

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Electromechanical switches for use in electrical and electronic equipment –
Part 1: Generic specification**

**Interrupteurs électromécaniques pour équipements électriques et
électroniques –
Partie 1: Spécification générique**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTROMECHANICAL SWITCHES
FOR USE IN ELECTRICAL AND ELECTRONIC EQUIPMENT –****Part 1: Generic specification**

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International Standard IEC 61020-1 has been prepared by subcommittee 23J: Switches for appliances, of IEC technical committee 23: Electrical accessories.

This second edition cancels and replaces the first edition published in 1991. This second edition constitutes a technical revision.

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

- a) The requirements of the IEC 60512 series of standards have been integrated in this second edition of IEC 61020-1. In particular the test methods, terminology, symbols and other necessary information concerning switches as specified in IEC 60512 have been implemented in this standard.
- b) Additionally, the following items have been updated with respect to the first edition:
 - test methods were reviewed for detailed description;

- the explanation for the test method of the operating force was rewritten in more detail;
- the test voltage for measurement for contact bounce was reviewed;
- the electrical endurance “ON” duration in the duty cycle was harmonized with IEC 61058;
- the requirements for fire hazards have been deleted;
- testing methods of surface mounting switches based on the Japanese industrial standard were added.

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

FDIS	Report on voting
23J/325/FDIS	23J/328/RVD

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

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

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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INTRODUCTION

This generic specification covers the general requirements and test methods for electromechanical switches with optional quality assurance procedures. It provides the general requirements and test methods for use in any detail specifications for pushbutton switches, rotary switches, sensitive switches, toggle switches, and other electromechanical switches. It also provides guidelines for appropriate quality assurance procedures in Annex A (informative).

Where it is intended that an electromechanical switch comply with requirements related to safety, the specific safety requirements are specified in IEC 61058-1.

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ELECTROMECHANICAL SWITCHES FOR USE IN ELECTRICAL AND ELECTRONIC EQUIPMENT –

Part 1: Generic specification

1 Scope and object

1.1 Scope

This generic specification relates to electromechanical switches intended for use in electrical and electronic appliances. Switches covered by this specification:

- a) are devices which open, close, or change the connection of a circuit by the mechanical motion of conducting parts (contacts);
- b) have a maximum rated voltage of 480 V;
- c) have a maximum rated current of 63 A.

This generic specification does not include keyboards and keypads which are intended for use in information-handling systems. Electromechanical key switches may be included under the scope of this generic specification.

Switch families shall be described in any detail specifications that will reference this generic specification.

1.2 Object

The object of this generic specification is to provide consistency in detail specifications for electromechanical switches by specifying the terminology, symbols, test methods and other necessary information.

2 General

2.1 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60027 (all parts), *Letter symbols to be used in electrical technology*

IEC 60050-581:2008, *International Electrotechnical Vocabulary – Part 581: Electromechanical components for electronic equipment*

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

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

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

IEC 60068-2-13:1983, *Environmental testing – Part 2-13: Tests – Test M: Low air pressure*

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 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12+12-hour cycle)*

IEC 60068-2-42:2003, *Environmental testing – Part 2-42: Tests – Test Kc: Sulphur dioxide test for contacts and connections*

IEC 60068-2-43:2003, *Environmental testing – Part 2-43: Tests – Test Kd: Hydrogen sulphide test for contacts and connections*

IEC 60068-2-45:1980, *Environmental testing – Part 2-45: Tests – Test XA and guidance: Immersion in cleaning solvents*
Amendment 1 (1993)

IEC 60068-2-49:1983, *Environmental testing – Part 2-49: Tests – Guidance to Test Kc: Sulphur dioxide test for contacts and connections*

IEC 60068-2-58:1999, *Environmental testing Part 2-58: Tests – Tests Td: Test methods for solderability, resistance to dissolution of metallization and to soldering heat of surface mounting devices (SMD)*

IEC 60068-2-61:1991, *Environmental testing – Part 2-61: Test methods – Test Z/ABDM: Climatic sequence*

IEC 60068-2-68:1994, *Environmental testing – Part 2-68: Tests – Test L: Dust and sand*

IEC 60068-2-78:2001, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
Amendment 1 (2001)

IEC 60617, *Graphical symbols for diagrams*

IEC 61058-1:2000, *Switches for appliances – Part 1: General requirements*
Amendment 1 (2001)
Amendment 2 (2007)

ISO 1000:1992, *SI units and recommendation for the use of their multiples and of certain other units*

2.2 Units and symbols

Units, graphic symbols, and letter symbols shall be, whenever possible, in accordance with ISO 1000, IEC 60027 and IEC 60617.

Graphic symbols and letter symbols peculiar to a particular switch subfamily shall be defined in the applicable detail specification. Graphic symbols and letter symbols peculiar to a group of structurally similar switches shall be defined in the detail specification. When additional units or symbols are required, they shall be derived in accordance with the principles of the documents listed above whenever possible.

2.3 Terms and definitions

For the purposes of this document the terminology of IEC 60050-581 as well as the following terms and definitions apply.

Terminology peculiar to a particular switch subfamily shall be defined in the applicable detail specification. Terminology peculiar to a group of structurally similar switches shall be defined in the detail specification.

The following terminology is common to all electromechanical switches. Where the definition is compatible with an established IEC 60050 definition, the IEC number for the related definition is given in brackets.

2.3.1

category temperature range

range of ambient temperature for which the switch has been designed to operate continuously

2.3.2

clearance

shortest distance in air between two conductive parts

2.3.3

contact bounce

intermittent and random opening of closed contacts and closing of open contacts which may occur after contact transfer and which is caused by the switch mechanism

2.3.4

contact bounce time

time period measured from the moment of first closure of two mating contacts or first opening of two closed contacts to the moment when all contact bounce ceases

2.3.5

contact disturbance

intermittent and random closing of open contacts and/or opening of closed contacts caused by external influences such as shock and vibration

2.3.6

contact separation (gap)

distance between mating contacts when the contacts are open

2.3.7

contact set

group of contacts which all function in relation to the same pole of a switch

2.3.8

creepage distance

shortest distance along the surface of the insulation material between two conductive parts

[IEV 151-15-50 modified]

2.3.9

double break switch

switch that opens a conductor at two points in series with each other

2.3.10

double throw

term applied to a contact arrangement to denote that each contact form included is a make-break

2.3.11

duty cycle

ratio of conducting (ON) time to the total time for one cycle; for example, 30 % ON

2.3.12

electromechanical switch

switch which opens, closes, or changes the connection of an electrical circuit by the mechanical motion of conducting parts (contacts)

2.3.13

lower category temperature

minimum ambient temperature for which a switch has been designed to operate continuously

2.3.14

pole of a switch

the part of the switch associated exclusively with one, electrically separated, conducting path of the switch

NOTE 1 Those parts that provide a means for mounting and operating all poles together are excluded from the definition of a pole.

NOTE 2 A switch is called "single-pole" if it has only one pole. If it has more than one pole, it may be called "multi-pole" (two-pole, three-pole, etc.) provided that the poles are coupled in such a manner as to operate together.

2.3.15

operating cycle

succession of operations from one position to another and back to the first position through all other positions, if any

[IEV 441-16-02]

2.3.16

opposite polarity

two parts of a switch such that when connected together may result in operation of the line fuses to the power supply

2.3.17

single throw

term applied to a contact arrangement to denote that each contact form included is a single contact pair

2.3.18

snap-action

type of switching action in which the speed of the moving contact is relatively independent of the speed of the actuating mechanism

2.3.19

surface mounting switch

small-sized switch which is suitable for surface mounting on the printed wiring board, consisting of terminals and framing parts

2.3.20

upper category temperature

maximum ambient temperature for which a switch has been designed to operate continuously

2.4 Preferred values

The detail specification may prescribe any preferred values for rated and limiting values, characteristics, tolerances, requirements and dimensions applicable to the whole subfamily.

2.4.1 Clearance and creepage distances

The detail specification shall specify either the minimum clearance and creepage distances or the minimum dielectric test voltage under specified air pressure for functional insulation. For basic, supplementary or reinforced insulation the minimum clearance and creepage distances shall be specified in accordance with Clause 20 of IEC 61058-1.

2.5 Marking

Where space permits after national or contractual marking requirements (for example, safety requirements) have been satisfied, each switch shall be marked with the following information:

- a) manufacturer's name or trademark;
- b) identification number;
- c) terminal identification when specified by the detail specification;
- d) date code: the date code shall be in accordance with IEC 60062.

Other markings may be applied to the switches provided they do not obscure or confuse the required markings. When conditions do not permit full marking on the switch, the markings shall be applied in the order of preference shown above. Any required marking that cannot be applied to the switch, shall be marked on the smallest packing unit of the switch.

3 Quality assessment procedures

NOTE See Annex A (informative) for guidelines on quality assurance procedures.

4 Test and measurement procedures

4.1 General

Any detail specification shall contain tables showing the tests to be conducted, the measurements to be made before and after each test or group of tests, and the sequence in which they shall be carried out. The measuring conditions shall be the same for initial and final measurements. When tests are performed in a sequence, the final measurements of one test may be taken as the initial measurements for the succeeding test.

If national specifications within any quality assessment system include test methods other than those specified in the above documents, the test methods shall be fully described.

Not all the test methods prescribed herein are applicable to all types of switches. The detail specification shall prescribe the test methods which are applicable for that type of switch.

When necessary, additional test methods and/or details of the test methods shall be prescribed by the detail specification.

4.1.1 Tolerances

Unless otherwise specified, the actual value of the parameters, for example test voltage, test current, test force or test torque shall be within 5 % of the specified values of the switch.

4.1.2 Preconditioning

Unless specified by the test method, the switches shall not be subjected to any special preparations, such as cleaning, prior to or during the tests.

4.1.3 Mounting

When mounting is prescribed by the test method, the switch shall be rigidly mounted by its normal mounting means and connected as specified in the detail specification. The method of mounting and the materials used for mounting shall not adversely affect the electrical or mechanical performance of the switch.

4.2 Standard atmospheric conditions

The standard atmospheric conditions shall be in accordance with Clause 5 of IEC 60068-1.

4.3 General examination

4.3.1 Visual examination

4.3.1.1 Method

The visual examination shall be carried out by one of the following methods:

- a) with the naked eye (normal strength of vision, normal colour perception, at the most favourable viewing distance and with suitable illumination);
- b) with magnifiers, if specified.

For the purpose of this standard, special methods, for example using polarized light (for observing internal tensions in materials) or other indicators (for observing internal material cracks or pores), are not permitted unless explicitly required by the detail specification.

4.3.1.2 Features

The following features shall be examined without magnification:

- a) markings according to 2.5;
- b) general appearance;
- c) workmanship.

4.3.1.3 Requirement

The markings shall be correct and legible. The switch shall be manufactured in a careful and workmanlike manner.

4.3.1.4 Details to be specified

When this test is required by the detail specification, the following details shall be specified:

- a) details to be examined;
- b) features to be checked;