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BS 5463-2:1991
(renumbers the BS to
BS EN 60265-2:1994)
and Amendments
Nos. 1 and 2 to
BS EN 60265-2:1994*

High-voltage switches

Part 2: High-voltage switches for rated voltages of 52 kV and above

The European Standard EN 60265-2:1993 with the incorporation of amendments A1:1995 and A2:1998 has the status of a British Standard

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- ASTA Certification Services
- Association of Manufacturers Allied to the Electrical and Electronic Industry (BEAMA Ltd.)
- British Railways Board
- Copper Development Association
- Department of the Environment (Property Services Agency)
- ERA Technology Ltd.
- Electricity Supply Industry in England and Wales
- GAMBICA (BEAMA Ltd.)
- Health and Safety Executive
- Transmission and Distribution Association (BEAMA Ltd.)

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- Association of Consulting Engineers
- Association of Supervisory and Executive Engineers
- Electrical Installation Equipment Manufacturers' Association (BEAMA Ltd.)
- Engineering Equipment and Materials Users' Association

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National foreword

This British Standard is the English language version of EN 60265-2:1993, including amendments A1:1995 and A2:1998. It is identical with IEC 60265-2:1988 including corrigendum February 1990 and amendments 1:1994 and 2:1998. It supersedes BS 5463:1977 which is withdrawn.

Change of identifier

Wherever BS 5463 : Part 2 : 1991 appears in this standard, it should be read as EN 60265-2:1993.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index” or using the “Find” facility of the BSI Standards Electronic Catalogue.

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Summary of pages

This standard comprises a front cover, an inside front cover, pages 1 to 4, the EN title page, page 4b, pages 5 to 48, an inside back cover and a back cover.

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English version

High-voltage switches

Part 2: High-voltage switches for rated voltages of 52 kV and above

(includes amendments A1:1995 and A2:1998)
(IEC 60265-2:1988 + corrigendum 1990 + A1:1994 + A2:1998)

Interrupteurs à haute tension

Deuxième partie: Interrupteurs à haute tension de tension assignée égale ou supérieure à 52 kV (inclut les amendements A1:1995 et A2:1998) (CEI 60265-2:1988 + corrigendum 1990 + A1:1994 + A2:1998)

Hochspannungs-Lastschalter

Teil 2: Hochspannungs-Lastschalter für Nennspannungen ab 52 kV und darüber (enthält Änderungen A1:1995 und A2:1998) (IEC 60265-2:1988 + corrigendum 1990 + A1:1994 + A2:1998)

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

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CENELEC

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

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Foreword

At the request of CENELEC Technical Committee TC 17A, High-voltage switchgear and controlgear, HD 355.2 S2:1991 (IEC 265-2:1988 + corrigendum February 1990) was submitted to the CENELEC voting procedure for conversion into a European Standard.

The text of the International Standard was approved by CENELEC as EN 60265-2 on 6 July 1993.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1994-03-01
- latest date of withdrawal of conflicting national standards (dow) 1994-03-01

Annexes designated “normative” are part of the body of the standard. In this standard, annex ZA is normative.

Foreword to amendment A1

The text of Amendment 1:1994 to the International Standard IEC 265-2:1988, prepared by SC 17A, High-voltage switchgear and controlgear of IEC TC 17, Switchgear and controlgear, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as Amendment A1 to EN 60265-2:1993 on 1995-07-04 without any modification.

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) 1996-07-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 1996-07-01

Foreword to amendment A2

The text of document 17A/532/FDIS, future amendment 2 to IEC 60265-2:1988, prepared by SC 17A, High-voltage switchgear and controlgear, of IEC TC 17, Switchgear and controlgear, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A2 to EN 60265-2:1993 on 1998-10-01.

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) 1999-07-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2001-07-01

HIGH-VOLTAGE SWITCHES

Part 2:

High-voltage switches for rated voltages of 52 kV and above

1. Scope

This standard is applicable to three-phase alternating-current switches, having making and breaking current ratings, for indoor and outdoor installations, for rated voltages 52 kV and above; and for rated frequencies up to and including 60 Hz.

This standard is also applicable to the operating devices of these switches and to their auxiliary equipment.

Notes 1. – Switches for gas insulated switchgear are covered by this standard.

2. – Switches having a disconnecting function and called switch-disconnectors are also covered by IEC Publication 129.

3. – Earthing switches are not covered by this standard. Earthing switches forming an integral part of a switch are covered by IEC Publication 129.

1.101 Object

The main object of this standard is to establish requirements for switches used in transmission and distribution systems. General-purpose switches for this application shall comply with the following service applications:

- carrying rated normal current continuously;
- carrying short-circuit currents for a specified time;
- switching of mainly active loads;
- switching of no-load transformers;
- switching of the charging current of unloaded cables, overhead lines or busbars;
- switching of closed-loop circuits;
- making short-circuit currents.

A further object of this standard is to establish requirements for limited-purpose and special-purpose switches used in transmission and distribution systems.

Limited-purpose switches shall comply with one or more of the service applications indicated above.

Special-purpose switches may comply with one or more of the service applications indicated above and, in addition, shall be suitable for one or more of the following applications:

- switching single capacitor banks;
- switching back-to-back capacitor banks;
- switching shunt reactors including secondary or tertiary reactors switched from the primary side of the transformer;
- applications requiring an increased number of operating cycles;
- switching under earth fault conditions in systems with isolated neutral or in resonant earthed systems.

2. **Normal and special service conditions**

IEC Publication 694 is applicable.

3. **Definitions**

For the definitions of general terms used in this standard, reference is made to the IEC Publications 50 (441) and 71-1.

3.101 *Switch* (441-14-10)

A switching device capable of making, carrying and breaking currents under normal circuit conditions, which may include specified operating overload conditions and also carrying for a specified time currents under specified abnormal circuit conditions, such as those of short-circuit.

3.102 *Switch-disconnector* (441-14-12)

A switch which, in the open position, satisfies the isolating requirements specified for a disconnector.

3.103 *General-purpose switch*

A switch capable of performing, with currents up to its rated breaking currents, all making and breaking operations which may normally occur. The switch shall also be capable of carrying and making short-circuit currents.

Note. — Refer to Sub-clause 4.114 for specific ratings of a general-purpose switch.

3.104 *Limited-purpose switch*

A switch which complies with one or more, but not with all, service applications of a general-purpose switch.

3.105 *Special-purpose switch*

A switch suitable for switching requirements other than those specified for a general-purpose switch.

Note. — Examples of such requirements are capacitor bank switching, shunt reactor switching, switching under earth fault conditions, and a capability of an increased number of operating cycles.

3.106 *Single capacitor bank switch*

A special-purpose switch intended for switching of a single capacitor bank with charging currents up to its rated single capacitor bank breaking current.

3.107 *Back-to-back capacitor bank switch*

A special-purpose switch intended for breaking capacitor bank-charging currents, with one or more capacitor banks connected to the bus or supply side of the switch, up to its rated back-to-back capacitor bank breaking current. The switch shall be capable of making the associated inrush current, up to its rated capacitor bank inrush making current.

3.108 *Shunt reactor switch*

A special-purpose switch intended for switching a shunt reactor, including secondary or tertiary reactors switched from the primary side of the transformer.

3.109 *Breaking capacity** (441-17-08)

3.110 *Mainly active load breaking capacity*

The breaking capacity when opening a mainly active load circuit in which the load can be represented by resistors and reactors in parallel.

3.111 *No-load transformer breaking capacity*

The breaking capacity when opening a no-load transformer circuit.

3.112 *Closed-loop breaking capacity*

The breaking capacity when opening a closed transmission line loop circuit, or a transformer in parallel with one or more transformers, i. e., a circuit in which both sides of the switch remain energized after breaking, and in which the voltage appearing across the terminals is substantially less than the system voltage.

3.113 *Cable-charging breaking capacity*

The breaking capacity when opening a cable circuit at no load.

3.114 *Line-charging breaking capacity*

The breaking capacity when opening an overhead line circuit at no load.

3.115 *Busbar charging breaking capacity*

The breaking capacity when opening a busbar circuit at no load.

3.116 *Single capacitor bank breaking capacity*

The breaking capacity when opening a single capacitor bank circuit connected to a supply that does not include another capacitor bank adjacent to the bank being switched.

3.117 *Back-to-back capacitor bank breaking capacity*

The breaking capacity when opening a capacitor bank circuit connected to a supply that includes one or more capacitor banks adjacent to the bank being switched.

3.118 *Capacitor bank inrush making current*

The high frequency and high magnitude current occurring when closing a capacitor bank circuit onto a supply including one or more capacitor banks adjacent to the bank being switched.

Note. — The frequency and magnitude of the inrush current depend upon the values of capacitance and the values of the inductance between the capacitor banks.

3.119 *Shunt reactor breaking capacity*

The breaking capacity when opening a shunt reactor circuit, including secondary or tertiary reactors switched from the primary side of the transformer.

** Note concerning the rated values:*

In English, the terms “rated making current” and “rated breaking current” are being used where formerly “rated making capacity” and “rated breaking capacity” were used, the intended meaning being adequately conveyed by the use of “rated”. In French, the terms “pouvoir de fermeture assigné” and “pouvoir de coupure assigné” continue to be used.

3.120 *Earth-fault breaking capacity*

The breaking capacity in the faulty phase of an isolated neutral or resonant earthed system when clearing an earth fault on an unloaded cable or overhead line on the load side of the switch.

3.121 *Cable and line charging breaking capacity under earth fault conditions*

The breaking capacity in the sound phases of an isolated neutral or resonant earthed system when switching off an unloaded cable or overhead line, with an earth fault on the supply side of the switch.

3.122 *Breaking current (441-17-07)*

3.123 *(Peak)-making current*

The peak value of the first major loop of the current in a pole of a switch during the transient period following the initiation of current during a making operation.

- Notes 1.* – The peak value may differ from one pole to another and from one operation to another as it depends on the instant of current initiation relative to the wave of the applied voltage.
- 2.* – Where, for a polyphase circuit, a single value of (peak) making current is referred to, it is, unless otherwise stated, the highest value in any phase.

3.124 *Short-circuit making capacity (441-17-10)*

4. *Rating*

Clause 4 of IEC Publication 694 is applicable with the additions and exceptions indicated below.

4.1 *Rated voltage*

Sub-clause 4.1 of IEC Publication 694 is applicable.

4.2 *Rated insulation level*

Sub-clause 4.2 of IEC Publication 694 is applicable.

4.3 *Rated frequency*

Sub-clause 4.3 of IEC Publication 694 is applicable.

4.4 *Rated normal current and temperature rise*

Sub-clause 4.4 of IEC Publication 694 is applicable.

4.5 *Rated short-time withstand current*

Sub-clause 4.5 of IEC Publication 694 is applicable.

4.6 *Rated peak withstand current*

Sub-clause 4.6 of IEC Publication 694 is applicable.

4.7 *Rated duration of short-circuit*

Sub-clause 4.7 of IEC Publication 694 is applicable.

4.8 *Rated supply voltage of closing and opening devices and auxiliary circuits*

Sub-clause 4.8 of IEC Publication 694 is applicable.

4.9 *Rated supply frequency of operating devices and auxiliary circuits*

Sub-clause 4.9 of IEC Publication 694 is applicable.

4.10 *Rated pressure of compressed gas supply for operation*

Sub-clause 4.10 of IEC Publication 694 is applicable.

4.101 *Rated mainly active load-breaking current**

The rated mainly active load-breaking current is the maximum mainly active load current that the switch shall be capable of breaking at its rated voltage.

4.102 *Rated closed-loop breaking current**

The rated closed-loop breaking current is the maximum closed-loop current the switch shall be capable of breaking. Separate ratings for transmission line loop current and parallel transformer current may be assigned.

4.103 *Rated no-load transformer breaking current**

The rated no-load transformer breaking current is the maximum no-load transformer current the switch shall be capable of breaking at its rated voltage.

4.104 *Rated cable-charging breaking current**

The rated cable-charging breaking current is the maximum cable-charging current that the switch shall be capable of breaking at its rated voltage.

4.105 *Rated line-charging breaking current**

The rated line-charging breaking current is the maximum line-charging current that the switch shall be capable of breaking at its rated voltage.

4.106 *Rated single capacitor bank breaking current**

The rated single capacitor bank breaking current is the maximum capacitor bank breaking current that the switch shall be capable of breaking at its rated voltage with no capacitor bank connected to the supply side of the switch adjacent to the bank being switched.

4.107 *Rated back-to-back capacitor bank breaking current**

The rated back-to-back capacitor bank breaking current is the maximum capacitor bank breaking current that the switch shall be capable of breaking at its rated voltage with one or more capacitor banks connected on the supply side of the switch adjacent to the bank being switched, such as to produce the rated capacitor bank inrush making current.

* *Note concerning the rated values:*

In English, the terms “rated making current” and “rated breaking current” are being used where formerly “rated making capacity” and “rated breaking capacity” were used, the intended meaning being adequately conveyed by the use of “rated”. In French, the terms “pouvoir de fermeture assigné” and “pouvoir de coupure assigné” continue to be used.

4.108 *Rated capacitor bank inrush making current**

The rated capacitor bank inrush making current is the peak value of the current that the switch shall be capable of making at its rated voltage and with a frequency of the inrush current appropriate to the service conditions.

The assignment of a rated capacitor bank inrush making current is mandatory for switches that have a rated back-to-back capacitor bank breaking current.

Note. — The frequency of the inrush current for back-to-back capacitor banks may be in the range of 2 kHz to 30 kHz. The specific values are dependent upon the size and configuration of the capacitor bank being switched, the supply side capacitor bank and the inclusion of limiting impedances, if any.

4.109 *Rated shunt reactor breaking current**

The rated shunt reactor breaking current is the maximum shunt reactor current that the switch shall be capable of breaking at its rated voltage.

Note. — The minimum shunt reactor breaking current, if other than zero, that the switch is capable of breaking should be specified by the manufacturer.

4.110 *Rated short-circuit making current**

The rated short-circuit making current is the maximum peak prospective current that the switch shall be capable of making at its rated voltage.

4.111 *Rated earth fault breaking current**

The rated earth fault breaking current, for an isolated neutral or resonant earthed system, is the maximum earth fault current in the faulted phase that the switch shall be capable of breaking at its rated voltage.

Note. — The TRV of an isolated neutral system is more severe than the TRV of a resonant earthed system, even if detuned.

4.112 *Rated cable and line-charging breaking current under earth fault conditions**

The rated cable and line-charging breaking current under earth fault conditions, for an isolated neutral or resonant earthed system, is the current in the sound phases that the switch shall be capable of breaking at its rated voltage.

Note. — The maximum cable and line-charging current under fault conditions is $\sqrt{3}$ times the cable and line charging current occurring in normal conditions. This covers the most severe case, which occurs with individually screened cables.

4.113 *Rated mechanical terminal load*

Sub-clause 4.103 of IEC Publication 129 is applicable.

4.114 *Co-ordination of rated values for a general-purpose switch*

A general-purpose switch shall have specific ratings for each switching duty as follows:

- rated mainly active load breaking current shall be equal to the rated normal current;
- rated no-load transformer breaking current shall be equal to 1.0% of the rated normal current;

** Note concerning the rated values:*

In English, the terms “rated making current” and “rated breaking current” are being used where formerly “rated making capacity” and “rated breaking capacity” were used, the intended meaning being adequately conveyed by the use of “rated”. In French, the terms “pouvoir de fermeture assigné” and “pouvoir de coupure assigné” continue to be used.

- rated transmission line loop breaking current shall be equal to the rated normal current;
- rated parallel transformer breaking current shall be equal to 50% of the rated normal current;
- rated cable-charging breaking current shall be as shown in Table I;
- rated line-charging breaking current shall be as shown in Table I;
- the rated short-circuit making current shall be equal to the rated peak withstand current.

The standard values of ratings should be selected from the R10 series specified in IEC Publication 59.

- Notes* 1. – Specific co-ordination between rated normal current and rated voltage is not a requirement of this standard.
2. – Specific co-ordination between rated normal current and short-time withstand current is not a requirement of this standard.

4.115 *Co-ordination of rated values for limited-purpose and special-purpose switches*

A limited-purpose switch should preferably have the same specific ratings as those for a general-purpose switch, where such ratings are applicable. If other ratings are specified, values from the R10 series should be selected.

A special-purpose switch is not required to have coordinated ratings. The rated values, however, should be selected from the R10 series specified in IEC Publication 59.

5. **Design and construction**

Clause 5 of IEC Publication 694 is applicable with the additions indicated below.

5.1 *Requirements for liquids in high-voltage switches*

Sub-clause 5.1 of IEC Publication 694 is applicable.

5.2 *Requirements for gases in high-voltage switches*

Sub-clause 5.2 of IEC Publication 694 is applicable.

5.3 *Earthing of high-voltage switches*

Sub-clause 5.3 of IEC Publication 694 is applicable.

5.4 *Auxiliary equipment*

Sub-clause 5.4 of IEC Publication 694 is applicable.

5.5 *Dependent power closing*

Sub-clause 5.5 of IEC Publication 694 is applicable.

5.6 *Stored energy closing*

Sub-clause 5.6 of IEC Publication 694 is applicable.

5.7 *Operation of releases*

Sub-clause 5.7 of IEC Publication 694 is applicable.

5.8 *Low and high pressure interlocking devices*

Sub-clause 5.8 of IEC Publication 694 is applicable.

5.9 *Nameplates*

Sub-clause 5.9 of IEC Publication 694 is applicable. Switches and their operating devices shall be provided with nameplates which contain information in accordance with Table II.

5.101 *Closing mechanism*

For switches having a short-circuit making current rating, only switches having stored energy closing or dependent power closing mechanisms are allowed.

5.102 *Mechanical strength*

Switches shall be capable of bearing the rated mechanical terminal load when installed according to the manufacturer's instructions, as well as electromagnetic forces, without reduction of their reliability or current carrying capacity.

5.103 *Position of the movable contact system and its indicating or signalling device*

5.103.1 *Securing the position*

Switches, including their operating devices, shall be so constructed that they cannot come out of their open or closed positions by forces arising from gravity, vibration, reasonable shocks or accidental touching of the connecting rods of their operating devices, or by electromagnetic forces. Switches or their operating devices shall be designed to allow the application of means to prevent unauthorized operation.

5.103.2 *Indication of position*

The open and closed positions of the switches shall be clearly indicated. This requirement is met if one of the following conditions is fulfilled:

- a) the gap or isolating distance is visible;
- b) the position of each movable contact is indicated by a reliable indicating device.

Notes 1. – A visible moving contact may serve as the indicating device.

- 2. – In the case where all poles of a switch are so coupled as to be operated as a single unit, it is permissible to use a common indicating device.

5.103.3 *Auxiliary contacts for signalling*

Signalling of the closed position shall not take place until it is certain that the movable contacts will reach a position in which the rated normal, peak withstand, and short-time withstand currents can be carried safely.

Signalling of the open position shall not take place until the movable contacts have reached a position such that the corresponding gap or isolating distance is at least 80% of the total isolating distance, or until it is certain that the movable contacts will reach their fully open position.

6. **Type tests**

The type tests are for the purpose of proving the characteristics of high-voltage switches, their operating devices and their auxiliary equipment.

Type tests include:

a) *normal type tests:*

- dielectric tests including lightning and switching impulse tests, power-frequency voltage withstand tests, and power-frequency voltage withstand tests on auxiliary and control circuits;
- temperature-rise tests;
- measurement of the resistance of the main circuit;
- short-time withstand current and peak withstand current tests;
- tests to prove the ability of the switch to make and break the specified currents;
- tests to prove satisfactory mechanical operation and endurance.

All of the above tests should be made on the complete high-voltage switch (filled with the specified types and quantities of liquid or gas at specified pressure or reduced pressure, as required), and on its operating devices and auxiliary equipment.

The high-voltage switch tested shall conform in all essential details to drawings of the type of switch specified.

b) *type tests upon special request of the user:*

- tests to prove the ability of the switch to make or break currents that are specified by the user and are beyond the scope of the normal type tests;
- tests to prove the ability of the switch to interrupt earth faults in systems with isolated neutrals or in resonant earthed systems;
- tests to prove satisfactory operation under severe ice conditions;
- tests to prove the integrity of the external insulation under conditions of air pollution;
- tests to determine the capability of a switch for applications requiring an increased number of operating cycles;
- radio interference voltage (R.I. V.) tests;
- partial discharge tests;
- tests for verification of operation during application of rated mechanical terminal loads.

6.1 *Dielectric tests*

Sub-clause 6.1 of IEC Publication 694 is applicable with the following exception:

6.1.9 *Partial discharge tests*

Sub-clause 6.1.9 of IEC Publication 694 is replaced by the following:

No partial discharge tests are required to be performed on the complete high voltage switch. However, in the case of switches using components for which a relevant IEC publication exists, including partial discharge measurements (e.g., bushings, IEC Publication 137), evidence shall be produced by the manufacturer showing that these components have passed the partial discharge tests as foreseen by the relevant IEC publication. For partial discharge measurements, refer to IEC Publication 270.