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Handläggande organ	Fastställd	Utgåva	Sida	Ingår i
Svenska Elektriska Kommissionen, SEK	1998-09-25	1	1(1+55)	SEK Översikt 14
				Reg 427 01 01

Krafttransformatorer – Del 1: Allmänt

Power transformers – Part 1: General

Som svensk standard gäller europastandarden EN 60076-1:1997. Den svenska standarden innehåller den officiella engelska språkversionen av EN 60076-1:1997.

Nationellt förord

Europastandarden EN 60076-1:1997

består av:

- **europastandardens ikraftsättningsdokument,** utarbetat inom CENELEC
- **IEC 60076-1, Second edition, 1993 - Power transformers - Part 1: General**

  utarbetad inom International Electrotechnical Commission, IEC.

I bilaga NA finns en lista över engelska termer och motsvarande svenska termer.

Tidigare utgiven svensk standard SS 427 01 01, utgåva 2, 1982, gäller ej fr o m 1998-09-25.

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*) Se även bifogat Corrigendum, June 1997, till IEC 60076-1.

ICS 29.180

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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)

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

Ref. No. EN 60076-1:1997 E

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.

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.

[redacted]

[redacted]

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.

Publication	Year	Title	EN/HD	Year
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.

Publication	Year	Title	EN/HD	Year
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

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.

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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).

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* 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.

b) Temperature of ambient air and cooling medium

A temperature of ambient air not below –25 °C and not above +40 °C. For water-cooled transformers, a temperature of cooling water at the inlet not exceeding +25 °C.

Further limitations, with regard to cooling are given for:

- oil-immersed transformers in IEC 76-2;
- dry-type transformers in IEC 726.

c) Wave shape of supply voltage

A supply voltage of which the wave shape is approximately sinusoidal.

NOTE - This requirement is normally not critical in public supply systems but may have to be considered in installations with considerable convertor loading. In such cases there is a conventional rule that the deformation shall neither exceed 5 % total harmonic content nor 1 % even harmonic content. Also note the importance of current harmonics for load loss and temperature rise.

d) Symmetry of three-phase supply voltage

For three-phase transformers, a set of three-phase supply voltages which are approximately symmetrical.

e) Installation environment

An environment with a pollution rate (see IEC 137 and IEC 815) that does not require special consideration regarding the external insulation of transformer bushings or of the transformer itself.

An environment not exposed to seismic disturbance which would otherwise require special consideration in the design. (This is assumed to be the case when the ground acceleration level a_g is below 2 m/s^2.)*

1.2.2 *Provision for unusual service conditions*

Any unusual service conditions which may lead to special consideration in the design of a transformer shall be stated in the enquiry and the order. These may be factors such as high altitude, extreme high or low temperature, tropical humidity, seismic activity, severe contamination, unusual voltage or load current wave shapes and intermittent loading. They may also concern conditions for shipment, storage and installation, such as weight or space limitations (see annex A).

Supplementary rules for rating and testing are given in other publications for:

- Temperature rise and cooling in high ambient temperature or at high altitude: IEC 76-2 for oil-immersed transformers, and IEC 726 for dry-type transformers.

- External insulation at high altitude: IEC 76-3 and IEC 76-3-1 for oil-immersed transformers, and IEC 726 for dry-type transformers.

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* See IEC 68-3-3.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 76. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 76 are encouraged to investigate the possibility of applying the most recent edition of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

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*

IEC 76-2: 1993, *Power transformers – Part 2: Temperature rise*

IEC 76-3: 1980, *Power transformers – Part 3: Insulation levels and dielectric tests*

IEC 76-3-1: 1987, *Power transformers – Part 3: Insulation levels and dielectric tests. External clearances in air*

IEC 76-5: 1976, *Power transformers – Part 5: Ability to withstand short circuit*

IEC 137: 1984, *Bushings for alternating voltages above 1 000 V*

IEC 354: 1991, *Loading guide for oil-immersed power transformers*

IEC 529: 1989, *Degrees of protection provided by enclosures (IP Code)*

IEC 551: 1987, *Determination of transformer and reactor sound levels*

IEC 606: 1978, *Application guide for power transformers*

IEC 726: 1982, *Dry-type power transformers*

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*