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Short-circuit currents in three-phase a.c systems - Part 3: Currents during two separate simultaneous line-to-earth short-circuits and partial short-circuit currents flowing through earth

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EUROPEAN STANDARD

**EN 60909-3**

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2003

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English version

**Short-circuit currents in three-phase a.c systems  
Part 3: Currents during two separate simultaneous line-to-earth  
short-circuits and partial short-circuit currents flowing through earth  
(IEC 60909-3:2003)**

Courants de court-circuit dans les réseaux triphasés à courant alternatif  
Partie 3: Courants durant deux court-circuits monophasés simultanés séparés à la terre et courants de court-circuit partiels s'écoulant à travers la terre  
(CEI 60909-3:2003)

Kurzschlussströme in Drehstromnetzen  
Teil 3: Ströme bei Doppelerdkurzschluss und Teilkurzschlussströme über Erde  
(IEC 60909-3:2003)

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**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 document 73/127/FDIS, future edition 2 of IEC 60909-3, prepared by IEC TC 73, Short-circuit currents, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60909-3 on 2003-11-01.

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) 2004-08-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2006-11-01

Annexes designated "normative" are part of the body of the standard.  
Annexes designated "informative" are given for information only.  
In this standard, annex ZA is normative annexes A and B are informative.  
Annex ZA has been added by CENELEC.

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## Endorsement notice

The text of the International Standard IEC 60909-3:2003 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.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60909-0	2001	Short-circuit currents in three-phase a.c. systems Part 0: Calculation of currents	EN 60909-0	2001

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

**Partie 3:**

**Courants durant deux courts-circuits monophasés  
simultanés séparés à la terre et courants de court-  
circuit partiels s'écoulant à travers la terre**

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

**Part 3:**

**Currents during two separate simultaneous  
line-to-earth short circuits and partial short-  
circuit currents flowing through earth**

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Commission Electrotechnique Internationale  
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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SHORT-CIRCUIT CURRENTS IN THREE-PHASE AC SYSTEMS –****Part 3: Currents during two separate simultaneous  
line-to-earth short circuits and partial short-circuit currents  
flowing through earth**

## FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60909-3 has been prepared by IEC technical committee 73: Short-circuit currents.

This second edition cancels and replaces the first edition published in 1995. This edition constitutes a technical revision.

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

FDIS	Voting report
73/127/FDIS	73/128/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.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until 2008. At this date, the publication will be

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

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## SHORT-CIRCUIT CURRENTS IN THREE-PHASE AC SYSTEMS –

### Part 3: Currents during two separate simultaneous line-to-earth short circuits and partial short-circuit currents flowing through earth

#### 1 Scope

This part of IEC 60909 specifies procedures for calculation of the prospective short-circuit currents with an unbalanced short circuit in high-voltage three-phase AC systems operating at nominal frequency 50 Hz or 60 Hz, i.e.

- a) currents during two separate simultaneous line-to-earth short circuits in isolated neutral or resonant earthed neutral systems;
- b) partial short-circuit currents flowing through earth in case of single line-to-earth short circuit in solidly earthed or low-impedance earthed neutral systems.

The currents calculated by these procedures are used when determining induced voltages or touch or step voltages and rise of earth potential at a station (power station or substation).

This standard does not cover:

- a) short-circuit currents deliberately created under controlled conditions as in short-circuit testing stations, or
- b) short-circuit currents in the electrical installations on board ships or aeroplanes, or
- c) single line-to-earth faults in isolated or resonant earthed systems.

The object of this standard is to establish practical and concise procedures for the calculation of line-to-earth short-circuit currents during two separate simultaneous line-to-earth short circuits and partial short-circuit currents through earth from electrical installations, leading to conservative results with sufficient accuracy. For this purpose, the current is determined by considering an equivalent voltage source applied at the short-circuit location with all other sources set to zero. The procedure is suitable for determination by manual methods or digital computation.

This standard is an addition to IEC 60909-0. General definitions, symbols and calculation assumptions refer to that publication. Special items only are defined or specified in this document. 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.

As stated in IEC 60909-0, short-circuit currents and their parameters may also be determined by system tests.

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