

**BS 4794 : Part 1 : 1979**

IEC 337-1 : 1970 IEC 337-1A : 1973

IEC 337-1B : 1975

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Specification for

Control switches (switching devices, including contactor relays, for control and auxiliary circuits, for voltages up to and including 1000 V a.c. and 1200 V d.c.)

Part 1. General requirements

[IEC title: Control switches (low-voltage switching devices for control and auxiliary circuits, including contactor relays)

Part 1. General requirements]

Spécification des auxiliaires de commande (appareils de connexion, y compris les contacteurs auxiliaires, pour des circuits de commande et des circuits auxiliaires, pour les tensions inférieures et égales à 1000 V en courant alternatif et 1200 V en courant continu)

Partie 1. Exigences générales

Spezifikation für Hilfsstromschalter (Schalter, einschließlich Hilfsschütze, für Steuer- und Hilfsstromkreise, für Spannungen bis und einschließlich 1000 V Wechselstrom und 1200 V Gleichstrom)

Teil 1. Allgemeine Anforderungen

National foreword

This revision of Part 1 of BS 4794 has been prepared under the direction of the Power Electrical Engineering Standards Committee. It provides general requirements for control switches. BS 4794 : Part 1 : 1973 was harmonized technically with IEC 337-1 : 1970, published by the International Electrotechnical Commission (IEC), but was not published as a dual-numbered standard. Since its publication, Sections 1, 2, 3, 4, 5 and 6 of Part 2 of BS 4794 have been published as dual-numbered standards. Two substantial amendments, IEC 337-1A : 1973 and IEC 337-1B : 1975, have subsequently been published to the IEC Publication, and since these affect certification it has been decided to issue a revision of Part 1 of BS 4794 as a dual-numbered standard incorporating these amendments.

Terminology and conventions. The text of the international standard has been approved as suitable for publication, without deviation, as a British Standard. Some terminology and certain conventions are not identical with those used in British Standards; attention is especially drawn to the following.

Wherever the word 'Recommendation' appears, referring to this standard, it should be read as 'British Standard'.

Where page numbers are quoted in connection with references to figures and tables in this British Standard, they are IEC page numbers, shown in square brackets at the foot of each page.

NOTE 1. In 7.4, paragraph 2, line 1, and in the following note, '70 deg C' should be read as '70°C'.

NOTE 2. *Textual error.* The following error in the text of the international standard has been noticed and has been reported to IEC and will be corrected in the next revision of the international standard.

Cross-reference

International standard	Corresponding British Standard
IEC 158 : Part 1 : 1970	BS 5424 Specification for controlgear for voltages up to and including 1000 V a.c. and 1200 V d.c. Part 1 : 1977 Contactors (Identical)
IEC 292 : Part 1 : 1969	BS 494 Specification for motor starters for voltages up to and including 1000 V a.c. and 1200 V d.c. Part 1 : 1979 Direct-on-line (full voltage) a.c. starters (Identical)

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British Standard Specification for

Control switches (switching devices, including contactor relays, for control and auxiliary circuits, for voltages up to and including 1000 V a.c. and 1200 V d.c.)

Part 1. General requirements

1. General

1.1 *Scope*

This Recommendation applies to mechanical switching devices intended to be installed in control circuits or auxiliary circuits of switchgear and controlgear for the purpose of controlling, signalling, interlocking, etc. These devices are intended to perform solely switching operations and include micro-gap switches.

Note. — Proximity switching devices and contactless switching devices are not considered in this Recommendation, but will be dealt with at a later stage.

This Recommendation applies only to devices, the rated insulation voltage of which does not exceed 1 000 V a.c. (at a frequency not exceeding 1 000 Hz) or 1 200 V d.c. However, for operational voltages below 100 V, see Clause 4.2.1.2, note 2.

In this Recommendation, the general term "control switch" will be used for such devices.

Control switches are inter alia:

- manual control switches, e.g.: push-buttons, rotary switches, foot switches, etc.;
- electromagnetically operated control switches, either time-delayed or instantaneous, e.g.: contactor relays;
- pilot switches, e.g.: pressure switches, temperature sensitive switches (thermostats), programmers, etc.;
- position switches, e.g.: limit switches or other control switches operated by part of a machine or mechanism.

Control switches intended for isolating purposes shall comply with the additional requirements given in Clause... (*).

Mechanical switching devices serving the purpose of control switches, but forming an integral part of another mechanical switching device, such as certain control contacts of contactors or of circuit-breakers, are not covered by this Recommendation. However, if they are self-contained and can be used independently, they shall satisfy this Recommendation.

Mechanical switching devices, covered by other Recommendations and used as control switches shall also comply with the appropriate clauses of this Recommendation.

Protective relays (e.g.: overload relays) are not considered to be control switches.

(*) At present, Part A-II of this Recommendation. (see p. 23)

1.2 *Object*

The object of this Recommendation is to state:

- 1) The characteristics of control switches, in particular with reference to the contact element and the actuator.
- 2) The electrical and mechanical requirements to be satisfied by the control switches with respect to:
 - a) the various duties to be performed;
 - b) the significance of the rated characteristics and of the markings;
 - c) the tests to verify the rated characteristics.

2. **Definitions**

For the purpose of this Recommendation, the following definitions and those found in Part 2 shall apply.

Note. — In addition to the definitions used in this Recommendation, this clause also contains definitions of terms generally useful in description or designation of control switches.

2.1 *Basic definitions*

2.1.1 *Control switch*

A mechanical switching device which serves the purpose of controlling the operation of switchgear or controlgear, including signalling, electrical interlocking, etc.

Note. — A control switch consists of one or more contact elements with a common actuating system.

2.1.2 *Control station*

An assembly of one or more control switches fixed on the same panel or located in the same enclosure.

Note. — A control station panel or enclosure may also contain related equipment, e.g.: potentiometers, signal lamps, instruments, etc.

2.1.3 *Contact element (of a control switch)*

All the structural parts, fixed and movable, conducting and insulating, of a control switch necessary to close and open one single conducting path of a circuit.

Notes 1. — The contact element and the actuating system may form an indivisible unit, but frequently one or more contact elements may be combined with one or several actuating system or systems. The actuating systems may be different.

2. — Definitions relating to various kinds of contact elements are given in Clause 2.3.

2.1.4 *Actuating system (of a control switch)*

All the operating means of a control switch which transmit the actuating force to the contact element.

Note. — The operating means of an actuating system may be mechanical, electromagnetic, hydraulic, pneumatic, thermal, etc. (see Clause 2.4).

2.1.5 *Actuator*

The part of the actuating system to which an external actuating force is applied.

Notes 1. — The actuator may take the form of a handle, knob, push-button, roller, plunger, etc.

2. — Control switches actuated by an internal actuating force (electro-magnet, piston, etc.) may have no actuator.

2.1.6 *Contact gap*

The total clearance between the contacts, or any conducting parts connected thereto, of a pole of a control switch in the open position.

Note. — A contact gap of less than 1 mm for single-break and 2×1 mm for double-break contacts is normally called a *micro-gap*.

2.1.7 *Conditional short-circuit current (of a control switch)*

A value of prospective current which a control switch, protected by a specified current-limiting switching device, can satisfactorily withstand for the operating time of this device under specified conditions of use and behaviour.

Note. — For a.c., the conditional short-circuit current is expressed by the r.m.s. value of the a.c. component.

2.1.8 *Fused short-circuit current (of a control switch)*

The conditional short-circuit current when the current-limiting switching device is a fuse.

2.2 *Definitions concerning operations*2.2.1 *Operation (of an actuator or a contact element)*

The transfer from one position to an adjacent position.

2.2.1.1 *Actuating operation*

The operation of an actuator.

Note. — An actuator may have more than two positions.

2.2.1.2 *Switching operation (of a contact element)*

The transfer of a contact element from the open to the closed position or vice versa.

2.2.2 *Operating cycle*

According to whether the operating cycle of an actuator or of a contact element is considered, distinction is made between *actuating cycle* and *switching cycle* as follows.

2.2.2.1 *Actuating cycle (of an actuator)*

A succession of operations, commencing at any one position, progressing through all other positions and ending at the initial position, in such a manner that a minimum number of operations is required.

Note. — A succession of operations not forming an actuating cycle is called an *actuating series*.

2.2.2.2 *Switching cycle (of a contact element)*

One closing followed by one opening operation or vice versa.

2.2.3 *Operating sequence*

A succession of specified operations with specified time intervals.

Note. — In this Recommendation, distinction is made between an *actuating sequence*, referring to an actuator, and a *switching sequence*, referring to a contact element.

2.2.4 *Travel*

The displacement (translation or rotation) of a point on a moving element.

Notes 1. — Distinction is made between *actuator travel* and *contact travel*.

2. — Distinction between *pre-travel*, *over-travel*, etc. will be made in the appropriate sections of Part 2.

2.2.5 *Actuating force (or moment)*

The force (or moment) applied to an actuator, necessary to complete the intended operation.

2.2.6 *Restoring force (or moment)*

The force (or moment) provided to restore an actuator or a contact element to its initial position.

2.3 *Definitions concerning contact elements*

2.3.1 *Make-contact element (normally open)*

A contact element which closes a conducting path when the control switch is actuated.

2.3.2 *Break-contact element (normally closed)*

A contact element which opens a conducting path when the control switch is actuated.

2.3.3 *Single-break contact element* (see Figure 3, page 42)

A contact element which opens the conducting path of its circuit in one location only.

2.3.4 *Double-break contact element* (see Figure 4, page 42)

A contact element which opens the conducting path of its circuit in two locations in series.

2.3.5 *Change-over contact elements*

A contact element combination which includes one make-contact element and one break-contact element.

Notes 1. — Distinction is made between change-over contact elements having three terminals (see Figure 5, page 42) and change-over contact elements having four terminals (see Figures 6 and 7, page 42); regarding the latter, the two contact elements may be electrically insulated but they are not necessarily separated (see Clause 2.3.7).

2. — Distinction is made between *make before break* (overlap) change-over contact elements where the two circuits are both closed for a part of the travel of the moving contacts from one position to the other, and *break before make* (non-overlap) change-over contact elements where the two circuits are both open for a part of the travel of the moving contacts from one position to the other. Unless otherwise stated, change-over contact elements are break before make.

2.3.6 *Pulse (fleeting) contact element*

A contact element which opens (or closes) a circuit for a part of the travel during the transition from one position to another.

2.3.7 *Electrically separated contact elements*

Contact elements belonging to the same control switch, but adequately insulated from each other so that they can be connected into electrically separated circuits.

2.3.8 *Snap action contact element*

A contact element in which the velocity of contact motion is substantially independent of the velocity of the actuating system.

Note. — Snap action implies means of storing energy during the first part of the travel of the actuating system, while the contacts remain at rest.

2.4 *Methods of actuating control switches*2.4.1 *Manual control switch*

A control switch intended to be actuated by human force.

2.4.2 *Electromagnetically operated control switch*

A control switch actuated by an electro-magnet.

2.4.2.1 *Contactor relay*

A contactor utilized as a control switch.

Notes 1. — The limits of operation for a contactor relay shall be in accordance with IEC Publication 158-1, Low-voltage Controlgear, Part 1: Contactors.

2. — In the past, a contactor relay has been referred to by a great variety of names, such as: control relay, auxiliary relay, etc., but it is recommended that preference should be given to the term "contactor relay".

2.4.2.1.1 *Instantaneous contactor relay*

A contactor relay operating without intentional time delay.

Note. — Unless otherwise stated, a contactor relay is an instantaneous contactor relay.

2.4.2.1.2 *Time-delay contactor relay*

A contactor relay with specified time-delay characteristics.

2.4.3 *Pilot switch*

A non-manual control switch actuated in response to specified conditions of an actuating quantity.

Notes 1. — The actuating quantity may be pressure, temperature, velocity, liquid level, elapsed time, etc.

2. — Occasionally, the English term "pilot switch" is used for a manual control switch having two positions of rest and used in conjunction with contactors, but such a use of the term "pilot switch" is deprecated.

2.4.4 *Position switch*

A pilot switch the actuating system of which is operated by a moving part of a machine, when this part reaches a predetermined position.

Note. — A special case of a position switch is the limit switch.

3. Classification

3.1 *Control switches*

Control switches are generally classified by the nomenclature defined in Clause 2, together with additional terms defined in Part 2, and by the rated quantities of the contact elements according to Clause 4.2.

In addition, certain control switches require supplementary information not covered by Clause 4.2. Such supplementary information is given in the relevant sections of Part 2 of the Recommendation.

3.2 *Control stations*

Control stations are generally classified by the nomenclature defined in Part 2, together with the characteristic numerals defining the degree of protection provided by the enclosure (see Clause 7.3).

4. Characteristics

4.1 *Operation in service*

4.1.1 *Conditions of use*

The principal application of a control switch is the switching of electro-magnets.

Other applications, e.g. the switching of tungsten filament lamps, small motors, etc., are not dealt with in detail in this Recommendation, but are mentioned in Clause 4.2.5.

4.1.1.1 *Normal conditions of use*

The normal use of a control switch is to close, maintain and open circuits which contain an electro-magnet the magnetic circuit of which is open at the time when the coil current is made and closed when the coil current is broken.

4.1.1.2 *Abnormal conditions of use*

Abnormal conditions may arise when an electro-magnet, although energized, has failed to close.

A control switch is required to be able to break the current corresponding to such abnormal conditions of use.

4.2 *Rated quantities for contact elements*

Electrical rated quantities for the contact elements of control switches shall be stated in accordance with Clauses 4.2.1 to 4.2.5, but it is not necessary to establish all the quantities listed.

4.2.1 *Rated voltages (of a contact element)*

A contact element is defined by the following rated voltages: