

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

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



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SHORT-CIRCUIT CURRENTS IN THREE-PHASE AC SYSTEMS –**Part 0: Calculation of currents****FOREWORD**

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International Standard IEC 60909-0 has been prepared by IEC technical committee 73: Short-circuit currents.

This second edition cancels and replaces the first edition published in 2001. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) contribution of windpower station units to the short-circuit current;
- b) contribution of power station units with full size converters to the short-circuit current;
- c) new document structure.

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

CDV	Report on voting
73/172/CDV	73/175A/RVC

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.

A list of all parts in the IEC 60909 series, published under the general title *Short-circuit currents in three-phase a.c. systems*, can be found on the IEC website.

This part of IEC 60909 is to be read in conjunction with the following International Standards and Technical Reports:

- IEC TR 60909-1:2002, *Short-circuit currents in three-phase a.c. systems – Part 1: Factors for the calculation of short-circuit currents according to IEC 60909-0*
- IEC TR 60909-2:2008, *Short-circuit currents in three-phase a.c. systems – Part 2: Data of electrical equipment for short-circuit current calculations*
- IEC 60909-3:2009, *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 TR 60909-4:2000, *Short-circuit currents in three-phase a.c. systems – Part 4: Examples for the calculation of short-circuit currents*

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- withdrawn,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

SHORT-CIRCUIT CURRENTS IN THREE-PHASE AC SYSTEMS –

Part 0: Calculation of currents

1 Scope

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

- in low-voltage three-phase AC systems, and
- in high-voltage three-phase AC 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.

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

A single line-to-earth fault is beyond the scope of this part of IEC 60909.

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 analyser, 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 types short-circuit currents, which differ in their magnitude, are considered:

- 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 part of IEC 60909.

This part of IEC 60909 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.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60038:2009, *IEC standard voltages*

IEC 60050-131, *International Electrotechnical Vocabulary – Part 131: Circuit theory* (available at: www.electropedia.org)

IEC TR 60909-1:2002, *Short-circuit currents in three-phase a.c. systems – Part 1: Factors for the calculation of short-circuit currents according to IEC 60909-0*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-131 and the following apply.

3.1

short circuit

accidental or intentional conductive path between two or more conductive parts (e.g. three-phase short circuit) forcing the electric potential differences between these conductive parts to be equal or close to zero

3.1.1

line-to-line short circuit

two-phase short circuit

accidental or intentional conductive path between two line conductors with or without earth connection

3.1.2

line-to-earth short circuit

single-phase 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

3.2

short-circuit current

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