

OBSOLESCENT
NOVEMBER 1998

Specification for

Lever-operated manual switches for aircraft

UDC 629.7.064.5:621.316.542.1

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Foreword

This British Standard specifies requirements for future designs and manufacture of lever-operated manual switches; it combines and revises the requirements specified in BS G 194 and BS G 200. Those two standards will not be withdrawn, however, until switches manufactured to those standards are no longer used.

The standard specifies performance requirements, defines preferred dimensions and fixing holes. Switches are classified according to the environmental conditions for which they are suitable.

The tests, which are grouped as type tests, production acceptance tests and quality assurance tests, include a test of the force required to operate the switch and recommends suitable tests for verifying the serviceability of the switches after storage or use.

Account has been taken in this standard of the requirements in International Standards ISO 493 and ISO 1466.

References to BS 2G 100 have been revised to the relevant parts of BS 3G 100 and certain other amendments effected in the interests of clarity.

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.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 15 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.

Amendments issued since publication

Amd. No.	Date of issue	Comments
2711	June 1978	Indicated by a sideline in the margin

This British Standard, having been prepared under the direction of the Aerospace Standards Committee, was published under the authority of the Executive Board on 30 June 1978

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The following BSI references relate to the work on this standard:
Committee reference ACE/43
Draft for comment 76/77633 DC

ISBN 0 580 10025 1

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1 Scope

This British Standard specifies the requirements for two basic sizes (A and B) of single-hole fixing, lever-operated manual switches for use in nominal 28 V d.c. and 115/200 V three-phase, 400 Hz a.c. systems in aircraft.

Two classes of environmentally sealed switches in each basic size are specified as follows.

- Class 1.* Switches suitable for high altitude and wide temperature conditions.
- Class 2.* Switches suitable for lower altitudes and narrower temperature conditions than class 1 switches.

2 References

The titles of the standards publications referred to in this standard are listed below.

BS 410, *Test sieves.*

BS 2011, *Basic environmental testing procedures — Part 2 Ea. Test Ea. Shock.*

BS 4760, *Numbering of weeks.*

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

BS 2G 100, *General requirements for electrical equipment and indicating instruments for aircraft — Part 2:1962 Environmental and operating conditions — Paragraph 213. Leakage tests for hermetically sealed equipment.*

BS 3G 100, *General requirements for equipment for use in aircraft.*

- *Part 0: Introduction;*
- *Part 1: Identification and declarations;*
- *Part 2: All equipment;*
- *Section 1: Construction;*
- *Section 3: Environmental conditions;*
- *Subsection 3.1 Vibration;*
- *Subsection 3.2 Temperature-pressure requirements;*
- *Subsection 3.3 Mould growth;*
- *Subsection 3.5 Explosion-proofness;*
- *Subsection 3.6 Acceleration requirements;*
- *Subsection 3.7 Tropical exposure;*
- *Subsection 3.8 Salt mist;*
- *Subsection 3.12 Fluid contamination;*
- *Part 3: Characteristics of aircraft electrical systems;*
- *Part 4: Electrical equipment;*
- *Section 1 Construction and general;*

— *Subsection 1.1 Electrical insulation tests.*

BS G 176, *Cartridge fuses for aircraft.*

BS 3G 178, *Crimped joints for aircraft electrical cables and wires.*

BS G 216, *Hand operated, thermally compensated, miniature single- and triple-pole circuit breakers.*

ISO 493, *Aircraft — Dimensions for single-hole mounting (Class 1 and Class 2) lever-operated manual switches¹⁾.*

ISO 1466, *Lever-operated manual switches for aircraft — Performance requirements¹⁾.*

3 General requirements

3.1 Description and design requirements

3.1.1 The switches shall comply with the requirements of this British Standard.

3.1.2 The switches shall be suitable for one of the following temperature and altitude classifications.

Class 1. Switches that are sealed and suitable for use at altitudes up to 21 300 m and for temperatures within the range -54°C to $+85^{\circ}\text{C}$; they shall not suffer damage nor deterioration when subjected to temperatures within the range -54°C to -62°C (non-operating), and shall be suitable for occasional operation within the temperature range $+85^{\circ}\text{C}$ to $+120^{\circ}\text{C}$.

Class 2. Switches that are only sealed at the lever bush and suitable for use at altitudes up to 6 100 m at temperatures within the range -40°C to $+85^{\circ}\text{C}$ and for occasional use at 21 300 m.

3.1.3 The switches shall be suitable for mounting through the panel from the rear and shall operate satisfactorily when mounted in any attitude.

3.1.4 The switches may be the two- or three-position type, with one or more poles: they may be self-retaining and/or spring return with or without lever locking.

3.1.5 The method of operation of the switch shall be by means of a single lever, moving in a plane at right angles to the mounting panel. The relationship of the lever positions to the keyway shall be as shown in Figure 1, and the relationship of the terminal numbers to the lever positions 1, 2 and 3 shall be as stated in the individual specification.

3.1.6 The switch terminals shall be identified by number in the sequence shown in the individual specification.

¹⁾ Referred to in foreword only.

3.2 Rating

3.2.1 Voltage. The switches shall be suitable for operating in nominal 28 V d.c. and 115/200 V three-phase, 400 Hz a.c. systems having the characteristics specified in BS 3G 100-3. In addition, the switch shall be suitable for use at voltages down to 4 V d.c. or a.c.

3.2.2 Current. The switches shall be suitable for all of the following normal current ratings.

Load	Size A	Size B
a) Resistive	15 A	5 A
b) Inductive	10 A	3 A
c) Lamp (28 V d.c.)	7.5 A	2.5 A
d) Lamp (200 V a.c.)	2.5 A	1.5 A
e) Low power (4 V)	0.01 A	0.01 A

Inductive loads shall be as follows:

28 V d.c.: 40 mH

115/200 V a.c.: 0.75 power factor lagging

3.3 Declarations. In addition to the declarations required by BS 3G 100-1, the manufacturer shall declare:

- the classification;
- the limits of the forces necessary to operate the switch to any position;
- the system of batching used for quality test sampling;
- the switch operation relative to the lever position, the keyway and the terminal numbering.

3.4 Marking

3.4.1 In addition to the terminal numbering, the following minimum information shall be clearly and indelibly marked on each switch:

- BS G 224 and classification, indicating compliance with the requirements of this standard;
- the manufacturer's name or identification;
- the manufacturer's type number;
- resistive current rating;
- voltage rating (d.c. and a.c.);
- date code (see 3.4.2).

3.4.2 Each switch shall be marked with a code indicating the date of manufacture. The first number in the code shall be the last two digits in the number of the year. The second number shall consist of two digits indicating the calendar week of the year; when the calendar week consists of a single digit, it shall be preceded by a zero. Week 01 is defined as the first week containing four days or more of the new year. In accordance with BS 4760 the first day of the week is taken as Monday and week 01 is the week containing the first Thursday in January. Reading from left to right or from top to bottom, the code shall designate the year and the week in that order.

4 Particular requirements

4.1 Operation

4.1.1 The switch lever action shall be positive and it shall not be possible during normal usage for the lever to stay in any position other than a fully-operated position. The operation of the switch shall not be affected adversely by the speed of movement of the lever.

4.1.2 It shall not be possible to rotate the lever about its longitudinal axis.

4.1.3 The angular movement of the lever shall be $20 \pm 2^\circ$ from the central position.

4.1.4 There shall be a minimum of 8° movement and a maximum of 16° movement of the lever before switching occurs. In multipole switches the contact opening mechanism shall be mechanically linked so that the remaining poles operate within 2° movement following the initial contact change.

4.1.5 The lever shall be capable of withstanding without damage or distortion a force of 90 N applied steadily in the directions specified in 6.9.2.

4.2 Construction

4.2.1 The lever, including any metal inserts, shall be insulated from all live parts.

4.2.2 The force required to operate the switch shall be not less than 4.5 N and not more than 45 N. For each operation of a particular type of switch, the maximum force shall not exceed the minimum force by more than 100 %. The manufacturer shall declare the maximum and minimum values of the force for each operation appropriate to each type of switch.

4.2.3 Where locking of the lever is provided, it shall be positive and automatic, and the lock shall be released by raising the lever against a spring force of 4.5 N to 22.5 N.

4.2.4 The exposed portion of the switches shall have a non-glaring finish.