

Conventions concerning electric and magnetic circuits

The European Standard EN 60375:2003 has the status of a
British Standard

ICS 17.220.01

National foreword

This British Standard is the official English language version of EN 60375:2003. It is identical with EN 60375:2003.

The UK participation in its preparation was entrusted to Technical Committee SS/7, General metrology, quantities, units and symbols, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 20, an inside back cover and a back cover.

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Conventions concernant les circuits
électriques et magnétiques
(CEI 60375:2003)

Vereinbarungen für Stromkreise
und magnetische Kreise
(IEC 60375:2003)

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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.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 25/261/FDIS, future edition 2 of IEC 60375, prepared by IEC TC 25, Quantities and units, and their letter symbols, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60375 on 2003-09-01.

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) 2004-06-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2006-09-01

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

Endorsement notice

The text of the International Standard IEC 60375:2003 was approved by CENELEC as a European Standard without any modification.

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CONVENTIONS CONCERNING ELECTRIC AND MAGNETIC CIRCUITS

1 Scope

This International Standard lays down rules for signs and reference directions and reference polarities for electric currents and voltages in electric networks, as well as for the corresponding quantities in magnetic circuits.

In Clauses 3 to 9, the time dependence is arbitrary. Clause 10 details the rules and recommendations for complex notation.

2 Normative references

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

IEC 60050-121:1998, *International Electrotechnical Vocabulary (IEV) – Part 121: Electromagnetism*

IEC 60050-131:2002, *International Electrotechnical Vocabulary (IEV) – Part 131: Circuit theory*

IEC 60617, *Graphical symbols for diagrams*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

terminal

point of interconnection of an electric circuit element, an electric circuit or a network (IEC 60050-131:2002, 131-13-03) with other electric circuit elements, electric circuits or networks

[IEV-131-11-11]

NOTE 1 For an electric circuit element, the terminals are the points at which or between which the related integral quantities are defined. At each terminal, there is only one electric current from outside into the element.

NOTE 2 The term “terminal” has a related meaning in IEC 60050-151.

3.2

circuit element

in electromagnetism, mathematical model of a device characterized by one or more relations between integral quantities

[IEV-131-11-03]

3.3

two-terminal element

electric circuit element having two terminals

[IEV 131-11-16]

3.4

n -terminal circuit element

electric circuit element having n terminals with generally $n > 2$

[IEV-131-11-13]

NOTE For an n -terminal electric circuit element:

- 1) the algebraic sum of the electric currents into the element through the terminals is zero at any instant;
- 2) there are $n - 1$ independent relations between integral quantities.

3.5

network

in network topology, set of ideal circuit elements and their interconnections, considered as a whole

[IEV-131-13-03]

NOTE 1 The term "electric network" is defined in IEC 60050-131-11-07 and in IEC 60050-151.

NOTE 2 In diagrams in this standard, a box, IEC 60617 symbol, represents any network, unless otherwise specified.

3.6

branch

subset of a network, considered as a two-terminal circuit, consisting of a circuit element or a combination of circuit elements

[IEV-131-13-06]

3.7

node, vertex (US)

end-point of a branch connected or not to one or more other branches

[IEV-131-13-07]

3.8

loop

closed path passing only once through any node

[IEV-131-13-12]

3.9

tree

connected set of branches joining all the nodes of a network without forming a loop

[IEV-131-13-13]

3.10

co-tree

set of the branches of a network not included in a chosen tree

[IEV-131-13-14]

3.11

link

branch of a co-tree

[IEV-131-13-15]

3.12

mesh

set of branches forming a loop and containing only one link of a given co-tree

[IEV-131-13-16]

Remark: The English terms *voltage*, *electric potential difference*, and *electric tension* have the same meaning in the area of electric circuits. In the English language version of the IEV *voltage* is the preferred term and *electric tension*, often shortened to *tension*, is an alternative. This standard uses the term *voltage*. The term *electric current* is often shortened to *current* according to IEC 60050-121.

For electric networks with lumped circuit elements (see IEC 60050-131), the Kirchhoff law for nodes (see 4.4) applies for the quantity *current*, and the Kirchhoff law for meshes (see 5.4) applies for the quantity *voltage*.

4 Direction rules for current

4.1 Physical direction of current

The net flow of electric charge through a surface is referred to as *electric current*. By convention, the *physical direction of the current* i is defined as the direction corresponding to the movement of positive charge. If the quasi-infinitesimal charge dq passes through a predetermined surface, for example the cross-section of a conductor, during the duration dt , the electric current is

$$i = \frac{dq}{dt}$$

4.2 Reference direction of current

The *reference direction* for the current in a branch or in a mesh is a direction fixed arbitrarily along the branch or around the mesh. A current is considered as positive when its physical direction corresponds to the reference direction.

4.3 Indication of the reference direction for currents

4.3.1 Indication of the reference direction for currents for a branch

An arrow having the direction corresponding to the reference direction for a current is placed on or near the line representing the branch element, or near the branch element. (See Figure 1.) The notations in Figures 1a and 1b are preferred.

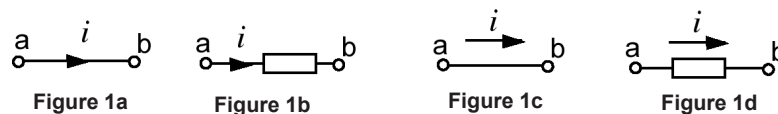


Figure 1 – Indication of the reference direction for a current by an arrow