



SLOVENSKI STANDARD
SIST EN 60076-1:1997

01-oktober-1997

Power transformers - Part 1: General (IEC 76-1:1993 modified)

Power transformers -- Part 1: General

Leistungstransformatoren -- Teil 1: Allgemeines

Transformateurs de puissance -- Partie 1: Généralités

Ta slovenski standard je istoveten z: EN 60076-1:1997

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ICS:

29.180

Transformatorji. Dušilke

Transformers. Reactors

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en

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 60076-1

May 1997

ICS 29.180

Supersedes HD 398.1 S1:1980 and HD 398.4 S1:1980

Descriptors: Power transformers, general, service conditions, definitions, rating plates, tolerances, tests, enquiries (requests for proposal), orders

English version

Power transformers
Part 1: General
(IEC 76-1:1993, modified)

Transformateurs de puissance
Partie 1: Généralités
(CEI 76-1:1993, modifiée)

Leistungstransformatoren
Teil 1: Allgemeines
(IEC 76-1:1993, modifiziert)

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This European Standard was approved by CENELEC on 1997-03-11. 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, 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 the International Standard IEC 76-1:1993, prepared by IEC TC 14, Power transformers, together with the common modifications prepared by the Technical Committee CENELEC TC 14 was submitted to the formal vote and was accepted by CENELEC as EN 60076-1 on 1997-03-11.

This European Standard supersedes HD 398.1 S1:1980 and HD 398.4 S1:1980.

Technical differences relate mainly to certain measures (e.g. of flexibility in given circumstances) to bring the standard in line with actual requirements of User's specifications.

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) 1997-09-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 1997-09-01

Annexes designated "normative" are part of the body of the standard. Annexes designated "informative" are given for information only. In this standard annexes A, E and ZA are normative and annexes B, C, D and F are informative.

Annex ZA has been added by CENELEC.

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Endorsement notice

The text of the International Standard IEC 76-1:1993 was approved by CENELEC as a European Standard with agreed common modifications as given below.

COMMON MODIFICATIONS**2 Normative references**

Delete the year of issue in the references to IEC 76-5 and IEC 606.
Replace the year of issue in the reference to IEC 137 by "1995".

3 Definitions**3.6 Add a new definition:****3.6.5 Total harmonic distortion factor:**

$$D = \sqrt{\sum_{h=2}^H u_h^2}$$

where:

$$u_h = U_h/U_1$$

U_h is the rms value of the h^{th} harmonic
 U_1 is the rms value of the fundamental

H may be taken as 7 in practice for the purposes of this standard.

4 Rating**4.1 Add at the end of the second paragraph:**

if not otherwise agreed between manufacturer and purchaser before an order is placed.

4.2 Add at the end of the third paragraph ("In the absence IEC 905"):

; however the need for compliance with IEC 354, IEC 905 or other loading conditions shall be stated by the purchaser at tender stage.

4.4 **Add** at the end of the second paragraph:

unless otherwise agreed between manufacturer and purchaser before an order is placed to meet exceptional operational conditions.

9 Tolerances

Add a new paragraph before the last paragraph:

For special cases, where tolerances other than detailed in table 1 are necessary, these shall be subject to agreement between manufacturer and purchaser before an order is placed.

10 Tests

10.1 **Add** a new paragraph after the third paragraph:

Tests on individual units in a group of identical transformers may be subject to agreement between manufacturer and purchaser in respect of choice of test. Type tests and special tests may be carried out on more than one unit in a batch if specified by the purchaser at the time of order. The sequence in which the tests are carried out and the choice of units on which they are performed shall also be subject to agreement at the time of order.

10.4 **Add** a new sentence at the end of the fourth paragraph:

Measurements on additional tap-positions may also be carried out by agreement between manufacturer and purchaser.

10.5 **Amend** the seventh paragraph as follows:

The test voltage shape is satisfactory if:

- the total harmonic distortion factor is $\leq 5\%$
- the readings U^1 and U are equal within 3%.

Retain the existing note.

Amend the penultimate paragraph as follows:

If the total harmonic distortion factor is $> 5\%$ and/or the difference between the voltmeter readings is larger than 3%, the validity of the test is subject to agreement.

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 50(421)	1990	International electrotechnical vocabulary Chapter 421: Power transformers and reactors	-	-
IEC 68-3-3	1991	Environmental testing Part 3: Guidance - Seismic test methods for equipments	EN 60068-3-3	1993
IEC 76-2 (mod)	1993	Power transformers Part 2: Temperature rise	EN 60076-2	1997
IEC 76-3 (mod) + A1 (mod)	1980 1981	Part 3: Insulation levels and dielectric tests	HD 398.3 S1	1986
IEC 76-3-1	1987	Part 3: Insulation levels and dielectric tests External clearances in air	-	-
IEC 76-5 (mod) A1	1976 ¹⁾ 1979	Part 5: Ability to withstand short-circuit	HD 398.5 S1 A1	1983 1988
IEC 137	1995	Bushings for alternating voltages above 1 kV	EN 60137	1996
IEC 354	1991	Loading guide for oil-immersed power transformers	-	-
IEC 529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529 + corr. May	1991 1993
IEC 551 (mod)	1987	Determination of transformer and reactor sound levels	EN 60551	1992

1) Under revision, latest edition will apply.

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<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 606	1978 ²⁾	Application guide for power transformers	-	-
IEC 726 (mod)	1982	Dry-type power transformers	HD 464 S1 ³⁾ + A2 + A3 + A4	1988 1991 1992 1995
IEC 815	1986	Guide for the selection of insulators in respect of polluted conditions	-	-
IEC 905	1987	Loading guide for dry-type power transformers	-	-
ISO 3	1973	Preferred numbers - Series of preferred numbers	-	-
ISO 9001	1987	Quality systems - Model for quality assurance in design/development, production, installation and servicing	EN 29001 ⁴⁾	1987

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2) Under revision, latest edition will apply.

3) HD 464 S1 includes A1:1986 to IEC 726:1982, mod.

4) EN 29001:1987 is superseded by EN ISO 9001:1994, which is based on ISO 9001:1994.

NORME
INTERNATIONALE
INTERNATIONAL
STANDARD

CEI
IEC
76-1

Deuxième édition
Second edition
1993-03

Transformateurs de puissance

**Partie 1:
Généralités**

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Power transformers
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**Part 1:
General**

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE

X

Pour prix, voir catalogue en vigueur
For price, see current catalogue

Publication 60076-1 de la CEI
(Deuxième édition - 1993)
Transformateurs de puissance –
Partie 1: Généralités

IEC Publication 60076-1
(Second edition - 1993)
Power transformers –
Part 1: General

CORRIGENDUM 1

Page 76

Article A.1.2:

Au point h), dans la première ligne, au lieu de

...(voir 2.1 b))...

lire

...(voir 1.2.1 b))...

Page 77

Clause A.1.2:

Item h), in the first line, instead of

...(see 2.1 b))...

read

...(see 1.2.1 b))...

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

POWER TRANSFORMERS

Part 1: General

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 cooperation 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, prepared by technical committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 3) They have the form of recommendations for international use published in the form of standards, 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.

This International Standard has been prepared by IEC by technical committee 14: Power transformers.

This second edition cancels and replaces the first edition published in 1976 as well as the first edition of IEC 76-4 published in 1976.

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

Six Month's Rule	Report on Voting
14(CO)75	14(CO)77

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

IEC 76 consists of the following parts, under the general title: Power transformers.

Part 1: 1993, General.

Part 2: 1993, Temperature rise.

Part 3: 1980, Insulation levels and dielectric tests.

Part 5: 1976, Ability to withstand short circuit.

Annexes A and E form an integral part of this standard.

Annexes B, C and D are for information only.

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POWER TRANSFORMERS

Part 1: General

1 Scope and service conditions

1.1 Scope

This part of International Standard IEC 76 applies to three-phase and single-phase power transformers (including auto-transformers) with the exception of certain categories of small and special transformers such as:

- single-phase transformers with rated power less than 1 kVA and three-phase transformers less than 5 kVA;
- instrument transformers;
- transformers for static convertors;
- traction transformers mounted on rolling stock;
- starting transformers;
- testing transformers;
- welding transformers.

When IEC standards do not exist for such categories of transformers, this part of IEC 76 may still be applicable either as a whole or in part.

For those categories of power transformers and reactors which have their own IEC standards, this part is applicable only to the extent in which it is specifically called up by cross-reference in the other standard.*

At several places in this part it is specified or recommended that an 'agreement' shall be reached concerning alternative or additional technical solutions or procedures. Such agreement is to be made between the manufacturer and the purchaser. The matters should preferably be raised at an early stage and the agreements included in the contract specification.

1.2 Service conditions

1.2.1 Normal service conditions

This part of IEC 76 gives detailed requirements for transformers for use under the following conditions:

a) Altitude

A height above sea-level not exceeding 1 000 m (3 300 ft).

* Such standards exist for dry-type transformers (IEC 726), for reactors in general (IEC 289), for traction transformers and reactors (IEC 310), and are under preparation for static convertor transformers.