



SLOVENSKI STANDARD
SIST EN 60076-5:2001
01-julij-2001

Power transformers - Part 5: Ability to withstand short circuit (IEC 60076-5:2000)

Power transformers -- Part 5: Ability to withstand short circuit

Leistungstransformatoren -- Teil 5: Kurzschlussfestigkeit

Transformateurs de puissance -- Partie 5: Tenue au court-circuit

Ta slovenski standard je istoveten z: EN 60076-5:2000

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ICS:

29.180 Transformatorji. Dušilke Transformers. Reactors

SIST EN 60076-5:2001

en

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EUROPEAN STANDARD

EN 60076-5

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2000

ICS 29.180

Supersedes HD 398.5 S1:1983 + A1:1988

English version

Power transformers
Part 5: Ability to withstand short circuit
 (IEC 60076-5:2000)

Transformateurs de puissance
 Partie 5: Tenue au court-circuit
 (CEI 60076-5:2000)

Leistungstransformatoren
 Teil 5: Kurzschlussfestigkeit
 (IEC 60076-5:2000)

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This European Standard was approved by CENELEC on 2000-08-01. 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.

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

Foreword

The text of document 14/346/FDIS, future edition 2 of IEC 60076-5, prepared by IEC TC 14, Power transformers, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60076-5 on 2000-08-01.

This European Standard supersedes HD 398.5 S1:1983 and its amendment A1:1988.

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) 2001-05-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2003-08-01

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

Endorsement notice

The text of the International Standard IEC 60076-5:2000 was approved by CENELEC as a European Standard without any modification. (standards.iteh.ai)

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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 60076-1 (mod)	1993	Power transformers Part 1: General	EN 60076-1 + A11	1997 1997
IEC 60076-8	1997	Part 8: Application guide	-	-
IEC 60726 (mod)	1982	Dry-type power transformers	HD 464 S11) + A2 + A3 + A4	1988 1991 1992 1995

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1) HD 464 S1 includes A1:1986 to IEC 60726.

**NORME
INTERNATIONALE
INTERNATIONAL
STANDARD**

**CEI
IEC**

60076-5

Deuxième édition
Second edition
2000-07

Transformateurs de puissance –

**Partie 5:
Tenue au court-circuit**

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Power transformers –
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**Part 5:
Ability to withstand short circuit**

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International Electrotechnical Commission
Telefax: +41 22 919 0300

3, rue de Varembe Geneva, Switzerland
e-mail: inmail@iec.ch IEC web site <http://www.iec.ch>



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

POWER TRANSFORMERS –

Part 5: Ability to withstand short circuit

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.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60076-5 has been prepared by IEC technical committee 14: Power transformers.

This second edition cancels and replaces the first edition published in 1976 and amendment 2 (1994). This second edition constitutes a technical revision.

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

FDIS	Report on voting
14/346/FDIS	14/353/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 3.

Annex A is for information only.

Annex B forms an integral part of this standard.

The committee has decided that this publication remains valid until 2004. At this date, in accordance with the committee's decision, the publication will be

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

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POWER TRANSFORMERS –

Part 5: Ability to withstand short circuit

1 Scope

This part of IEC 60076 identifies the requirements for power transformers to sustain without damage the effects of overcurrents originated by external short circuits. It describes the calculation procedures used to demonstrate the thermal ability of a power transformer to withstand such overcurrents and both the special test and the calculation method used to demonstrate its ability to withstand the relevant dynamic effects. The requirements apply to transformers as defined in the scope of IEC 60076-1.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60076. 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 60076 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.

IEC 60076-1:1993, *Power transformers – Part 1: General*

<https://standards.iteh.ai/catalog/standards/sist/c1849ae0-f1d1-4cb0-834a->

IEC 60076-8:1997, *Power transformers – Part 8: Application guide*

IEC 60726:1982, *Dry-type power transformers*

3 Requirements with regard to ability to withstand short circuit

3.1 General

Transformers together with all equipment and accessories shall be designed and constructed to withstand without damage the thermal and dynamic effects of external short circuits under the conditions specified in 3.2.

External short circuits are not restricted to three-phase short circuits; they include line-to-line, double-earth and line-to-earth faults. The currents resulting from these conditions in the windings are designated as 'overcurrents' in this part of IEC 60076.

3.2 Overcurrent conditions

3.2.1 General considerations

3.2.1.1 Application conditions requiring special consideration

The following situations affecting overcurrent magnitude, duration, or frequency of occurrence require special consideration and shall be clearly identified in transformer specifications:

- regulating transformers with very low impedance that depend on the impedance of directly connected apparatus to limit overcurrents;
- unit generator transformers susceptible to high overcurrents produced by connection of the generator to the system out of synchronism;
- transformers directly connected to rotating machines, such as motors or synchronous condensers, that can act as generators to feed current into the transformer under system fault conditions;
- special transformers and transformers installed in systems characterized by high fault rates; see 3.2.6;
- operating voltage higher than rated maintained at the unfaulted terminal(s) during a fault condition.

3.2.1.2 Current limitations concerning booster transformers

When the combined impedance of the booster transformer and the system result in short-circuit current levels for which the transformer cannot feasibly or economically be designed to withstand, the manufacturer and the purchaser shall mutually agree on the maximum allowed overcurrent. In this case, provision should be made by the purchaser to limit the overcurrent to the maximum value determined by the manufacturer and stated on the rating plate.

3.2.2 Transformers with two separate windings

3.2.2.1 For the purpose of this standard, three categories for the rated power of three-phase transformers or three-phase banks are recognized:

- category I: up to 2 500 kVA;
- category II: 2 501 kVA to 100 000 kVA;
- category III: above 100 000 kVA.

3.2.2.2 In the absence of other specifications, the symmetrical short-circuit current (r.m.s. value, see 4.1.2) shall be calculated using the measured short-circuit impedance of the transformer plus the system impedance.

For transformers of category I, the contribution of the system impedance shall be neglected in the calculation of the short-circuit current if this impedance is equal to or less than 5 % of the short-circuit impedance of the transformer.

The peak value of the short-circuit current shall be calculated in accordance with 4.2.3.

3.2.2.3 Commonly recognized minimum values for the short-circuit impedance of transformers at rated current (principal tapping) are given in table 1. If lower values are required, the ability of the transformer to withstand short circuit shall be subject to agreement between the manufacturer and the purchaser.