Conventions concerning electric circuits



EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN IEC 60375:2018 sisaldab Euroopa standardi EN IEC 60375:2018 ingliskeelset teksti.	This Estonian standard EVS-EN IEC 60375:2018 consists of the English text of the European standard EN IEC 60375:2018.		
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.		
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 17.08.2018.	Date of Availability of the European standard is 17.08.2018.		
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.		

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile <u>standardiosakond@evs.ee</u>.

ICS 01.060, 01.080.40

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega: Koduleht <u>www.evs.ee</u>; telefon 605 5050; e-post <u>info@evs.ee</u>

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:

Homepage www.evs.ee; phone +372 605 5050; e-mail info@evs.ee

EUROPEAN STANDARD NORME EUROPÉENNE EUROPÄISCHE NORM

EN IEC 60375

August 2018

ICS 01.060; 01.080.40

Supersedes EN 60375:2003

English Version

Conventions concerning electric circuits (IEC 60375:2018)

Conventions concernant les circuits électriques (IEC 60375:2018)

Vereinbarungen für Stromkreise (IEC 60375:2018)

This European Standard was approved by CENELEC on 2018-06-12. 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.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 25/620/FDIS, future edition 3 of IEC 60375, prepared by IEC/TC 25 "Quantities and units, and their letter symbols" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60375:2018.

The following dates are fixed:

•	latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2019-03-12
•	latest date by which the national standards conflicting with the	(dow)	2021-06-12

This document supersedes EN 60375:2003.

document have to be withdrawn

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

3€.60375:2\. The text of the International Standard IEC 60375:2018 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

www.ceneiec.eu.			
<u>Publication</u>	<u>Year</u> <u>Title</u>	EN/HD	<u>Year</u>
IEC 60617-DB	- Graphical symbols for diagrams		

CONTENTS

FC	REWO	RD	5
1	Scop	e	7
2	Norm	native references	7
3	Term	s and definitions	7
4		』 Itation of geometrical objects	
7	4.1	Orientation of a curve	
	4.1	Orientation of a surface	
	4.2	Arrows perpendicular to the plane of the figure	
5		entions concerning currents	
J	5.1	Physical direction of current	
	5.1	Reference direction of current	
	5.3	Indication of the reference direction for currents	
	5.3.1		
	5.3.2		
	5.4	Kirchhoff law for nodes	
6	-	entions concerning voltages	
Ū	6.1	Physical polarity of voltage	
	6.2	Reference polarity for a pair of nodes	
	6.3	Indication of the reference polarity	
	6.3.1	First method	
	6.3.2		
	6.3.3		
	6.4	Kirchhoff law for meshes	
7	-	entions concerning power	
	7.1	Physical direction of power	20
	7.2	Reference direction of power	
	7.3	Indication of the reference direction of power	
	7.4	Combined conventions	
	7.4.1		
	7.4.2		
	7.4.3		
8	Conv	entions concerning two-port networks	
9		entions concerning sources	
·	9.1	Conventions concerning voltage sources	
	9.1.1		
	9.1.2		
	9.2	Conventions concerning current sources	
	9.2.1	Independent current sources	
	9.2.2		
10		entions concerning passive elements	
	10.1	General conventions	
	10.1	Resistive elements	
	10.2		
	10.2.		
	10.3	Capacitive elements	
	10.3.	•	
		1	

10.3.2 Capacitive <i>n</i> -terminal elements	27
10.4 Inductive elements	29
10.4.1 Inductive two-terminal elements	29
10.4.2 Inductive <i>n</i> -port elements	30
11 Complex notation	32
11.1 General	32
11.2 Conventions concerning complex representation of sinusoidal quantities	32
11.3 Reference direction of a complex current	32
11.4 Reference polarity for a complex voltage	33
11.5 Complex representation of Ohm's law	34
11.6 Conventions concerning the graphical representation of phasors	35
11.7 Conventions concerning phase differences	35
11.8 Conventions concerning power	36
11.8.1 Time-dependent electric power	36
11.8.2 Complex power	
Bibliography	37
Figure 1 – Orientation of a curve	15
Figure 2 – Orientation of a surface	15
Figure 3 – Indication of the reference direction for a current by an arrow	16
Figure 4 – Indication of the reference direction using the node names	16
Figure 5 – Indication of the reference direction for mesh currents	
Figure 6 – Examples of the Kirchhoff law for nodes	
Figure 7 – Indication of the reference polarity by means of plus and minus signs	
Figure 8 – Simplified indication of the reference polarity by means of plus signs	
Figure 9 – Indication of the reference polarity by an arrow	
Figure 10 – Indication of the reference polarity using the node names	
Figure 11 – Simplified indication of the reference polarity using the node names	
Figure 12 – Examples of the Kirchhoff law for meshes	20
Figure 13 – Indication of the reference direction of power	
Figure 14 – Examples of motor conventions	21
Figure 14 – Examples of motor conventions	21
Figure 16 – A reference convention for a two-port network	22
Figure 17 – Graphical representation of an independent voltage source	
Figure 18 – Graphical representation of a voltage source controlled by a voltage: $u_s = \alpha u_c$	22
	22
Figure 19 – Graphical representation of a voltage source controlled by a current:	
$u_{\rm s} = \beta i_{\rm c}$	
Figure 20 – Graphical representation of an independent current source	23
Figure 21 – Graphical representation of a current source controlled by a voltage:	(0)
$i_s = \gamma u_c$	24
Figure 22 – Graphical representation of a current source controlled by a current:	
$i_{\rm s} = \delta i_{\rm c}$	24
Figure 23 - Examples of graphical representations of a two-terminal resistive element	25

	- Examples of the graphical representation of a four-terminal resistive	25
	- Examples of the graphical representation of a two-terminal capacitive	26
Figure 26 -	- Examples of the graphical representation of a four-terminal capacitive	
Figure 27 -	- Examples of the graphical representation of a two-terminal inductive	
	- Examples of the graphical representation of a three-port inductive element	
-	Examples of the Kirchhoff law for nodes in complex notation	
Figure 30 –	Examples of the Kirchhoff law for meshes in complex notation	34
	- Examples of graphical representation of reference directions and polarities w for a complex two-terminal element	35
	Graphical representation of a phasor in the complex plane	
•	Graphical representation of phase difference in the complex plane	
-	Examples of the reference directions for time-dependent electric power	
•	Examples of the reference directions for the complex newer	
	Examples of the reference directions for the complex power	
		ņ

INTERNATIONAL ELECTROTECHNICAL COMMISSION

CONVENTIONS CONCERNING ELECTRIC CIRCUITS

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.
- 2) The formal decisions or agreements of 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 IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60375 has been prepared by IEC technical committee 25: Quantities and units, and their letter symbols.

This third edition cancels and replaces the second edition issued in 2003. This edition constitutes a technical revision.

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

- a) the clause on conventions concerning magnetic circuits has been removed; accordingly the title of the document has been abbreviated to read "Conventions concerning electric circuits":
- b) text and figures have been revised and homogenised;
- c) Clause 3 has been structured into subclauses;
- d) Clause 4 Orientation of geometrical objects has been inserted, and thus the clause numbering has been altered.

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

FDIS	Report on voting
25/620/FDIS	25/622/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 the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or a providing a solution of the solution of the
- amended.