SLOVENSKI STANDARD
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01-september-2002

Nadomešča:
SIST HD 533 S1:1998

Kratkostični toki v izmeničnih trifaznih sistemih - 0. del: Računanje tokov

Short-circuit currents in three-phase a.c. systems - Part 0: Calculation of currents

Kurzschlussströme in Drehstromnetzen - Teil 0: Berechnung der Ströme

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Courants de court-circuit dans les réseaux triphasés à courant alternatif Partie 0: Calcul des courants

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Ta slovenski standard je istoveten z: EN 60909-0:2001

ICS:

17.220.01	Elektrika. Magnetizem. Splošni vidiki	Electricity. Magnetism. General aspects
29.240.20	Daljnovodi	Power transmission and distribution lines

SIST EN 60909-0:2002 **en**

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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EUROPEAN STANDARD **EN 60909-0**

NORME EUROPÉENNE

EUROPÄISCHE NORM August 2001

ICS 17.220.01; 29.240.20 Supersedes HD 533 S1:1991

English version

Short-circuit currents in three-phase a.c. systems
Part 0: Calculation of currents
(IEC 60909-0:2001)

Courants de court-circuit dans les réseaux triphasés à courant alternatif
Partie 0: Calcul des courants
(CEI 60909-0:2001)

Kurzschlussströme in Drehstromnetzen
Teil 0: Berechnung der Ströme
(IEC 60909-0:2001)

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This European Standard was approved by CENELEC on 2001-07-01. 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.

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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.

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, 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

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Ref. No. EN 60909-0:2001 E

Foreword

The text of document 73/119/FDIS, future edition 1 of IEC 60909-0, prepared by IEC TC 73, Short-circuit currents, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60909-0 on 2001-07-01.

This European Standard supersedes HD 533 S1:1991.

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 (d'op) 2002-04-01

– latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2004-07-01

Annexes designated "normative" are part of the body of the standard.
In this standard, annexes A and ZA are normative.
Annex ZA has been added by CENELEC.

Endorsement notice

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The text of the International Standard IEC 60909-0:2001 was approved by CENELEC as a European Standard without any modification.

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Annex ZA
(normative)

Normative references to international publications with their corresponding 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 (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 60038 (mod)	1983	Nominal voltages for low-voltage public electricity supply systems	HD 472 S1	1989
IEC 60050-131	1978	International Electrotechnical Vocabulary (IEV) Chapter 131: Electric and magnetic circuits	-	-
IEC 60050-151	1978	Chapter 151: Electrical and magnetic devices	-	-
IEC 60050-195	1998	Chapter 195: Earthing and protection against electric shock	-	-
IEC 60056 (mod)	1987	High-voltage alternating-current circuit-breakers	HD 348 S7[1)]	1998
IEC 60071-1	1993	Insulation co-ordination Part 1: Definitions, principles and rules	EN 60071-1	1995
IEC 60781	1989	Application guide for calculation of short-circuit currents in low-voltage radial systems	HD 581 S1	1991
IEC 60865-1	1993	Short-circuit currents - Calculation of effects Part 1: Definitions and calculation methods	EN 60865-1	1993
IEC 60909-1	[2)]	Short-circuit currents calculation in three-phase a.c. systems Part 1: Factors for the calculation of short-circuit currents in three-phase a.c. systems according to IEC 60909-0	-	-

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1) HD 348 S7 is based on IEC 60056:1987 + A3:1996.

2) To be published.

Publication	Year	Title	EN/HD	Year
IEC 60909-2	1992	Electrical equipment - Data for short-circuit current calculations in accordance with IEC 60909	-	-
IEC 60909-3	1995	Part 3: Currents during two separate simultaneous single phase line-to-earth short circuits and partial short-circuit currents flowing through earth	-	-
IEC 60909-4	2)	Part 4: Examples for the calculation of short-circuit currents	-	-
IEC 60949	1988	Calculation of thermally permissible short-circuit currents, taking into account non-adiabatic heating effects	-	-
IEC 60986	1989	Guide to the short-circuit temperature limits of electric cables with a rated voltage from 1,8/3 (3,6) kV to 18/30 (36) kV	-	-

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2) To be published.

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Courants de court-circuit dans les réseaux triphasés à courant alternatif –

Partie 0: Calcul des courants

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Short-circuit currents in three-phase a.c. systems –

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Part 0: Calculation of currents

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International Electrotechnical Commission
Международная Электротехническая Комиссия

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SHORT-CIRCUIT CURRENTS IN THREE-PHASE AC SYSTEMS –

Part 0: Calculation of currents

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
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International Standard IEC 60909-0 has been prepared by IEC technical committee 73: Short-circuit currents.

This first edition cancels and replaces IEC 60909 published in 1988 and constitutes a technical revision.

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

FDIS	Report on voting
73/119/FDIS	73/121/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

Annex A forms an integral part of this standard.

This part of IEC 60909 shall be read in conjunction with the International Standards, Technical Reports and Technical Specifications mentioned below:

– IEC TR 60909-1,— *Short-circuit current calculation in three-phase a.c. systems – Part 1: Factors for the calculation of short-circuit currents in three-phase a.c. systems according to IEC 60909-0* [1)]

– IEC TR3 60909-2:1992, *Electrical equipment – Data for short-circuit current calculations in accordance with IEC 60909*

– IEC 60909-3:1995, *Short-circuit current calculation in three-phase a.c. systems – Part 3: Currents during two separate simultaneous single-phase line-to-earth short circuits and partial short-circuit currents following through earth*

– IEC TR 60909-4:2000, *Short-circuit current calculation in three-phase a.c. systems – Part 4: Examples for the calculation of short-circuit currents*

The committee has decided that the contents of this publication will remain unchanged until 2007. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

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The contents of the corrigendum of February 2002 have been included in this copy.

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1) To be published.

SHORT-CIRCUIT CURRENTS IN THREE-PHASE AC SYSTEMS –

Part 0: Calculation of currents

1 General

1.1 Scope

This part of IEC 60909 is applicable to the calculation of short-circuit currents:

- in low-voltage three-phase a.c. systems
- in high-voltage three-phase a.c. systems

operating at a nominal frequency of 50 Hz or 60 Hz.

Systems at highest voltages of 550 kV and above with long transmission lines need special consideration.

This part of IEC 60909 establishes a general, practicable and concise procedure leading to results, which are generally of acceptable accuracy. For this calculation method, an equivalent voltage source at the short-circuit location is introduced. This does not exclude the use of special methods, for example the superposition method, adjusted to particular circumstances, if they give at least the same precision. The superposition method gives the short-circuit current related to the one load flow presupposed. This method, therefore, does not necessarily lead to the maximum short-circuit current.

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This part of IEC 60909 deals with the calculation of short-circuit currents in the case of balanced or unbalanced short circuits.

In case of an accidental or intentional conductive path between one line conductor and local earth, the following two cases must be clearly distinguished with regard to their different physical properties and effects (resulting in different requirements for their calculation):

- line-to-earth short circuit, occurring in a solidly earthed neutral system or an impedance earthed neutral system;
- a single line-to-earth fault, occurring in an isolated neutral earthed system or a resonance earthed neutral system. This fault is beyond the scope of, and is therefore not dealt with in, this standard.

For currents during two separate simultaneous single-phase line-to-earth short circuits in an isolated neutral system or a resonance earthed neutral system, see IEC 60909-3.

Short-circuit currents and short-circuit impedances may also be determined by system tests, by measurement on a network analyzer, or with a digital computer. In existing low-voltage systems it is possible to determine the short-circuit impedance on the basis of measurements at the location of the prospective short circuit considered.

The calculation of the short-circuit impedance is in general based on the rated data of the electrical equipment and the topological arrangement of the system and has the advantage of being possible both for existing systems and for systems at the planning stage.

In general, two short-circuit currents, which differ in their magnitude, are to be calculated:

- the maximum short-circuit current which determines the capacity or rating of electrical equipment; and
- the minimum short-circuit current which can be a basis, for example, for the selection of fuses, for the setting of protective devices, and for checking the run-up of motors.

NOTE The current in a three-phase short circuit is assumed to be made simultaneously in all poles. Investigations of non-simultaneous short circuits, which may lead to higher aperiodic components of short-circuit current, are beyond the scope of this standard.

This standard does not cover short-circuit currents deliberately created under controlled conditions (short-circuit testing stations).

This part of IEC 60909 does not deal with the calculation of short-circuit currents in installations on board ships and aeroplanes.

1.2 Normative references

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The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60909. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 60909 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

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IEC 60038:1983, *IEC standard voltages*

IEC 60050(131):1978, *International Electrotechnical Vocabulary – Chapter 131: Electric and magnetic circuits*

IEC 60050(151):1978, *International Electrotechnical Vocabulary – Chapter 151: Electric and magnetic devices*

IEC 60050-195:1998, *International Electrotechnical Vocabulary – Part 195: Earthing and protection against electric shock*

IEC 60056:1987, *High-voltage alternating-current circuit-breakers*

IEC 60071-1:1993, *Insulation coordination – Part 1: Definitions, principles and rules*

IEC 60781:1989, *Application guide for calculation of short-circuit currents in low-voltage radial systems*

IEC 60865-1:1993, *Short-circuit currents – Calculation of effects – Part 1: Definitions and calculation methods*

IEC TR 60909-1,— *Short-circuit currents calculation in three-phase a.c. systems – Part 1: Factors for the calculation of short-circuit currents in three-phase a.c. systems according to IEC 60909-0*[1)]

IEC TR3 60909-2:1992, *Electrical equipment – Data for short-circuit current calculations in accordance with IEC 60909*

IEC 60909-3:1995, *Short-circuit current calculation in three-phase a.c. systems – Part 3: Currents during two separate simultaneous single phase line-to-earth short circuits and partial short-circuit currents flowing through earth*

IEC TR 60909-4:2000, *Short-circuit current calculation in three-phase a.c. systems – Part 4: Examples for the calculation of short-circuit currents*

IEC 60949:1988, *Calculation of thermally permissible short-circuit currents, taking into account non-adiabatic heating effects*

IEC 60986:1989, *Guide to the short-circuit temperature limits of electrical cables with a rated voltage from 1,8/3 (3,6) kV to 18/30 (36) kV*

1.3 Definitions

For the purposes of this part of IEC 60909, the definitions given in IEC 60050(131) and the following definitions apply.

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1.3.1
short circuit
accidental or intentional conductive path between two or more conductive parts forcing the electric potential differences between these conductive parts to be equal or close to zero

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1.3.1.1
line-to-line short circuit
accidental or intentional conductive path between two or more line conductors with or without earth connection

1.3.1.2
line-to-earth short circuit
accidental or intentional conductive path in a solidly earthed neutral system or an impedance earthed neutral system between a line conductor and local earth

1.3.2
short-circuit current
over-current resulting from a short circuit in an electric system

NOTE It is necessary to distinguish between the short-circuit current at the short-circuit location and partial short-circuit currents in the network branches (see figure 3) at any point of the network.

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1) To be published.