

**Harmonized system of quality
assessment for electronic components**

Generic specification: Electromechanical switches

The European Standard EN 196000:1992, with the incorporation of amendment A1:2001, has the status of a British Standard

ICS 31.220.20

Cooperating organizations

The European Committee for Electrotechnical Standardization (CENELEC), under whose supervision this European Standard was prepared, comprises the national committees of the following countries:

Austria	Italy
Belgium	Luxembourg
Denmark	Netherlands
Finland	Norway
France	Portugal
Germany	Spain
Greece	Sweden
Iceland	Switzerland
Ireland	United Kingdom

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National foreword

This British Standard has been prepared under the direction of the Electronic Components Standards Policy Committee and is the English language version of EN 196000:1992, *Generic Specification: Electromechanical switches*, including amendment A1:2001, published by the European Committee for Electrotechnical Standardization (CENELEC) Electronic Components Committee (CECC). It was identical with CECC 96000 Issue 2:1992 but is modified by the inclusion of CENELEC amendment A1:2001.

This generic specification is applicable to electromechanical switches intended primarily for use in telecommunications equipment and in electronic equipment employing similar techniques.

BS CECC 96000:1987 will remain valid for existing qualification approvals until further notice.

The British Standard which implements the CECC Rules of Procedure is BS 9000-2:1991, *General requirements for a system for electronic components of assessed quality — Part 2: Specification for the national implementation of the CECC system*.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 46, an inside back cover and a back cover.

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(including amendment A1:2001)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the General Secretariat of the CECC or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CECC General Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom. The membership of the CECC is identical, with the exception of the national electrotechnical committees of Greece, Iceland and Luxembourg.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The CENELEC Electronic Components Committee (CECC) is composed of those member countries of the European Committee for Electrotechnical Standardization (CENELEC) who wish to take part in a harmonized System for electronic components of assessed quality.

The object of the System is to facilitate international trade by the harmonization of the specifications and quality assessment procedures for electronic components, and by the grant of an internationally recognized Mark, or Certificate, of Conformity. The components produced under the System are thereby acceptable in all member countries without further testing.

This specification has been formally approved by the CECC, and has been prepared for those countries taking part in the System who wish to issue national harmonized specifications for ELECTROMECHANICAL SWITCHES. It should be read in conjunction with the current regulations for the CECC System.

At the date of printing of this specification, the member countries of the CECC are Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom, and copies of it can be obtained from the addresses shown on the blue fly sheet.

Preface

This generic specification was prepared by CECC WG 24: Switches and sensors. It is based, wherever possible, on the Publications of the International Electrotechnical Commission. The text of this Issue 2 consists of the text of CECC 96000 Issue 1 (1985) amended in accordance with the ratified new material introduced in the following documents:

Document	Date of voting	Report on the voting
CECC (Secretariat) 2347	January 1989	CECC (Secretariat) 2510
CECC (Secretariat) 2548	June 1990	CECC (Secretariat) 2721

Effective date

This Issue 2 shall become effective for all new applications for qualification approval on 20 February 1992. Issue 1 shall remain valid to cover all past approvals.

NOTE The numbering of clauses of this specification does not fully comply with the requirements of CECC 00400.

Foreword

This amendment was prepared by the former Technical Committee CENELEC TC CECC/SC 23JX, Switches and sensors. It was approved by CENELEC as amendment A1 to EN 196000:1992 on 2000-08-01. This amendment combines the texts of the draft amendments prAA and prAB, which were submitted to the Unique Acceptance Procedure, and of documents CECC(Secretariat)2950 and CECC(Secretariat)3170 with their respective voting reports CECC(Secretariat)3119 and CECC(Secretariat)3370.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2002-03-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2003-08-01

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Section 1. Scope

1.1 Scope

This generic specification relates to electromechanical switches intended primarily for use in telecommunications equipment and in electronic equipment employing similar techniques. It is limited to switches with a rated voltage not exceeding 500 V (d.c. or a.c. r.m.s.) and a rated carrying current not exceeding 25 A. It specifies the terms, definitions, symbols, test methods and other material necessary to prepare detail specifications for these components in the CECC System.

1.2 Switch classes included

The following classes of switch are covered by this specification, together with their sub-classes.

Class	Examples of sub-class
Lever (toggle)	Rocker Joystick
Rotary	Thumbwheel (edge-mounted) Key activated
Sensitive (microswitch)	
Push-button	Multicell Matrix Piano-key Keyboard Keypad
Slide	
Non-manually operated	Temperature Pressure
Membrane	Button actuated Keyboard Keypad

NOTE 1 The principal classes of switch listed have been classified according to construction or mode of actuation; classification by other features is permitted: for example, dual-in-line mounting.

NOTE 2 Each class of switch, inclusive of its sub-classes, is covered by one BDS.

NOTE 3 All classes of switch may have further sub-classification according to other features relating, for example, to direct or indirect actuation, the provision of illumination or indication, time delay, mounting facilities, and method of termination. The detail specification shall clearly indicate such features.

1.3 Switch classes excluded

The following classes of switch are not-covered by this specification:

- relays;
- circuit breakers;
- optically activated switches;
- solid-state switches which are wholly electronic with no integral moving parts (for example touch-sensitive and proximity devices);
- waveguide switches;
- coaxial switches.

Section 2. General

2.1 Related documents

CECC 00007	<i>Basic specification: Sampling plans and procedures for inspection by attributes</i>
CECC 00009	<i>Basic specification: Basic and testing procedures and measuring methods for electromechanical components</i>
CECC 00109	<i>Certified Test Records</i>
CECC 00111	<i>Specifications and their Harmonization</i>
CECC 00114	<i>Quality Assessment Procedures</i>
IEC 27	<i>Letter symbols to be used in electrical technology</i>
IEC 50 (581):1978	<i>International electrotechnical vocabulary</i> (Electromechanical components for electronic equipment)
IEC 65	<i>Safety requirements for mains operated electronic and related apparatus for household use</i>
IEC 68	<i>Basic environmental testing procedures</i>
IEC 117	<i>Recommended graphical symbols</i>
IEC 341-1:1973	<i>Push-button switches: General requirements and measuring methods</i>
IEC 389-1:1972	<i>Thermostatic switches: General requirements and measuring methods</i>
389-1A:1976	
IEC 410	<i>Sampling procedures and tables for inspection by attributes</i>
IEC 512	<i>Electromechanical components for electronic equipment: basic testing procedures and measuring methods</i>
IEC 512-1:1976	— Part 1: General
512-2:1976	— Part 2: General examination
512-3:1976	— Part 3: Current carrying capacity
512-4:1976	— Part 4: Dynamic stress tests
512-5:1977	— Part 5: Impact tests
512-6:1977	— Part 6: Climatic tests and soldering
512-6A:1980	
512-7:1978	— Part 7: Mechanical operating tests
512-8:1980	— Part 8: Mechanical tests
512-9:1977	— Part 9: Miscellaneous tests
IEC 695	<i>Fire hazard testing</i>
ISO 1000:1973	<i>SI Units and recommendations for the use of their multiples and of certain other units</i>

NOTE Unless otherwise specified, the latest issue document is to be used.

2.2 Units, symbols and terminology

2.2.1 General

Units, graphical symbols and terminology shall, wherever possible, be taken from the following documents:

ISO 1000	— SI units and recommendations for the use of their multiples and of certain other units
IEC 27	— Letter symbols to be used in electrical technology
IEC 50 (581)	— International Electromechanical Vocabulary: Electromechanical Components for Electronic Equipment
IEC 117	— Recommended graphical symbols.

Any other units, symbols and terminology peculiar to one of the components covered by this specification shall be taken from the relevant IEC or ISO document listed in **2.1**.

2.2.2 Classification of switches

For the purpose of this specification, switches are classified according to mode of operation of the actuator. Each class or sub-class of switch may be covered by a BDS.

a) **Lever (toggle) switch.** A switch having an actuator in the form of a protruding lever whose movement about an axis parallel to the face of the switch from which it emerges results in the connection or disconnection of the switch terminations in a specified manner.

1) **Rocker switch.** A sub-class of lever switch in which the actuator takes the form of a low profile member rocking about an axis parallel to the face of the switch in which it appears.

2) **Joystick switch.** A sub-class of lever switch in which the lever is able to move freely within a cone whose axis is perpendicular to the mounting face, and which actuates two switch circuits each relating to movement around one or two mutually perpendicular axes.

b) **Rotary switch.** A switch actuated by a rotary motion which results in the connection or disconnection of the switch terminations in a specified manner.

1) **Thumbwheel (edge-mounted) switch.** A sub-class of rotary switch in which the axis of rotation is parallel to the face from which the actuator emerges, the actuator consisting of a disc which is rotated by manual contact with its edge.

2) **Key activated switch.** A sub-class of rotary switch in which the actuator is a mechanically coded key. The key may be removable at one or more operating positions of the switch.

c) **Sensitive switches (microswitches).** A switch having a snap action mechanism which is operated by the movement of an actuator with a defined force through a defined travel. The travel required at the operating point is small. The resulting indirect contacting action may be such that the speed of the contacting is independent of the speed of the actuation.

d) **Push button switch.** A switch in which the longitudinal movement of the actuator perpendicular to the face of the switch from which it emerges results in the connection or disconnection of the switch terminations in a specified manner.

1) **Keyboard.** A sub-class of push-button switch in which the switches are arranged in a two-dimensional array, and are mechanically independent. The action is normally short and light to facilitate rapid actuation by finger-tip.

2) **Keypad.** A sub-class of keyboard in which the number of keys is generally restricted to no more than a 4×4 array and in which actuation is by very short travel.

3) **Matrix switch.** A sub-class of push-button switch in which the switches are arranged in two-dimensional array, with specific latching and interlocking provisions.

4) **Multicell switch.** A sub-class of push-button switch in which modular construction permits switches to be arranged in a linear array, with provision for latching and interlocking facilities.

5) **Piano-key switch.** A sub-class of multicell switch in which the longitudinal movement of the mechanism of each cell is activated by the pivotal movement of an actuator about an axis co-linear with the array.

e) **Slide switch.** A switch in which the movement of the actuator parallel to the face of the body from which it emerges results in the connection or disconnection of the switch terminations in a specified manner.

f) **Non-manually activated switch.** A switch which operates in response to changes in an environmental parameter to which its sensing element is exposed, and not in response to mechanical movement of a primary actuator.

1) **Temperature-activated switch.** A sub-class of non-manually activated switch in which the switch is controlled by variations of temperature, and whose contacts connect or disconnect the switch terminations in a specified manner when the temperature of the ambient space in which its sensing element is placed or the temperature of the surface on which it is fixed reaches a predetermined value.

2) **Pressure-activated switch.** A sub-class of non-manually activated switch in which the switch is controlled by variations of fluid (liquid or gas) pressure, and whose contacts connect or disconnect the switch terminations in a specified manner when the pressure to which its sensing element is exposed reaches a predetermined value.

g) **Membrane switch.** A switch the actuator of which is a membrane. Longitudinal movement of the actuator perpendicular to the face of the switch results in the connection or disconnection of the switch terminals in a specified manner.

1) **Button actuated membrane.** A sub-class of membrane switches in which the auxiliary actuator is independent of the membrane switch.

2) **Keyboard/key pad membrane.** A sub-class of membrane switches comprising a panel in which individual switches are arranged in a two dimensional array and are mechanically independent.

2.2.3 General terminology

Definitions not given below are to be taken from chapter 581 of IEC 50.

a) **Type.** A type comprises products having similar design features (exclusive of any mounting accessories, provided that they have no significant effect on test results) and falling within the manufacturer's usual range of ratings for such a design.

b) **Style.** A particular switch within a type to be defined by the BDS for the purpose of grouping switches for inspection.

c) **Contact resistance.** The total resistance through the switch when measured between two terminations whose internal contacts, when closed, complete a circuit.

d) **Cycle of operation.** Movement of the switching mechanism by means of the actuator, from one extreme position through all other positions, and returning in the reverse sequence to the original extreme position.

e) **Position.** A setting of the switch which results in a particular circuit condition.

f) **Rated voltage.** The maximum value of voltage applied between pairs of switch contacts or between switch contacts and any mounting arrangement at which specified requirements will be met under defined conditions.

g) **Maximum and minimum switch voltage — (see note).** The maximum and minimum values of open circuit voltage applied to the switch contacts at which specified requirements will be met under defined conditions.

h) **Maximum and minimum switch current — Making (see note).** The maximum and minimum value of current carried by the switch contacts at contact closure or within a specified period following contact closure at which the switch will meet specified requirements under defined conditions.

i) **Maximum switched current — breaking (see note).** The maximum value of current interrupted by the switch contacts at which the switch will meet specified requirements under defined conditions.

j) **Maximum carrying current (see note).** The maximum value of current carried continuously by the switch contacts at which the switch will meet specified requirements under defined conditions.

k) **Maximum and minimum switched power (see note).** The maximum and minimum values of the product of open circuit voltage and closed circuit made or broken by the switch contacts at contact closure or contact opening at which the switch will meet specified requirements under defined conditions.

NOTE Electrical ratings defined in g), h), i), j) and k) may not be independent of one another.

l) **Clearance.** The shortest distance in air between conductive parts with the switch in a defined setting.

m) **Creepage distance.** The shortest distance along the surface of insulation between conductive parts with the switch in a defined setting.

n) **Change-over contacts.** A set of contacts in which the connection of one (common) contact with two others is opened with one and closed with another as a consequence of movement of the actuator.

o) **Solvent seal.** A seal incorporated in a switch to prevent the ingress of solvents.

p) **Hermetically-sealed switch.** A switch which is completely protected in itself against the ingress of moisture or gases.

q) **Non-sealed switch.** A switch having no seal against the ingress of moisture or gases.

r) **Contact set.** A group of contacts which all function in relation to the same pole of a switch.

s) **Operating force.** The force necessary to move the actuator of a switch from any one position to the next.

t) **Operating torque.** The torque necessary to rotate the actuator of a switch from any one position to the next.

u) **Tactile.** Where the switch has a designed feature to give a sensory feed back on actuation.

v) **Non tactile.** Where the switch has no designed features to give a sensory feed back on actuation.

2.3 Standard and preferred values

2.3.1 Preferred climatic categories

The following groups apply to operating environments only, and not to storage conditions:

10/070/04	25/085/21	40/100/21	55/125/21
40/070/21	40/085/10	40/100/56	55/125/56
40/070/56	40/085/21	55/100/56	
	40/085/56		
	55/085/56		

2.3.2 Environmental test severities

Shock test Ea IEC 68-2-27:1972

294 m/s² (30 g) 18 ms

490 m/s² (50 g) 11 ms

981 m/s² (100 g) 6 ms

The number of shocks in each plane shall be prescribed in the detail specification.

Bump test Eb IEC 68-2-29:1968

Acceleration:	98 m/s ² (10 g)
	245 m/s ² (25 g)
	390 m/s ² (40 g)

Number of bumps:	1 000 ± 10
	4 000 ± 10

Duration of each bump:	6 ms
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Vibration test Fc IEC 68-2-6:1970

10 Hz – 55 Hz	)	
10 Hz – 150 Hz	)	Displacement 0,75 mm
10 Hz – 500 Hz	)	Acceleration 98 m/s ² (10 g)
10 Hz – 2 000 Hz	)	

Duration shall be prescribed in the detail specification.

Acceleration test Ga IEC 68-2-7:1968

98 m/s ² (10 g)
196 m/s ² (20 g)
490 m/s ² (50 g)
981 m/s ² (100 g)

Duration shall be prescribed in the detail specification.

Low air pressure test M IEC 68-2-13:1966

70,0 kPa	(700 mbar)
65,0 kPa	(650 mbar)
30,0 kPa	(300 mbar)
8,5 kPa	(85 mbar)
2,0 kPa	(20 mbar)
1,0 kPa	(10 mbar)

2.3.3 Endurance test severities

100 cycles	20 000 cycles	10 000 000 cycles
500 cycles	50 000 cycles	50 000 000 cycles
1 000 cycles	100 000 cycles	100 000 000 cycles
5 000 cycles	200 000 cycles	
10 000 cycles	1 000 000 cycles	
	5 000 000 cycles	

2.3.4 Switching

Maximum switched voltage, a.c. or d.c.

5 V	25 V	125 V
6,3 V	32 V	160 V
8 V	40 V	200 V
10 V	50 V	250 V
12,5 V	63 V	320 V
16 V	80 V	400 V
20 V	100 V	500 V

Rated voltage, a.c. or d.c.

As maximum switched voltage, above.

Maximum switched current, a.c. or d.c.

16 mA	250 mA	4 A
25 mA	400 mA	6,3 A
40 mA	630 mA	10 A
63 mA	1 A	16 A
100 mA	1,6 A	25 A
160 mA	2,5 A	

Maximum switched power, a.c. or d.c.

0,1 VA	1 VA	10 VA	100 VA	1 kVA
0,16 VA	1,6 VA	16 VA	160 VA	1,6 kVA
0,25 VA	2,5 VA	25 VA	250 VA	2,5 kVA
0,4 VA	4 VA	40 VA	400 VA	4 kVA
0,63 VA	6,3 VA	63 VA	630 VA	6,3 kVA

2.3.5 Preferred values of minimum insulation resistance

1 MΩ	1 GΩ	1 TΩ
10 MΩ	10 GΩ	
100 MΩ	100 GΩ	

2.3.6 Preferred values of maximum contact resistance

2 mΩ	200 mΩ	20 Ω	10 KΩ
5 mΩ	500 mΩ	50 Ω	
10 mΩ	1 Ω	100 Ω	
20 mΩ	2 Ω	200 Ω	
50 mΩ	5 Ω	500 Ω	
100 mΩ	10 Ω	1 kΩ	

2.4 Marking

Where space permits after mandatory national or contractual marking requirements (for example, safety requirements) have been satisfied, each switch shall be clearly and indelibly marked with the information listed below in the indicated recommended order of preference.

- a) Number of the detail specification/type
- b) Manufacturer's name and/or trade mark
- c) Terminal identification
- d) Date code.

The package shall be marked with a), b) and d) above and with any special marking prescribed in the detail specification. When required, the switch and/or package may be marked with additional information (for example, customer's reference number).

2.5 Safety requirements

If there are relevant safety standards which have been harmonized, then reference shall be made to such safety standards in the detail specification.