

Specification for

Lever operated switches of assessed quality: generic data and methods of test; general rules for the preparation of detail specifications

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- Electricity Supply Industry in England and Wales
- Electronic Components Industry Federation*
- Institution of Electronic and Radio Engineers
- Ministry of Defence
- National Supervising Inspectorate
- Post Office*
- Society of British Aerospace Companies Limited*
- Telecommunication, Engineering and Manufacturing Association (TEMA)

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

- Association of Control Manufacturers (Tacma) (BEAMA)
- Electronic Engineering Association

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Foreword

This revised British Standard, which has been prepared under the direction of the Electronic Components Standards Committee, is the generic specification for lever operated switches in the system of standards for electronic components of assessed quality.

This standard specifies 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 the user from statutory obligations relating to health and safety at any stage of manufacture or use.

When references to IEC Publications are given in parentheses, the recommendations are usually identical in technical content, apart from minor deviations, with the British Standard quoted or with this specification.

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 20 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 standard specifies requirements and methods of test for manually operated lever switches of assessed quality for use primarily in equipment for telecommunications and in electronic devices employing similar techniques, including switches for connecting to the supply mains.

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

Switches are sub-divided depending upon:

- a) assessment level (see 5.12 of BS 9000-1);
- b) dimensions;
- c) type of operation or construction.

NOTE This standard should be read in conjunction with BS 6001, BS 9000, PD 9002 and any other relevant specification.

General rules for drafting detail specifications for use by BSI Technical Committees or by components manufacturers are given in section 2.

1.1.2 Related documents

BS 308, *Engineering drawing practice*.

BS 415, (IEC 65) *Safety requirements for mains-operated household sound and vision equipment*.

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*.

BS 4000, *Sizes of papers and boards*.

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

BS 5772, *Specification for electrotechnical 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 by attributes*.

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

BS 9003, *Requirements for the manufacture of electronic components of assessed quality intended for long life applications*.

PD 9002, *BS 9000 component selection guide*.

NOTE The attention of users is drawn to the need to comply with safety requirements given in any equipment specification, 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

contact resistance

the total resistance through the switch measured between two terminations whose internal contacts complete a circuit

1.1.3.2

cycle of operation

this consists of moving the lever from one end position through all other positions and returning to the initial end position

1.1.3.3

hermetically-sealed switch

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

1.1.3.4

lever operated switch

a switch that has a lever, the manual movement of which results either directly or indirectly in the connection or disconnection of the switch terminals in a specified manner

1.1.3.5

non-sealed switch

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

1.1.3.6

operation

a change brought about by the manual movement of the switch lever whereby a series of switching conditions is changed from one set of conditions to another

NOTE The extent and precise nature of the change will be as specified in the relevant detail specification.

1.1.3.7

panel seal (or seals)

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

1.1.3.8**position**

a setting of the lever which results in a particular circuit condition. The position of the lever may be held for as long as the operating force is applied, or maintained after the operating force has been removed

1.1.3.9**rated voltage and rated current**

the voltage and current specified in the detail specification

1.1.3.10**solvent seal**

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

1.1.3.11**termination**

that part of the switch intended for the connection of external circuits

1.1.3.12**test voltage**

the voltage applied between a terminal and a given reference point

1.1.3.13**volt-ampere (VA) rating**

the product of rated voltage and rated current which is used to define the primary capability of a lever switch

1.1.3.14**style**

switches having similar design features

1.1.3.15**pattern**

switches of one style which are specified in an individual detail specification

1.1.3.16**type**

a particular version of a pattern

1.1.4 Letter symbols, signs and abbreviations

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

1.1.5 Graphical symbols

The graphical symbols shall be in accordance with BS 3939 where applicable.

1.1.6 Marking of the component and package

Wherever practicable, each switch shall be clearly and indelibly marked with the following information in this order of preference:

- a) the number of the detail specification;

- b) the manufacturer's identity;

- c) the date code;

- d) identification of terminations.

The minimum marking on the package shall be a), b) and c) above. When called for in the contract the switch and/or package shall be marked with additional information, e.g. 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 part assemblies to produce the complete switch assembly is carried out under the direct surveillance of an approved chief inspector.

1.1.8 Structurally similar components

For the purpose of sampling inspection, switches may be grouped in common lots provided that they are covered by the same detail specification and meet the following requirements:

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

No distinction shall be made on the extent of the testing of switches which 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 the 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 given in the detail specification. The maximum allowable period specified in the detail specification shall be 3 years.

1.1.10 Procedure for qualification approval

The procedure to be used for qualification approval shall be either that given in clause 14 of BS 9000-1, or alternatively, subject to the agreement of the supervising inspectorate, by using a prescribed series of tests and a fixed sample size specified in Table 2 and Table 4 of this standard.

1.1.11 Certified test records

1.1.11.1 The results of specified tests in groups A, B, C and D 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 and an example of a certified test record is shown in Appendix A.

Certified test records are required for switches at the full assessment level but not for switches at the basic assessment level.

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

- a) 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;
- b) where a subgroup comprises a number of conditioning tests, the 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, whenever possible, be taken from the preferred list given below. If additional ratings and characteristics are included in 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 also be stated.

1.1.12.1 Environmental categories. Selection shall preferably be made from the following groups (see the appendix to BS 2011-1.1:1971) (IEC 68-1):

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

1.1.12.2 Environmental test severities.

Selection shall preferably be made from the following values:

- a) *Shock* (BS 2011-2.1Ea:1977) (IEC 68-2-27:1972)
490 m/s² (50g_n), 11 ms
980 m/s² (100g_n), 6 ms

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

390 m/s² (40g_n), 6 ms 1 000 ± 10 bumps

390 m/s² (40g_n), 6 ms 4 000 ± 10 bumps

- c) *Vibration* (BS 2011-2.1Fa:1977) (IEC 68-2-6:1970)

10 Hz to 150 Hz Displacement 0.75 mm
10 Hz to 500 Hz Acceleration 98 m/s² (10g_n)
10 Hz to 5 000 Hz

- d) *Acceleration* (BS 2011-2.1Ga:1977) (IEC 68-2-7:1968)

98 m/s² (10g_n)

196 m/s² (20g_n)

490 m/s² (50g_n)

980 m/s² (100g_n)

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

30 kN/m² (300 mbar)

8.5 kN/m² (85 mbar)

4.4 kN/m² (44 mbar)

1.0 kN/m² (10 mbar)

1.1.12.3 Endurance test severities. Selection shall preferably be made from the following values:

- a) *Electrical endurance.* Resistive/inductive/lamp load under standard atmospheric conditions (BS 2011-1.1:1977) (IEC 68-1):

5 000 cycles
10 000 cycles
20 000 cycles
50 000 cycles

- b) *High temperature endurance.* Resistive load:
5 000 cycles

1.1.12.4 Standard ratings. Selection shall preferably be made from the following values:

- a) *Voltage.* 30 V, 50 V, 70 V, 125 V, 250 V, 380 V, 500 V (a.c., r.m.s. or d.c.).

- b) *Current.* 15 mA, 50 mA, 500 mA, 1 A, 2 A, 3 A, 6 A, 10 A, 16 A, 25 A.

- c) *Volt-ampere ratings.* 7.5 VA, 10.0 VA, 50.0 VA, 100.0 VA, 125 VA, 250 VA, 500 VA, 750 VA, 1 000 VA, 1 250 VA, 2 500 VA, 5 000 VA.