

A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV

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Committees responsible for this British Standard

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- British Cable Makers Confederation
- British Railways Board
- Electrical Installation Equipment Manufacturers' Association (BEAMA Ltd.)
- Electricity Association
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- GAMBICA (BEAMA Ltd.)
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National foreword

This British Standard has been prepared by Subcommittee PEL/17/1 and is the English language version of EN 60298:1996 *A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV* including amendment A11:1999, published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 60298:1990 and its amendment 1:1994 including the corrigenda dated April 1995 and May 1998, published by the International Electrotechnical Commission (IEC).

The CENELEC common modifications have been implemented at the appropriate places in the text. The start and finish of each common modification is indicated in the text by tags [C] [C]. Where a common modification has been introduced by amendment, the tags carry the number of the amendment. For example, the common modifications introduced by CENELEC amendment A11 are indicated by [C11] [C11].

The foreword of the EN makes reference to the “date of withdrawal”, dow, of the relevant national standard. In this case the relevant national standard is BS 5227:1992 which will be withdrawn on 1996-12-01. Certificates and marks will not be awarded after this date with respect to the withdrawn British Standard. However such certificates and marks, already awarded, may continue to apply to production until 2001-12-01.

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 by using the “Find” facility of the BSI Standards Electronic Catalogue.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to ii, the EN title page, pages 2 to 48, an inside back cover and a back cover.

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Descriptors: High-voltage switchgear and controlgear ($1\text{ kV} < \text{rated voltage} \leq 52\text{ kV}$), switches, disconnectors, switch-disconnectors, fuse-combination units

English version

A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV

(includes amendment A11:1999)

(IEC 60298:1990 + corrigenda 1995 and 1998 + A1:1994, modified)

Appareillage sous enveloppe métallique pour courant alternatif de tensions assignées supérieures à 1 kV et inférieures ou égales à 52 kV
(inclut l'amendement A11:1999)
(CEI 60298:1990 + corrigenda 1995 et 1998 + A1:1994, modifiée)

Metallgekapselte Wechselstrom-Schaltanlagen für Nennspannungen über 1 kV bis einschließlich 52 kV
(enthält Änderung A11:1999)
(IEC 60298:1990 + corrigenda 1995 und 1998 + A1:1994, modifiziert)

This European Standard was approved by CENELEC on 1995-11-28. Amendment A11 was approved by CENELEC on 1999-09-27. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B-1050 Brussels

Foreword

The text of the International Standard IEC 298:1990 with its corrigendum April 1995 and its amendment 1:1994, prepared by SC 17C, High-voltage enclosed switchgear and controlgear, of IEC TC 17, Switchgear and controlgear, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 60298 on 1995-11-28 without any modification.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1996-12-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1996-12-01

For products which have complied with HD 187 S5:1992 before 1996-12-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 2001-12-01.

Annexes designated “normative” are part of the body of the standard. Annexes designated “informative” are given for information only. In this standard, Annex AA, Annex BB, Annex DD, Annex EE, Annex FF, Annex ZA and Annex ZB are normative and Annex ZC is informative. Annex ZA, Annex ZB and Annex ZC have been added by CENELEC.

Foreword to amendment A11

At the request of the Italian electrotechnical committee, a draft for an amendment to EN 60298:1996 was submitted to the CENELEC members for acceptance in July 1999.

The text of the draft was accepted by CENELEC as amendment A11 to EN 60298:1996 on 1999-09-27.

The following dates were fixed:

- latest date by which the existence of the amendment has to be announced at national level (doa) 1999-12-27
- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2000-03-27 

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Section 1. General

1 Scope

This standard specifies requirements for factory-assembled metal-enclosed switchgear and controlgear for alternating current of rated voltages above 1 kV and up to and including 52 kV for indoor and outdoor installation, and for service frequencies up to and including 60 Hz.

For metal-enclosed switchgear and controlgear containing gas-filled compartments, the design pressure is limited to a maximum of 3 bar (gauge). Gas-filled compartments having a design pressure exceeding 3 bar (gauge) shall be designed and tested in accordance with IEC 517.

Metal-enclosed switchgear and controlgear for special use, for example in flammable atmospheres, in mines or on board ships, may be subject to additional requirements.

Components contained in metal-enclosed switchgear and controlgear are to be designed and tested in accordance with their various relevant standards. This standard supplements the standards for the individual components regarding their installation in switchgear and controlgear.

NOTE 1 Switchgear and controlgear assemblies having an insulation enclosure are covered by IEC 466.

NOTE 2 Metal-enclosed switchgear and controlgear for rated voltages above 52 kV insulated by air at atmospheric pressure may be covered by this standard taking into account the insulation levels of IEC 694.

NOTE 3 Liquid-insulated hermetically sealed compartments are equal to gas-filled compartments with respect to independence from ambient atmosphere.

Section 2. Service conditions

2 Normal and special service conditions

Unless otherwise specified in this standard, the metal-enclosed switchgear and controlgear is designed to be used under normal service conditions.

Refer to Clause 2 of IEC 694.

For outdoor installation it is assumed that inside the enclosure, normal indoor conditions prevail. If necessary, appropriate measures shall be taken, such as air conditioning, so that common indoor components may be used. This does not apply to gas-filled compartments.

Section 3. Terms and definitions

3 Definitions

For the definitions of general terms used in this standard, reference is made to the International Electrotechnical Vocabulary (IEV), namely IEC 50 (441) and IEC 50(151).

The following definitions apply for the purpose of this standard:

3.101

switchgear and controlgear

a general term covering switching devices and their combination with associated control, measuring, protective and regulating equipment, also assemblies of such devices and equipment with associated interconnections, accessories, enclosures and supporting structures
(IEV 441-11-01)

3.102

metal-enclosed switchgear and controlgear

switchgear and controlgear assemblies with an external metal enclosure intended to be earthed and complete except for external connections
(IEV 441-12-04)

NOTE The metal-enclosed switchgear and controlgear is subdivided into three types:

- metal-clad switchgear and controlgear;
- compartmented switchgear and controlgear (with one or more non-metallic partitions);
- cubicle switchgear and controlgear.

3.102.1

metal-clad switchgear and controlgear

metal-enclosed switchgear and controlgear in which components are arranged in separate compartments with metal partitions intended to be earthed

NOTE 1 This term applies to metal-enclosed switchgear and controlgear with metal partitions providing the degree of protection IP2X (or higher) of Table 6 of IEC 60694 (1996) and having separate compartments at least for the following components:

- a) each main switching device;
- b) components connected to one side of a main switching device, for example feeder circuit;
- c) components connected to the other side of the main switching device, for example busbars; where more than one set of busbars is provided, each set being in a separate compartment.

NOTE 2 Metal-enclosed switchgear and controlgear having metal partitions and meeting all the requirements of note 1, may utilize an insulating shutter barrier as a part of the shutter arrangement, the combination of which provides the degree of protection IP2X (or higher) of Table 6 of IEC 60694 (1996) and satisfies the requirements of Sub-clause 5.103.1 for partitions and shutters made of insulating material.

3.102.2

compartmented switchgear and controlgear (with non-metallic partitions)

metal-enclosed switchgear and controlgear in which components are arranged in separate compartments as for metal-clad switchgear and controlgear, but with one or more non-metallic partitions providing the degree of protection IP2X (or higher) of Table 6 of IEC 60694 (1996)

NOTE Metal-enclosed switchgear and controlgear in which the main circuit components are individually embedded in solid insulating material can be considered as an alternative, provided that the conditions specified in IEC 466 are met.

3.102.3

cubicle switchgear and controlgear

metal-enclosed switchgear and controlgear, other than metal-clad and compartmented switchgear and controlgear

NOTE This term applies to switchgear and controlgear having a metal enclosure and having either:

- a) a number of compartments less than that required for metal-clad or compartmented switchgear and controlgear;
- b) partitions having a degree of protection lower than IP2X of Table 6 of IEC 60694 (1996);
- c) no partitions.

3.103

transport unit

a part of metal-enclosed switchgear and controlgear suitable for shipment without being dismantled

3.104**functional unit**

a part of metal-enclosed switchgear and controlgear comprising all the components of the main circuits and auxiliary circuits that contribute to the fulfilment of a single function
(IEV 441-13-04)

NOTE Functional units may be distinguished according to the function for which they are intended, for example: incoming unit, outgoing unit, etc.

3.105**enclosure**

a part of metal-enclosed switchgear and controlgear providing a specified degree of protection of equipment against external influences and a specified degree of protection against approach to or contact with live parts and against contact with moving parts
(IEV 441-13-01)

3.106**compartment**

a part of metal-enclosed switchgear and controlgear enclosed except for openings necessary for interconnection, control or ventilation
(IEV 441-13-05)

NOTE 1 A compartment may be designated by the main component contained therein, e.g. circuit-breaker compartment, busbar compartment, etc.

NOTE 2 Openings necessary for interconnection between compartments are closed with bushings or other equivalent means.

NOTE 3 Busbar compartments may extend through several functional units without the need for bushings or other equivalent means.

3.107**gas-filled compartment**

a compartment of metal-enclosed switchgear and controlgear in which the gas pressure is maintained by one of the following systems:

- a) controlled pressure system;
- b) closed pressure system;
- c) sealed pressure system.

(Refer to Annex GG.)

NOTE Several gas-filled compartments may be interconnected to a common gas-system (gas-tight assembly).

3.108**component**

an essential part of the main or earthing circuits of metal-enclosed switchgear and controlgear which serves a specific function (for example circuit-breaker, disconnecter, switch, fuse, instrument transformer, bushing, busbar, etc.)

3.109**partition**

a part of metal-enclosed switchgear and controlgear separating one compartment from other compartments
(IEV 441-13-06)

3.110**shutter**

a part of metal-enclosed switchgear and controlgear that can be moved from a position where it permits contacts of a removable part to engage fixed contacts, to a position where it becomes a part of the enclosure or partition shielding the fixed contacts
(IEV 441-13-07)

3.111**bushing**

a structure carrying one or more conductors through an enclosure and insulating it therefrom, including the means of attachment

3.112**removable part**

a part of metal-enclosed switchgear and controlgear that may be removed entirely from the metal-enclosed switchgear and controlgear and replaced, even though the main circuit is alive
(IEV 441-13-08)

3.113**withdrawable part**

a removable part of metal-enclosed switchgear and controlgear that can be moved to positions in which an isolating distance or segregation between open contacts is established, while the part remains mechanically attached to the enclosure
(IEV 441-13-09)

3.114**segregation (of conductors)**

an arrangement of conductors with earthed metal interposed between them in such a manner that disruptive discharges can only occur to earth
(IEV 441-11-11)

NOTE A segregation may be established between the conductors as well as between the open contacts of a switching device.

3.115**service position (connected position)**

the position of a removable part in which it is fully connected for its intended function
(IEV 441-16-25)

3.116**earthing position**

the position of a removable part in which the closing of a mechanical switching device causes a main circuit to be short-circuited and earthed
(IEV 441-16-26)

3.117**test position (of a withdrawable part)**

the position of a withdrawable part in which an isolating distance or segregation is established in the main circuit and in which the control circuits are connected
(IEV 441-16-27)

3.118**disconnected position (of a withdrawable part)**

the position of a withdrawable part in which an isolating distance or segregation is established in the circuits of the withdrawable part, that part remaining mechanically attached to the enclosure
(IEV 441-16-28)

NOTE In high-voltage metal-enclosed switchgear and controlgear, the auxiliary circuits may not be disconnected.

3.119**removed position (of a removable part)**

the position of a removable part when it is outside and mechanically and electrically separated from the enclosure
(IEV 441-16-29)

3.120**main circuit**

all the conductive parts of metal-enclosed switchgear and controlgear included in a circuit which is intended to transmit electrical energy
(IEV 441-13-02)

3.121**auxiliary circuit**

all the conductive parts of metal-enclosed switchgear and controlgear included in a circuit (other than the main circuit) intended to control, measure, signal and regulate
(IEV 441-13-03)

NOTE The auxiliary circuits of metal-enclosed switchgear and controlgear include the control and auxiliary circuits of the switching devices.

3.122**rated value**

a quantity value assigned, generally by a manufacturer, for a specified operating condition of the metal-enclosed switchgear and controlgear
(IEV 151-04-03)

NOTE See Section 4 for individual rated values.

3.123**degree of protection**

the degree of protection provided by an enclosure to protect persons against contact with or approach to live parts and against contact with moving parts inside the enclosure and to protect the equipment against ingress of solid bodies

3.124**ambient air temperature (of metal-enclosed switchgear and controlgear)**

the temperature, determined under prescribed conditions, of the air surrounding the enclosure of metal-enclosed switchgear and controlgear

3.125**disruptive discharge**

phenomena associated with the failure of insulation under electric stress, in which the discharge completely bridges the insulation under test, reducing the voltage between the electrodes to zero or nearly to zero

NOTE 1 The term applies to discharges in solid, liquid and gaseous dielectrics and to combinations of these.

NOTE 2 A disruptive discharge in a solid dielectric produces permanent loss of dielectric strength (non-self-restoring insulation); in a liquid or gaseous dielectric, the loss may be only temporary (self-restoring insulation).

NOTE 3 The term “sparkover” is used when a disruptive discharge occurs in a gaseous or liquid dielectric.

The term “flashover” is used when a disruptive discharge occurs over the surface of a solid dielectric in gaseous or liquid medium.

The term “puncture” is used when a disruptive discharge occurs through a solid dielectric.

3.126**minimum functional pressure (of gas-filled compartments)**

the gas pressure in bars (gauge) referred to atmospheric air conditions of 20 °C and 1 013 hPa at and above which the rated values of the switchgear are maintained

3.127**design pressure (of gas-filled compartments)**

the pressure in bars (gauge) used to determine the design of a gas-filled compartment

3.128**design temperature (of gas-filled compartments)**

the highest temperature which can be reached by the gas under service conditions

Section 4. Rated characteristics

4 Rating

The ratings of metal-enclosed switchgear and controlgear are the following:

- a) rated voltage and number of phases;
- b) rated insulation level;
- c) rated frequency;
- d) rated normal current (for main circuits);
- e) rated short-time withstand current (for main and earthing circuits);
- f) rated peak withstand current, if applicable (for main and earthing circuits);
- g) rated duration of short circuit;
- h) rated values of the components forming part of the metal-enclosed switchgear and controlgear including their operating devices and auxiliary equipment;
- i) rated filling pressure (of gas-filled compartments).

For the co-ordination of rated voltages, rated short-time withstand currents, rated peak withstand currents and rated normal currents of metal-enclosed switchgear and controlgear reference is made to IEC 56 and to IEC 129.

4.1 Rated voltage

Refer to Sub-clauses 4.1 and 4.1.1 of IEC 694.

NOTE Components forming part of metal-enclosed switchgear and controlgear may have individual values of rated voltage in accordance with their relevant standards.

4.2 Rated insulation level

Refer to Sub-clauses 4.2 and 4.2.1 of IEC 694. For metal-enclosed switchgear and controlgear the rated withstand voltage values, based on current practice in Canada and the United States of America, are given in the table of Annex EE.

4.3 Rated frequency

Refer to Sub-clause 4.3 of IEC 694 with the addition of the following rated values:

16⅔ Hz and 25 Hz

4.4 Rated normal current and temperature rise

4.4.1 Rated normal current

Refer to Sub-clause 4.4.1 of IEC 694 with the addition of the following paragraph:

Some main circuits of metal-enclosed switchgear and controlgear (e.g. busbars, feeder circuits, etc.) may not have the same value of rated normal current.

4.4.2 Temperature rise

Refer to Sub-clause 4.4.2 of IEC 694 with the addition of the following supplement:

The temperature rise of components contained in metal-enclosed switchgear and controlgear which are subject to individual specifications not covered by the scope of IEC 694 shall not exceed the temperature-rise limits permitted in the relevant standard for that component.

The maximum permissible temperatures and temperature rises to be taken into account for busbars are those specified for contacts, connections and metal parts in contact with insulation, as the case may be.

The temperature rise for accessible enclosures and covers shall not exceed 30 K. In the case of enclosures and covers which are accessible but need not be touched during normal operation, the temperature-rise limit may be increased by 10 K.