SLOVENSKI STANDARD
SIST HD 348 S7:2001

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SIST HD 348 S5:1995

High-voltage alternating-current circuit-breakers

High-voltage alternating-current circuit-breakers

Hochspannungs-Wechselstrom-Leistungsschalter

Disjoncteurs à courant alternatif à haute tension

Ta slovenski standard je istoveten z: HD 348 S7:1998

ICS:

29.130.10	Visokonapetostne stikalne in krmilne naprave	High voltage switchgear and controlgear

SIST HD 348 S7:2001 **en**

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Descriptors: Switchgear and controlgear, high voltage, circuit-breaker, characteristic, design, test

English version

High-voltage alternating-current circuit-breakers
(IEC 60056:1987 + A3:1996, modified)

Disjoncteurs à courant alternatif à haute tension
(CEI 60056:1987 + A3:1996, modifiée)

Hochspannungs-Wechselstrom-Leistungsschalter
(IEC 60056:1987 + A3:1996, modifiziert)

This Harmonization Document was approved by CENELEC on 1998-04-01. 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, Czech Republic, 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

Ref. No. HD 348 S7:1998 E

Foreword

The text of the International Standard IEC 60056:1987 and its amendment 3:1996, prepared by SC 17A, High-voltage switchgear and controlgear, of IEC TC 17, Switchgear and controlgear, together with common modifications prepared by the Technical Committee CENELEC TC 17A, High-voltage switchgear and controlgear, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as HD 348 S7 on 1998-04-01.

This European Standard supersedes HD 348 S6:1995.

The following dates were fixed:

- latest date by which the existence of the HD has to be announced at national level (doa) 1998-07-01
- latest date by which the HD has to be implemented at national level by publication of a harmonized national standard or by endorsement (dop) 1999-01-01
- latest date by which the national standards conflicting with the HD have to be withdrawn (dow) 1999-01-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annexes AA, BB, CC, DD, EE, FF, GG, HH, ZA and ZB are normative and annexes JJ and KK are informative.
Annexes ZA and ZB have been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60056:1987 and its amendment 3:1996 was approved by CENELEC as a Harmonization Document with agreed common modifications as given below.

COMMON MODIFICATIONS

Table Xc Co-ordination table of rated values for circuit-breakers

1) In the heading of column 2 change (kV) into (kA).

2) Add the following values:

Rated voltage U (kV)	Rated short-circuit breaking current I_{sc} (kA)	Rated normal current I_n (A)					
100	16 20 31,5		1250		2000	3150	

3) In the first line of the note delete the words ", omitting 100 kV".

6.109.5 Test duties

Replace the text of this subclause of amendment 3 by:

"Add the following sentence at the end of subclause 6.109.5:

By agreement between manufacturer and user, any equivalent procedure which complies with the requirements of IEC 60427 may also be used."

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

To take account of a special national condition where there are appreciable discrepancies between actual network voltages and the next high test IEC rated voltages, two additional rated voltages are permittted, 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 EN 60694:1996/corrigendum April 1998.

Annex ZB (normative)

Normative references to international publications with their corresponding European publications

This Harmonization Document 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 Harmonization Document only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

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

Publication	Year	Title	EN/HD	Year
IEC 60050(151)	1978	International Electrotechnical Vocabulary (IEV) Chapter 151: Electrical and magnetic devices	-	-
IEC 60050(441)	1984	Chapter 441: Switchgear, controlgear and fuses	-	-
IEC 60050(604)	1987	Chapter 604: Generation, transmission and distribution of electricity - Operation	-	-
IEC 60060-1	1973[1]	High-voltage test techniques Part 1: General definitions and test requirements	-	-
IEC 60068-2-5	1975	Basic environmental testing procedures Part 2: Tests - Test Sa: Simulated solar radiation at ground level	HD 323.2.5 S1	1988
IEC 60068-2-17	1978	Part 2: Tests - Test Q: Sealing	HD 323.2.17 S4[2]	1990
IEC 60071-2	1976	Insulation co-ordination Part 2: Application guide	HD 540.2 S1[3]	1991
IEC 60077	1968	Rules for electric traction equipment	-	-
IEC 60129	1984	Alternating current disconnectors and earthing switches	EN 60129	1994
IEC 60137	1984[4]	Bushings for alternating voltages above 1 kV	-	-

1) IEC 60060-1:1989 and its corrigendum March 1990 are harmonized as HD 588.1 S1:1991.
2) HD 323.2.17 S4 is superseded by EN 60068-2-17:1994, which is based on IEC 60068-2-17:1994.
3) HD 540.2 S1 is superseded by EN 60071-2:1997, which is based on IEC 60071-2:1996.
4) IEC 60137:1995 is harmonized as EN 60137:1996.

Publication	Year	Title	EN/HD	Year
IEC 60185	1966[5]	Current transformers	-	-
IEC 60296	1982	Specification for unused mineral insulating oils for transformers and switchgear	-	-
IEC 60376	1971	Specification and acceptance of new sulphur hexafluoride	-	-
IEC 60427	1973[6]	Report on synthetic testing of high-voltage alternating current circuit-breakers	-	-
IEC 60694	1980	Common clauses for high-voltage switchgear and controlgear standards	HD 448 S4[7]	1996

5) IEC 60185:1987 + A1:1990, mod. are harmonized as HD 553 S2:1993.

6) IEC 60427:1989 is harmonized as EN 60427:1992.

7) HD 448 S4 is superseded by EN 60694:1996 (and its corrigendum April 1998), which is based on IEC 60694:1996.

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Disjoncteurs à courant alternatif à haute tension

High-voltage alternating-current circuit-breakers

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

HIGH-VOLTAGE ALTERNATING-CURRENT CIRCUIT-BREAKERS

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.

This forms the fourth edition of IEC Publication 56 and replaces IEC Publications 56-1, 56-2, 56-3, 56-4, 56-4A, 56-5 and 56-6 and their amendments.

The text of this standard is based on the following documents:

Six Months' Rule	Reports on Voting
17A(CO)145	17A(CO)149
17A(CO)155	17A(CO)169
17A(CO)156	17A(CO)170
17A(CO)157	17A(CO)171
17A(CO)159+A	17A(CO)172
17A(CO)160	17A(CO)167
17A(CO)161	17A(CO)165
17A(CO)173	17A(CO)183+A
17A(CO)174	17A(CO)184+A
17A(CO)175	17A(CO)185+A
17A(CO)176, I, II, III	17A(CO)191
17A(CO)177	17A(CO)186+A
17A(CO)178	17A(CO)187+A
17A(CO)179	17A(CO)188
17A(CO)180	17A(CO)190
17A(CO)181	17A(CO)192
17A(CO)195	17A(CO)201

Further information can be found in the relevant Reports on Voting, indicated in the table above.

The supplementary sub-clauses are numbered from 101 onwards. The appendices and their figures are named, AA, BB, etc.

The following IEC publications are quoted in this standard:

Publication Nos. 50(151) (1978): International Electrotechnical Vocabulary (IEV), Chapter 151: Electrical and Magnetic Devices.
50(441) (1984): Chapter 441: Switchgear, Controlgear and Fuses.
50(604) (1986): Chapter 604: Generation, Transmission and Distribution of Electricity: Operation.
60-1 (1973): High-voltage Test Techniques, Part 1: General Definitions and Test Requirements.

68-2-5 (1975): Basic Environmental Testing Procedures, Part 2: Tests — Test Sa: Simulated Solar Radiation at Ground Level.

68-2-17 (1978): Test Q: Sealing.
71-2 (1976): Insulation Co-ordination. Part 2: Application Guide.
77 (1968): Rules for Electric Traction Equipment.
129 (1984): Alternating Current Disconnectors and Earthing Switches.
137 (1984): Bushings for Alternating Voltages Above 1 000 V.
185 (1966): Current Transformers.
296 (1982): Specification for Unused Mineral Insulating Oils for Transformers and Switchgear.

376 (1971): Specification and Acceptance of New Sulphur Hexafluoride.
427 (1973): Report on Synthetic Testing of High-voltage Alternating Current Circuit-breakers.
694 (1980): Common Clauses for High-voltage Switchgear and Controlgear Standards.

HIGH-VOLTAGE ALTERNATING-CURRENT CIRCUIT-BREAKERS

CHAPTER I: SERVICE CONDITIONS, DEFINITIONS, RATING, CONSTRUCTION AND DESIGN

1. Scope

This standard is applicable to a.c. circuit-breakers designed for indoor or outdoor installation and for operation at frequencies up to and including 60 Hz on systems having voltages above 1 000 V.

It is only applicable to three-pole circuit-breakers for use in three-phase systems and single-pole circuit-breakers for use in single-phase systems. Two-pole circuit-breakers for use in single-phase systems are subject to agreement between manufacturer and user.

This standard is also applicable to the operating devices of circuit-breakers and to their auxiliary equipment. However, a circuit-breaker with a closing mechanism for dependent manual operation is not covered by this standard, as a rated short-circuit making-current cannot be specified, and such dependent manual operation may be objectionable because of safety considerations.

This standard does not cover circuit-breakers intended for use on motive power units of electrical traction equipment; these are covered by IEC Publication 77: Rules for Electric Traction Equipment.

Circuit-breakers for use with overhead lines which include series capacitors are not within the scope of this standard.

Note. — Tests to prove the performance under abnormal conditions should be subject to agreement between manufacturer and user. Such abnormal conditions are, for instance, cases where the voltage is higher than the rated voltage of the circuit-breaker, conditions which may occur due to sudden loss of load on long lines or cables.

This standard is not necessarily applicable to circuit-breakers for special conditions, for example, those produced by two earth faults on two different phases one of which occurs on one side of the circuit-breaker and the other on the other side.

2. Normal and special service conditions

Clause 2 of IEC Publication 694: Common Clauses for High-voltage Switchgear and Controlgear Standards, is applicable.

3. Definitions

In this clause reference is made to definitions in the following publications of the International Electrotechnical Vocabulary (IEV):

- 50(151) (1978): Chapter 151: Electrical and Magnetic Devices,
- 50(441) (1984): Chapter 441: Switchgear; Controlgear and Fuses,
- 50(604) (—): Chapter 604: Generation, Transmission and Distribution of Electricity: Operation (being printed).

For the purpose of this standard, the following definitions are applicable.

3.101 *General terms*

3.101.1 *Switchgear and controlgear* (441-11-01)

3.101.2 *Indoor switchgear and controlgear* (441-11-04)

3.101.3 *Outdoor switchgear and controlgear* (441-11-05)

3.101.4 *Short-circuit current* (441-11-07)

3.101.5 *Isolated neutral system*

A system which has no intentional connection to earth except through indicating, measuring or protective devices of very high impedance.

3.101.6 *Resonant earthed system; system earthed through an arc-suppression coil*

A system in which the neutral is earthed through a reactor, the reactance having a value such that during a single phase-to-earth fault, the power frequency inductive current passed by this reactor substantially neutralizes the power frequency capacitive component of the earth-fault current.

Note. — With resonant earthing of a system, the residual current in the fault is limited to such an extent that an arcing fault in air is usually self-extinguishing.

3.101.7 *Earthed neutral system*

A system in which the neutral is connected to earth, either solidly, or through a resistance or reactance of a value low enough to reduce materially any transient oscillations and to improve the conditions for selective earth-fault protection.

3.101.8 *Earth fault factor*

At a selected location of a three-phase system (generally the point of installation of an equipment) and for a given system configuration, the ratio of the highest r.m.s. phase-to-earth power-frequency voltage on a sound phase during a fault to earth (affecting one or more phases at any point) to the r.m.s. phase-to-earth power-frequency voltage which would be obtained at the selected location without the fault.

Notes 1. — This factor is a pure numerical ratio (higher than 1) and characterizes in general terms the earthing conditions of a system as viewed from the stated location, independently of the actual operating values of the voltage at that location.

The "earth fault factor" is the product of $\sqrt{3}$ and the "factor of earthing" which has been used in the past.

2. — The earth fault factors are calculated from the phase-sequence impedance components of the system, as viewed from the selected location, using for any rotating machines the subtransient reactances.

3. — If, for all credible system configurations, the zero-sequence reactance is less than three times the positive-sequence reactance and if the zero-sequence resistance does not exceed the positive-sequence reactance, the earth fault factor will not exceed 1.4.

3.101.9 *Ambient air temperature* (441-11-13)

3.101.10 *Temperature rise (of a part of a circuit-breaker)*

The difference between the temperature of the part and the ambient air temperature.

3.101.11 *Single capacitor bank*

A bank of shunt capacitors in which the inrush current is limited by the inductance of the supply system and the capacitance of the bank of capacitors being energized, there being no other capacitors connected in parallel to the system sufficiently close to increase the inrush current appreciably.