedures 63
F.5.3 Requirements 64
Bibliography 65

Figure 1 – Methods for measuring the response speed 28
Figure 2 – Output signal 28
Figure 3 – Methods for measuring the operating frequency (*f*) 30
Figure 4 – Output signal during the measuring of operating frequency (*f*) 31
Figure 5 – Ball pressure test apparatus 45
Figure A.1 – Driven method for reed contact magnetic sensor by permanent magnetic actuator 47
Figure B.1 – Explanatory diagram of terms related to operation by magnetic actuator 48
Figure C.1 – Operating approaches 49
Figure C.2 – Axial approach relating to sensing distances 50
Figure C.3 – Lateral approach relating to sensing distances 51
Figure C.4 – Specified directions relating to sensing distances and contact states 52
Figure C.5 – Specified directions relating to sensing distances 53
Figure C.6 – Sensing distances 54
Figure C.7 – Sensing distances according to liquid level 55
Figure D.1 – Iterative process of risk assessment and risk reduction 56
Figure D.2 – Risk reduction 58
Figure E.1 – Test circuit – Example 61
Figure E.2 – Measurement data by oscilloscope – Example 62

Table 1 – Reference values of influence quantities 16
Table 2 – Rated insulation voltage 16
Table 3 – Rated operating voltage 17
Table 4 – Rated operating distance 17
Table 5 – Rated maximum working pressure 17
Table 6 – Examples of output functions of MSD 19
Table 7 – Type testing 21
Table 8 – Routine tests 22
Table 9 – Required data 23
Table 10 – Symbols 25
Table 11 – Examples of indication of rated values 25
Table 12 – Deviation of operating distance 26
Table 13 – Remanence value 27
Table 14 – Typical rated speeds 28
Table 15 – Typical operating times of switching loads 29
Table 16 – Frequency of operating cycles 31
Table 17 – Function test by temperature change 31

Table 18 – Deviation of operating distance 32
Table 19 – Test current 32
Table 20 – Rated voltage of insulation resistance test 33
Table 21 – Dielectric test voltage 33
Table 22 – Minimum clearances and creepage distances 34
Table 23 – Number of cycles for endurance test 35
Table 24 – Criteria for electrical endurance tests 35
Table 25 – Torque severity 36
Table 26 – Value of applied force for test U_{a1} 37
Table 27 – Vibration test 38
Table 28 – Shock test 39
Table D.1 – Examples of the relation between failure mode, consequences and hazard 59
Table D.2 – Severity of harm 59
Table D.3 – Probability of harm 60
Table D.4 – Risk category 60

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REED SWITCHES –

Part 4: Application in conjunction with magnetic actuator used for magnetic sensing devices

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

Draft	Report on voting
94/786/FDIS	94/807/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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 webstore.iec.ch in the data related to the specific document. At this date, the document will be

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INTRODUCTION

Reed switches are used as sensing devices in a variety of applications (e.g. safety of machinery, alarm detectors, factory automation, pneumatics and hydraulics, railways, automotive, utilities, healthcare, consumer electronics and appliances, lifts).

The intention of this document is:

1) to define the functions, types, characteristics, product information, etc. for magnetic sensing devices:
   – recommended response speed and frequency of operating cycles are determined as rated values;
2) to specify the test and measurement procedures for magnetic sensing devices:
   – response speed and operating time of load are determined when used as trip function or presence sensing function according to the relevant standards;
3) to specify the additional tests for magnetic sensing devices used for specific product standards.

REED SWITCHES –

Part 4: Application in conjunction with magnetic actuator used for magnetic sensing devices

1 Scope

This part of IEC 62246 gives additional requirements for the evaluation of functional characteristics on reed switching components operated by magnetic actuator and gives guidance for their implementation in selected applications.

This document specifies test and measurement procedures for the application of reed switch (contact) based magnetic sensors.

NOTE This document can be used in conjunction with specific product standards (e.g. IEC 60947-5-1) applying reed switching with magnetic actuation to provide specific requirements and verification methods.

In case the application of a reed contact magnetic sensor determines additional requirements exceeding those specified in this document, the sensor is evaluated with this application in accordance with the relevant IEC or ISO standard(s) (e.g. IEC 62061 or ISO 13849 series, IEC 60335-1 and relevant parts of the IEC 60335-2 series, IEC 60730-1, IEC 61373, ISO 16750-3).

This document does not apply to:

– sensing or monitoring of the position of elements of interlocking devices for movable guards (see ISO 14119);
– sensing or monitoring of the position of elements of pressure sensitive protective equipment (PSPE, see ISO 13856 series);
– electrical equipment for measurement, control, and laboratory use (see IEC 61010-1);
– aircraft – proximity switches (see ISO 6859-1).

Information contained in this document is relevant to the application of a magnetic sensor on new installations as well as modifications to existing installations.

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 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

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

IEC 60068-2-10:2005, *Environmental testing – Part 2-10: Tests – Test J and guidance: Mould growth*
IEC 60068-2-10:2005/AMD1:2018

IEC 60068-2-11:2021, *Environmental testing – Part 2-11: Tests – Test Ka: Salt mist*

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

IEC 60068-2-18:2017, *Environmental testing – Part 2-18: Tests – Test R and guidance: Water*

IEC 60068-2-21:2021, *Environmental testing – Part 2-21: Tests – Test U: Robustness of terminations and integral mounting devices*

IEC 60068-2-27:2008, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-31:2008, *Environmental testing – Part 2-31: Tests – Test Ec: Rough handling shocks, primarily for equipment-type specimens*

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

IEC 60079 (all parts), *Explosive atmospheres*

IEC 60079-0:2017, *Explosive atmospheres – Part 0: Equipment – General requirements*

IEC 60079-1:2014, *Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures "d"*

IEC 60079-10-1:2020, *Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres*

IEC 60079-11:2011, *Explosive atmospheres – Part 11: Equipment protection by intrinsic safety "i"*

IEC 60079-15:2017, *Explosive atmospheres – Part 15: Equipment protection by type of protection "n"*

IEC 60079-18:2014, *Explosive atmospheres – Part 18: Equipment protection by encapsulation "m"*
IEC 60079-18:2014/AMD1:2017

IEC 60417, *Graphical symbols for use on equipment*
(available at http://www.graphical-symbols.info/equipment)

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

IEC 60695-2-10:2021, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

IEC 60695-2-11:2021, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products (GWEPT)*

IEC 60695-2-12:2021, *Fire hazard testing – Part 2-12: Glowing/hot-wire based test methods – Glow-wire flammability index (GWFI) test method for materials*

IEC 60695-2-13:2021, *Fire hazard testing – Part 2-13: Glowing/hot-wire based test methods – Glow-wire ignition temperature (GWFI) test method for materials*

IEC 60721-3-3:2019, *Classification of environmental conditions – Part 3-3: Classification of groups of environmental parameters and their severities – Stationary use at weatherprotected locations*

IEC 60947-5-1:2016, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices*

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

IEC 62246 (all parts), *Reed switches*

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

ISO/IEC 80079-20-1:2017, *Explosive atmospheres – Part 20-1: Material characteristics for gas and vapour classification – Test methods and data*

ISO 16750-3:2012, *Road vehicles – Environmental conditions and testing for electrical and electronic equipment – Part 3: Mechanical loads*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62246 (all parts), and the following apply.

ISO and IEC maintain terminology 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 Types of magnetic-sensing device (MSD)

3.1.1
magnetic-sensing device
MSD
assembly of either devices or components or both working together for protective tripping or presence sensing purposes and comprising as a minimum

– a reed contact magnetic sensor;

  and

– an output signal switching device

Note 1 to entry: The output switching device can be a reed switch.

Note 2 to entry: A description of the elements of the MSD is given in 3.2, that of the external connections of the MSD in 3.3 and that of the operation of the MSD in 3.4.

Note 3 to entry: Explanations regarding reed contact magnetic sensors are given in Annex A.

Note 4 to entry: Explanations regarding the operation of reed contact magnetic sensors are given in Annex B.

Note 5 to entry: Proximity switches specified in IEC 60947-5-2 and IEC 60947-5-3 are not magnetic sensing devices.

Note 6 to entry: In safety related applications, magnetic sensing devices can be used with a safety monitoring device.

3.1.2
reed contact magnetic proximity sensor
electromechanical control circuit device without external power supply, operated by the presence of a magnetic actuator or magnetic float actuator or ferromagnetic plate without contact and consisting of a reed contact-based sensor and a magnetic actuator

Note 1 to entry: Reed contact magnetic proximity sensors designed for industrial applications are called reed contact magnetic switches in IEC AFDIS 60947-5-1:2023, which is under preparation.

Note 2 to entry: Reed contact magnetic proximity sensors are not proximity switches, as specified in IEC 60947-5-2 and IEC 60947-5-3.

3.1.3
reed contact magnetic proximity sensor with magnetic actuator set
<separate type> reed contact-based magnetic sensor operated by the external presence of a magnetic actuator where the sensor housing and the magnetic actuator housing are separated

Note 1 to entry: The sensor can include one or more reed contacts.

Note 2 to entry: The sensor is operated when the magnetic actuator is within operating range. See Clause C.2 for the separate type.

3.1.4
reed contact magnetic proximity sensor with magnetic actuator set
<latching type> reed contact-based magnetic sensor operated by the external presence of a magnetic actuator and maintained by the built-in bias magnet where the sensor housing and the magnetic actuator housing are separated

Note 1 to entry: The sensor can include one or more reed contacts.

Note 2 to entry: The sensor is maintained when the magnetic actuator exceeds the operating range. See Clause C.3 for the latching type.

3.1.5
reed contact magnetic proximity sensor with magnetic actuator set
<fork type> reed contact(s)-based magnetic sensor operated by the external presence of a ferromagnetic plate where the sensor and the magnetic actuator are mounted in the same housing

Note 1 to entry: The sensor can include one or more reed contacts.

Note 2 to entry: The sensor is operated when the ferromagnetic plate is placed between the reed switch and the magnetic actuator. See Clause C.4 for the fork type.

3.1.6
reed contact magnetic sensor with magnetic actuator set
<plunger type> reed contact(s)-based magnetic sensor operated by the internal presence of magnetic actuator(s) separately mounted in a plunger element

Note 1 to entry: The sensor is operated when the plunger element reaches a predetermined range of positions by the actuator. See Clause C.5 for the plunger type.

3.1.7
reed contact magnetic sensor with magnetic actuator set
<float type> reed contact(s)-based magnetic sensor operated by the external presence of magnetic float actuator(s) separately mounted in a floating element

Note 1 to entry: The sensor is operated when the floating element reaches a given position range determined by the level of the liquid where the actuator floats. See Clause C.6 for the float type.

3.2 Elements of an MSD

3.2.1
switching element
<reed-contact> reed switch that is driven magnetically and switches the current of the electric circuit

3.2.2
magnetic actuator
polarized permanent magnet used to operate the magnetic sensing device

Note 1 to entry: A particular type of magnetic actuator is recommended by the manufacturer for comparative measurement of operating distance and releasing distance.

3.2.3
magnetic float actuator
<magnetic float liquid level sensor> polarized magnet built in a float for water or other liquid level sensing

3.2.4
sensing face
surface intended to be used to detect a magnetic field and activate the output switch

3.2.5
ferromagnetic plate
plate for the fork type magnetic sensor to cut off the magnetic field of the internal magnetic actuator

3.3 Connections

3.3.1
external connections
output signal(s) from the magnetic sensing device

Note 1 to entry: The design is such that the external connections can be extracted directly from the lead wire, terminal, connector or leaded connector.

3.4 Operation of an MSD

3.4.1
rated operating distance
S_n
conventional quantity used to designate the operating distance that is given with the actuator recommended by the manufacturer (e.g. part number of the value in Tesla)

Note 1 to entry: The rated operating distance does not take into account manufacturing tolerances nor variations due to external conditions such as temperature.

3.4.2
operating distance
S_{on}
distance at which the target approaching the sensing face along the reference axis causes the output signal to change the state of output contacts

Note 1 to entry: The target represents the centre of the magnetic field that is most sensitive to the built-in reed contact(s) and represents the physical position of the magnetic sensor (see Figure C.1).

3.4.3
releasing distance
S_{off}
distance at which the target leaving the sensing face along the reference axis causes the output signal to change state of output contacts

3.4.4
sensing distance
operating distance or releasing distance

3.4.5
differential travel
H
absolute value of the difference between the operating distance and releasing distance

3.4.6
sensing area
area of operating or releasing obtained using a predetermined magnetic actuator

3.4.7
magnetic interference
state in which the performance or characteristics of an MSD are affected when two or more reed contact magnetic sensors and their magnetic actuators are placed near to each other

3.4.8
response time
<for output of MSD> length of the delay from the instant when a magnetic actuator enters or leaves the sensing area until a change is completed in the output of an MSD

Note 1 to entry: The term "operating response time" is used to refer to response delays during times of operation and the term "releasing response time" is used to refer to response delays at times of release.

3.4.9
response speed
speed at which the magnetic actuator or sensing ferromagnetic plate enters the sensing area so that the MSD can output the pulse signal of a predetermined time

3.4.10
lateral approach
approach of the magnetic actuator perpendicular to the reference axis

3.4.11
axial approach
approach of the magnetic actuator with its centre maintained on the reference axis

4 Influence quantities

The specified performance of a reed contact magnetic sensor shall be given with respect to the reference conditions, i.e. the set of reference values of all influence quantities.

Unless otherwise explicitly stated by the manufacturer, the tests shall be carried out at the reference values and tolerance ranges listed in Table 1.