

Specification for

Push-button switches of assessed quality: generic data and methods of test; general rules for the preparation of detail specifications

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Foreword

This British Standard, which has been prepared under the direction of the Electronic Components Standards Committee is the generic specification for push-button switches in the system of standards for electronic components.

The revision is necessary in the light of changes in test requirements for switches for electronic equipment.

This standard calls for the use of substances and/or test procedures that may be injurious to health if adequate precautions are not taken.

It refers only to technical suitability and in no way absolves either the supplier or user from statutory obligations relating to health and safety at any stage of manufacture or use.

When references are given in parentheses to IEC publications of the International Electrotechnical Commission (IEC) the standards are usually identical in technical content, apart from minor deviations, with the British Standard quoted or with this British Standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 24 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Section 1. Principles and mandatory procedures

1.1 General matters

1.1.1 Scope

This British Standard specifies requirements and methods of test for push-button switches of assessed quality for use primarily in equipment for telecommunications and in electronic devices employing similar techniques.

It also prescribes rules for the preparation of detail specifications.

Switches covered by this specification have a rated voltage not exceeding 500 V (d.c. or a.c. r.m.s.) or a rated current not exceeding 25 A.

1.1.2 Related documents

BS 245, *Specification for mineral solvents (white spirit and related hydrocarbon solvents) for paints and other purposes.*

BS 308, *Engineering drawing practice.*

BS 415, (IEC 65) *Safety requirements for mains-operated electronic and related apparatus for household and similar general use.*

BS 575, *Carbon tetrachloride.*

BS 580, *Trichloroethylene.*

BS 1376, *Colours of light signals.*

BS 1991, *Letter symbols, signs and abbreviations — Part 6: Electrical science and engineering.*

BS 2011, (IEC 68) *Basic environmental testing procedures.*

BS 3763, *The International System of units (SI).*

BS 3939, *Graphical symbols for electrical power, telecommunications and electronics diagrams — Sections 15 to 19.*

BS 3955, *Electrical controls for domestic appliances.*

BS 4000, *Sizes of papers and boards.*

BS 4099, *Specification for colours of indicator lights, push buttons, annunciators and digital readouts.*

BS 4727, *Glossary of electrotechnical, power, telecommunication, electronics, lighting and colour terms.*

BS 5772, *Specification for electromechanical components for electronic equipment: Basic testing procedures and measuring methods — Part 2: General examination, electrical continuity and contact resistance tests, insulation tests and voltage stress tests.*

BS 6000, *Guide to the use of BS 6001. Sampling procedures and tables for inspection by attributes.*

BS 6001, *Sampling procedures and tables for inspection for attributes.*

BS 9000, *General requirements for electronic components of assessed quality.*

PD 9002, BS 9000 *Component selection guide.*

PD 9004, BS 9000, *CECC and IECQA — UK Administrative Guide. Procedures for the national implementation of quality assessment systems for electronic components.*

NOTE The attention of users is drawn to the need to comply with safety requirements given in any equipment specifications (e.g. BS 415).

1.1.3 Terminology

For the purposes of this British Standard, the following terms and their definitions are applicable, in addition to those given in BS 4727.

1.1.3.1 Push-button switches

1.1.3.1.1

basic single cell

an assembly consisting of a button, a mechanical system, a switching element and possibly an associated lamp or light source

1.1.3.1.2

multi-cell

an assembly containing two or more basic single cells, each of which may have any of the mechanical systems. The assembly may have the basic single cells stacked in both horizontal and vertical directions. Interaction may be mechanical and/or electromagnetic

1.1.3.1.3

assembly

- a) A *frame assembly* consists of one row of single cells and a specified method of mounting.
- b) A *matrix assembly* consists of two or more rows of single cells and a specified method of mounting.

1.1.3.1.4

fixing supports

the points of attachment for either a frame or a matrix assembly to a panel or mounting plate

1.1.3.2 Buttons

1.1.3.2.1

push-button

a control device that moves under manual pressure generally in the direction of the axis of the button

1.1.3.2.2

illuminated button

a button that has associated with it a lamp or lamps that can give a visual indication by illumination. The lamp circuitry or light source may be related to, or independent of, the button action

1.1.3.2.3**piano key button**

a button that is generally actuated by a movement of rotation about a distant axis as with a piano key

1.1.3.2.4**rocker button**

a button actuated by a movement of rotation about a frontal axis adjacent to the button and such that there are two or more positions

1.1.3.2.5**button operation**

the movement of a button to the full extent of its permissible travel when a defined force is first applied and then removed

1.1.3.2.6**button positions**

the points of rest (including non-locking) that the button may occupy

- a) *normal position*. The position that the button assumes when no force has been exerted on it.
- b) *depressed position*. The position assumed by the button when a manual force is exerted on it (1.1.3.3.8) or has been exerted on it (1.1.3.3.7), resulting in its displacement.

1.1.3.3 Mechanical (and electromagnetic) systems and related button actions**1.1.3.3.1****basic mechanical system**

a device ensuring the transmission of the button movement to the part carrying the moving contacts

1.1.3.3.2**inter-dependent mechanical system**

a mechanical system used with two or more basic cells such that the operation of the button causes the tripping of another

NOTE The term applies to grouped cells. A complete push-button switch may comprise several distinct groups of interdependent basic cells. The above definition is valid only within the same group.

1.1.3.3.3**independent mechanical system**

a mechanical system used with one basic cell the button of which, when subjected to the normal manual operation, has no effect on other basic cells; similarly other basic cells, when actuated, have no effect on the independent basic cell. Locking and non-locking types are included

1.1.3.3.4**locking mechanical system**

a mechanical system such that the operation of a button locks a given number of other buttons in either the depressed position or the normal position

1.1.3.3.5**blocked mechanical system**

a mechanical system preventing the operation of more than one button at a time

1.1.3.3.6**accumulative latching mechanical system**

a mechanical system such that any number of buttons will remain operated until a separate cancelling button is operated

1.1.3.3.7**double pressure mechanical system (push-push)**

a mechanical system such that the button attains a position at first pressure, is retained there after the removal of that pressure, and is disengaged when the pressure is again applied and removed

1.1.3.3.8**single pressure mechanical system (momentary)**

a mechanical system such that the button attains a position at first pressure and returns to its original position on the removal of that pressure

1.1.3.3.9**single pressure maintained mechanical system**

a mechanical system such that the button attains a position at first pressure and returns to its original position on the removal of that pressure, leaving the internal mechanism and contacts in the operated condition. Repeating the application and removal of the pressure on the button releases the mechanical system and the contacts to their original positions

1.1.3.3.10**sequence systems**

mechanical interlocking systems of multi-cell switches whereby the operation of prescribed button(s) may prevent the operation and/or release the locking mechanism of other cells

NOTE The system should be described in the detail specification.

1.1.3.4 Electrical ratings and characteristics**1.1.3.4.1****rated voltage and rated current**

the voltage and current specified in the detail specification

1.1.3.4.2**transit time**

the time interval between the instant when the moving contact leaves one fixed contact and the instant when it reaches the other fixed contact. For multiple moving contacts in a single basic cell, transit time is calculated from the first break to the last make

1.1.3.5 Seals**1.1.3.5.1****panel seal (or seals)**

a seal (or seals) incorporated in the design of a switch that permits the switch to be mounted and operated on the panel of a sealed enclosure without impairing the sealing of the enclosure

1.1.3.5.2**solvents seal**

a seal incorporated in the design of a switch to prevent the ingress of solvents

1.1.3.5.3**hermetically sealed switch**

a switch that is completely protected in itself against the ingress of moisture or gases

1.1.3.5.4**non-sealed switch**

a switch having no seal against the ingress of moisture or gases

1.1.3.6**sub-assembly**

the permanent assembly of two or more piece parts

1.1.4 Letter symbols, signs and abbreviations

The letter symbols, signs and abbreviations shall be in accordance with BS 1991-6 where applicable.

1.1.5 Graphical symbols

Where applicable, the symbols defined in BS 3939:Section 15 shall be used. A guide to the presentation of drawing information is included as Appendix A.

1.1.6 Marking of the component and package

Whenever practicable, each switch shall be marked with the termination identification and, where space permits, the following information shall be clearly and legibly marked on each switch in the following order of preference:

- a) the manufacturer's identity;
- b) the date code;
- c) the number of the detail specification.

The package shall be marked with a), b) and c) together with the lot identification and also with any special marking invoked on the detail specification. When called for in the contract, the switch and/or package shall be marked with additional information, e.g. the customer's reference number.

1.1.7 Eligibility for qualification approval

To qualify for eligibility, a manufacturer shall ensure that the final assembly of individual piece parts and/or sub-assemblies to produce the complete switch assembly is carried out under the direct surveillance of an approved quality manager.

1.1.8 Structurally similar components

For the purposes of sampling inspection, switches of the same style may be grouped in common lots provided that the following requirements are satisfied.

- a) All switches considered to be part of one lot should have been produced with essentially similar processes and materials.
- b) Whenever possible, the lots shall contain due proportions of the differently identified switches.
- c) The grouping should meet the approval of the supervising inspectorate.

No distinction shall be made between switches on the extent of the testing of switches that may be grouped for sampling inspection purposes, but the limits applicable to any identifiable switch shall still apply. Where grouping has been carried out in this manner, the failure of the sample to meet the required AQL shall cause the rejection of all the lots from which grouping was made, regardless of the cause of failure.

1.1.9 Delayed delivery

Unless otherwise stated in the detail specification, switches held by a manufacturer or an approved stockist for a period exceeding one year after acceptance testing shall be re-examined prior to despatch and shall satisfy the group A inspection requirements, as specified in the relevant detail specification. The maximum allowable period specified in the detail specification shall be 3 years.

1.1.10 Procedures for qualification approval

The procedure to be used for qualification approval shall be either that given in clause 14 of BS 9000-1:1981, or, alternatively, subject to the agreement of the supervising inspectorate, by using a prescribed series of tests and a fixed sample size specified in 2.2 and Table 3 and Table 4.

1.1.11 Certified test records

1.1.11.1 The results of specified tests from the A, B, C and D groups shall be summarized and presented in the form of a certified test record (CTR). Details of the information required and the method of presentation are given in 2.3. An example of a certified test record is shown in Appendix B.

Certified test records are required for switches at the full assessment level and the full plus additional assessment level. They are not required for switches at the basic assessment level.

1.1.11.2 When the relevant detail specification requires that attributes information shall be recorded, the following procedures shall be used.

- Where a subgroup comprises a single conditioning test, the total number of rejected switches shall be recorded without reference to the parameter for which the rejection was made.
- Where a subgroup comprises a number of conditioning tests, the relevant detail specification shall state whether the result shall be recorded for the individual conditioning tests or for a number of them as a group.

1.1.12 Standard values of ratings and characteristics

Ratings and characteristics shall, wherever possible, be taken from the preferred list in **1.1.12.1**. If additional ratings and characteristics are included in the detail specification, the values and conditions under which they apply shall be stated. Any interdependence of ratings and characteristics, and any limiting conditions of use, shall be stated.

1.1.12.1 Preferred electrical ratings. Selection shall preferably be made from the following values:

- Voltage (a.c. r.m.s. and d.c.)
50 mV, 5 V, 30 V, 50 V, 70 V, 125 V, 250 V, 380 V, 500 V
- Current
10 mA, 25 mA, 50 mA, 500 mA, 1 A, 2 A, 3 A, 6 A, 10 A, 16 A, 25 A.

1.1.12.2 Environmental categories. Preferred groups as defined in the appendix of BS 2011-1.1:1977 (IEC 68-1):

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

1.1.12.3 Environmental test severities. Preferred values:

- Shock.* [BS 2011-2.1Ea:1977 (IEC 68-2-27:1972)]

294 m/s ² (30 g _n),	18 ms
490 m/s ² (50 g _n),	11 ms
980 m/s ² (100 g _n),	6 ms

- Bump.* (BS 2011-2.1Eb:1977) (IEC 68-2-29:1968)

390 m/s ² (40 g _n),	6 ms 1 000 ± 10 bumps
390 m/s ² (40 g _n),	6 ms 4 000 ± 10 bumps

- Vibration (sinusoidal).* [BS 2011-2.1Fc:1977 (IEC 68-2-6:1970)]

10 Hz to 150 Hz	Displacement of 0.75 mm or acceleration 98 m/s ² (10 g _n)
10 Hz to 500 Hz	
10 Hz to 5 000 Hz	

- Acceleration, steady state.* [BS 2011-2.1Ga:1977 (IEC 68-2-7:1968)]

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

- Low air pressure.* [BS 2011-2.1M:1977 (IEC 68-2-13:1966)]

Pressure	Approximate altitude
30 kN/m ² (300 mbar)	8 500 m
8.5 kN/m ² (85 mbar)	16 000 m
4.4 kN/m ² (44 mbar)	20 000 m
1.0 kN/m ² (10 mbar)	31 000 m

1.1.12.4 Endurance test severities

- Selection shall preferably be made from the following values for the number of operations per button (or latchbar):

20 000
50 000
100 000
300 000
500 000
1 000 000
1 500 000

- Selection shall preferably be made from the following values for the number of hours at high temperature:

250 h
500 h
1 000 h
2 000 h

1.1.12.5 Preferred resistance values. Selection shall preferably be made from the following values.

- Minimum value of insulation resistance:
10 MΩ, 30 MΩ, 50 MΩ, 100 MΩ, 500 MΩ, 1 000 MΩ, 5 000 MΩ, 10 000 MΩ.

- Maximum initial values of contact resistance (expressed as the total resistance through the switch when measured between two terminations whose internal contacts complete a circuit):

2 mΩ, 5 mΩ, 10 mΩ, 20 mΩ, 50 mΩ, 100 mΩ, 200 mΩ, 500 mΩ.
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1.1.12.6 Colours of light signals. The selection of colours of lenscaps and filters shall be made using Table 1 of BS 1376:1974 as a guide.