SLOVENSKI STANDARD
SIST HD 448 S3:1996

01-maj-1996

Common clauses for high-voltage switchgear and controlgear standards (IEC 694:1980 + A1:1985 + A2:1993)

Common clauses for high-voltage switchgear and controlgear standards

Gemeinsame Bestimmungen für Hochspannungsschaltgeräte-Normen

Clauses communes pour les normes de l'appareillage à haute tension

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English version

Common clauses for high-voltage switchgear and controlgear standards
(IEC 694:1980 + A1:1985 + A2:1993)

Clauses communes pour les normes de l'appareillage à haute tension
(CEI 694:1980 + A1:1985 + A2:1993)

Gemeinsame Bestimmungen für Hochspannungsschaltgeräte-Normen
(IEC 694:1980 + A1:1985 + A2:1993)

This Harmonization Document was approved by CENELEC on 1994-12-06. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for implementation of this Harmonization Document on a national level.

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

This Harmonization Document exists in three official versions (English, French, German).

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 694:1980 and its amendments 1:1985 and 2:1993, prepared by SC 17A, High-voltage switchgear and controlgear, of IEC TC 17, Switchgear and controlgear, was submitted to the formal vote and was approved by CENELEC as HD 448 S3 on 1994-12-06 without any modification.

The following dates were fixed:

- latest date by which the existence of the HD has to be announced at national level (doa) 1995-06-01
- latest date by which the HD has to be implemented at national level by publication of a harmonized national standard or by endorsement (dop) 1995-12-01
- latest date by which the national standards conflicting with the HD have to be withdrawn (dow) 1995-12-01

Appendices and annexes designated "normative" are part of the body of the standard. In this standard, appendices A and B and annexes ZA and ZB are normative. Annexes ZA and ZB have been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 694:1980 and its amendments 1:1985 and 2:1993 was approved by CENELEC as a Harmonization Document without any modification.

Annex ZA (normative)

Special national conditions

Special national condition: National characteristic or practice that cannot be changed even over a long period, e.g. climatic conditions, electrical earthing conditions. If it affects harmonization, it forms part of the European Standard or Harmonization Document.

For the countries in which the relevant special national conditions apply these provisions are normative, for other countries they are informative.

Belgium

Rated voltages

There are appreciable discrepancies between actual network voltages and the next highest IEC rated voltages, two additional rated voltages are permitted, those being 41,5 kV and 82,5 kV.

The rated lightning impulse withstand voltage and the rated one minute power-frequency withstand voltage related to these values are given in the table below.

Rated voltage U (r.m.s. value) (kV)	Rated lightning impulse withstand voltage (peak value)				Rated 1 min power-frequency withstand voltage (r.m.s. value)	
	List 1		List 2			
	to earth, between poles and across open switching device (kV)	Across the isolating distance (kV)	To earth, between poles and across open switching device (kV)	Across the isolating distance (kV)	To earth, between poles and across open switching device (kV)	Across the isolating distance
(1)	(2)	(3)	(4)	(5)	(6)	(7)
41,5	170	195	200	230	80	92
82,5	380	440	380	440	150	175

ANNEX ZB (normative)

OTHER INTERNATIONAL PUBLICATIONS QUOTED IN THIS STANDARD WITH THE REFERENCES OF THE RELEVANT EUROPEAN PUBLICATIONS

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

NOTE : When the international publication has been modified by CENELEC common modifications, indicated by (mod), the relevant EN/HD applies.

IEC Publication	Date	Title	EN/HD	Date
38	1975*	IEC standard voltages	-	-
50(441)	1974	International Electrotechnical Vocabulary (IEV) Chapter 441: Switchgear, controlgear and fuses	-	-
59	1938	IEC standard current ratings	-	-
60	series	High-voltage test techniques	HD 588.1 S1 EN 60060-2	1991 1994
71-1	1976	Insulation co-ordination Part 1: Terms, definitions, principles and rules	-	-
71-2	1976	Part 2: Application guide	HD 540.2 S1	1991
71-3	1982	Part 3: Phase-to-phase insulation co-ordination - Principles, rules and application guide	HD 540.3 S1	1991
85	1957*	Recommendations for the classification of materials for the insulation of electrical machinery and apparatus in relation to their thermal stability in service	-	-
117-1	1960	Recommended graphical symbols Part 1: Kind of current, distribution systems, methods of connectionand circuit elements	-	-
270	1968	Partial discharge measurements	-	-

* IEC 38:1983 is harmonized as HD 472 S1:1989
The title of HD 472 S1 is: Nominal voltages for low public electricity supply systems
* IEC 85:1984 is harmonized as HD 566 S1:1990

IEC Publication	Date	Title	EN/HD	Date
296	1969	Specification for new insulating oils for transformers and switchgear	-	-
376	1971	Specification and acceptance of new sulphur hexafluoride	-	-
480	1974	Guide to the checking of sulphur hexafluoride (SF6) taken from electrical equipment	-	-
507	1975*	Artificial pollution tests on high-voltage insulators to be used on a.c. systems	-	-

Other publication:

CISPR 16 - CISPR Specification for radio interference measuring apparatus and measuring methods

* IEC 507:1991 is harmonized as EN 60507:1993

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Common clauses for high-voltage switchgear and controlgear standards

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For price, see current catalogue

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMON CLAUSES FOR HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR STANDARDS

FOREWORD

1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.

2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.

3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

PREFACE

This standard has been prepared by Sub-Committee 17A: High-voltage Switchgear and Controlgear, of IEC Technical Committee No. 17: Switchgear and Controlgear.

Drafts were discussed at the meeting held in Moscow in 1977. As a result of this meeting, drafts were circulated under the Accelerated Procedure and submitted to the National Committees for approval under the Six Months' Rule in October 1978 as Documents 17A(Central Office)129, 130 and 131.

The National Committees of the following countries voted explicitly in favour of publication of Document 17A(Central Office)129:

Australia	France	South Africa (Republic of)
Austria	Germany	Spain
Belgium	Italy	Sweden
Canada	Japan	Switzerland
China	Netherlands	Turkey
Denmark	Norway	United Kingdom
Finland	Poland	United States of America

The National Committees of the following countries voted explicitly in favour of publication of Document 17A(Central Office)130:

Australia	Germany	Sweden
Austria	Italy	Switzerland
Belgium	Japan	Turkey
Canada	Netherlands	Union of Soviet Socialist Republics
China	Norway	United Kingdom
Denmark	Poland	United States of America
Finland	South Africa (Republic of)	
France	Spain	

The National Committees of the following countries voted explicitly in favour of publication of Document 17A(Central Office)131:

Australia	Germany	Spain
Austria	Italy	Sweden
Belgium	Japan	Switzerland
Canada	Netherlands	Turkey
China	Norway	Union of Soviet Socialist Republics
Denmark	Poland	United Kingdom
Finland	South Africa (Republic of)	
France		

The National Committee of the United States of America has voted negatively on Document 17A(Central Office)131 because the short-time withstand current tests in Sub-clause 6.5.2 do not recognize practice in the United States of America.

The remaining drafts were discussed at the meeting held in Sydney in 1979. As a result of this meeting a draft was submitted to the National Committees for approval under the Six Months' Rule in November 1979 as Document 17A(Central Office)136.

The National Committees of the following countries voted explicitly in favour of publication:

Australia	Finland	Poland
Austria	France	South Africa (Republic of)
Belgium	Germany	Spain
Brazil	Italy	Sweden
Canada	Netherlands	Switzerland
China	New Zealand	Turkey
Denmark	Norway	

The National Committee of the United States of America has voted against the Document 17A(Central Office)136 because the concept of common requirements has been carried to uncommon product areas and also because adoption in the United States would influence some important system reliabilities.

Other IEC publications quoted in this standard:

Publications Nos. 38: IEC Standard Voltages.
50(441): International Electrotechnical Vocabulary, Chapter 441: Switchgear and Controlgear. (To be replaced by Publication 50(443), under consideration.)
59: IEC Standard Current Ratings.
60: High-voltage Test Techniques.
71-1: Insulation Co-ordination, Part 1: Terms, Definitions, Principles and Rules.
71-2: Insulation Co-ordination, Part 2: Application Guide.
71-3: Insulation Co-ordination, Part 3: Phase-to-phase Insulation Co-ordination. Principles, Rules and Application Guide. (Under consideration.)
85: Recommendations for the Classification of Materials for the Insulation of Electric Machinery and Apparatus in Relation to Their Thermal Stability in Service.
117-1: Recommended Graphical Symbols; Graphical Symbols, Part 1: Kind of Current, Distribution Systems, Methods of Connection and Circuit Elements.
270: Partial Discharge Measurements.
296: Specification for New Insulating Oils for Transformers and Switchgear.
376: Specification and Acceptance of New Sulphur Hexafluoride.
480: Guide to the Checking of Sulphur Hexafluoride (SF_6) Taken from Electrical Equipment.
507: Artificial Pollution Tests on High-voltage Insulators to be Used on A.C. Systems.

C.I.S.P.R. publication quoted in this standard:

Publication No. 16: C.I.S.P.R. Specification for Radio Interference Measuring Apparatus and Measuring Methods.

COMMON CLAUSES FOR HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR STANDARDS

1. Scope

This standard applies to a.c. switchgear and controlgear, designed for indoor and outdoor installation and for operation at service frequencies up to and including 60 Hz on systems having voltages above 1 000 V.

This standard applies to all high-voltage switchgear and controlgear except as otherwise specified in the relevant IEC standards for the particular type of switchgear and controlgear.

2. Normal and special service conditions

Unless otherwise specified, high-voltage switchgear and controlgear, including the operating devices and the auxiliary equipment which form an integral part of it, is intended to be used at its rated characteristics under the normal service conditions listed in Sub-clause 2.1.

If the actual service conditions differ from these normal service conditions, high-voltage switchgear and controlgear and associated operating devices and auxiliary equipment shall be designed to comply with any special service conditions required by the user, or appropriate arrangements shall be made (see Sub-clause 2.2).

Note. – Appropriate action should also be taken to ensure proper operation under such conditions of other components, such as relays.

2.1 *Normal service conditions*

2.1.1 *Indoor switchgear and controlgear*

a) The ambient air temperature does not exceed 40 °C and its average value, measured over a period of 24 h, does not exceed 35 °C.

The minimum ambient air temperature is –5 °C for class 'minus 5 indoor' and –25 °C for class 'minus 25 indoor'.

b) The altitude does not exceed 1 000 m.

c) The ambient air is not significantly polluted by dust, smoke, corrosive or flammable gases, vapours or salt.

d) The conditions of humidity are under consideration but, in the meantime, the following figures can be used as a guide:

– the average value of the relative humidity, measured during a period of 24 h, does not exceed 95%,

– the average value of the vapour pressure, for a period of 24 h, does not exceed 22 mbar,

– the average value of the relative humidity, for a period of one month, does not exceed 90%,

– the average value of the vapour pressure, for a period of one month, does not exceed 18 mbar.

For these conditions, condensation may occasionally occur.

Notes 1. – Condensation can be expected where sudden temperature changes occur in periods of high humidity.

2. – To withstand the effects of humidity and occasional condensation, such as breakdown of insulation or corrosion of metallic parts, indoor switchgear, designed for such conditions and tested accordingly, or outdoor switchgear may be used.

3. – Condensation may be prevented by special design of the building or housing, by suitable ventilation and heating of the station or by the use of dehumidifying equipment.

e) Vibrations due to causes external to the switchgear and controlgear or earth tremors are negligible.

2.1.2 *Outdoor switchgear and controlgear*

a) The ambient air temperature does not exceed 40 °C and its average value, measured over a period of 24 h, does not exceed 35 °C.

The minimum ambient air temperature is –25 °C for class 'minus 25 outdoor' and –40 °C for class 'minus 40 outdoor'.

b) The altitude does not exceed 1 000 m.

c) Ambient air pollution (classification is under consideration).

d) The ice coating does not exceed 1 mm for Class 1, 10 mm for Class 10 and 20 mm for Class 20.

e) The wind pressure does not exceed 700 Pa (corresponding to 34 m/s wind speed).

f) Account should be taken of the presence of condensation or rain, rapid temperature changes, and the effects of solar radiation.

Note. – This does not imply that outdoor switchgear and controlgear will carry its rated normal current under all conditions of solar radiation without exceeding the specified temperature rise. When required, appropriate measures shall be taken, e.g. roofing, forced ventilation, etc.

g) Vibrations due to causes external to the switchgear and controlgear or earth tremors are negligible.

2.2 *Special service conditions*

By agreement between manufacturer and user, high-voltage switchgear and controlgear may be used under conditions different from the normal service conditions given in Subclause 2.1. For any special service condition, the manufacturer shall be consulted.

Notes 1. – For internal insulation, the dielectric characteristics are identical at any altitude and no special precautions need be taken. For definitions of external and internal insulation see IEC Publication 71-1.

2. – For low-voltage auxiliary equipment, no special precautions need be taken if the altitude is lower than 2 000 m.

3. Definitions

For the definitions of general terms used in this publication, reference is made to IEC Publication 50(441). (To be replaced by Publication 50(443), under consideration.)

4. Rating

The common ratings of switchgear and controlgear including their operating devices and auxiliary equipment should be selected from the following:

a) Rated voltage.

b) Rated insulation level.

c) Rated frequency.

d) Rated normal current.

e) Rated short-time withstand current.

f) Rated peak withstand current.

g) Rated duration of short circuit.

h) Rated supply voltage of closing and opening devices and of auxiliary circuits.

i) Rated supply frequency of closing and opening devices and of auxiliary circuits.

j) Rated pressure of compressed gas supply for operation.

Note. – Other rated characteristics may be necessary and will be specified in the relevant IEC standards.

4.1 *Rated voltage*

The rated voltage indicates the upper limit of the highest voltage of systems for which the switchgear and controlgear is intended. Standard values of rated voltages are given below:

Note. – For editorial reasons, mainly due to the characteristics of the transient recovery voltages, the subdivision in voltage ranges differs from that in IEC Publication 38 and IEC Publication 71.

4.1.1 *For rated voltages of 72.5 kV and below*

Series I 3.6 kV - 7.2 kV - 12 kV - 17.5 kV - 24 kV - 36 kV - 52 kV - 72.5 kV.
Series II 4.76 kV - 8.25 kV - 15 kV - 15.5 kV - 25.8 kV - 38 kV - 48.3 kV - 72.5 kV.

Note. – Series I 50 Hz and 60 Hz.
Series II 60 Hz, based on current practice in the United States of America and Canada.

4.1.2 *For rated voltages above 72.5 kV*

100 kV - 123 kV - 145 kV - 170 kV - 245 kV - 300 kV – 362 kV - 420 kV - 525 kV - 765 kV.

Note. – The value 550 kV is also used, as well as values between 765 kV and 800 kV.

4.2 *Rated insulation level*

The rated insulation level shall be selected from the values given in the following Tables I, II, III and IV. The withstand voltage values in Tables I, II, III and IV apply at the standard reference atmosphere (temperature, pressure and humidity) specified in IEC Publication 60.