

© Copyright SEK Svensk Elstandard. Reproduction in any form without permission is prohibited.

Krafttransformatorer – Del 22-6: Transformator tillbehör – Elektriska fläktar för transformatorer

*Power transformers –
Part 22-6: Power transformer and reactor fittings –
Electric fans for transformers*

Som svensk standard gäller europastandarden EN IEC 60076-22-6:2021. Den svenska standarden innehåller den officiella engelska språkversionen av EN IEC 60076-22-6:2021.

Nationellt förord

Europastandarden EN IEC 60076-22-6:2021

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 60076-22-6, First edition, 2021 - Power transformers - Part 22-6: Power transformer and reactor fittings - Electric fans for transformers**

utarbetad inom International Electrotechnical Commission, IEC.

ICS 29.180.00

Denna standard är fastställd av SEK Svensk Elstandard, som också kan lämna upplysningar om **sakinnehållet** i standarden.
Postadress: Box 1284, 164 29 KISTA
Telefon: 08 - 444 14 00.
E-post: sek@elstandard.se. Internet: www.elstandard.se

Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a mätning, säkerhet och provning och för utförande, skötsel och dokumentation av elprodukter och elanläggningar.

Genom att utforma sådana standarder blir säkerhetsfordringar tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

SEK Svensk Elstandard

Box 1284
164 29 Kista
Tel 08-444 14 00
www.elstandard.se

ICS 29.180

English Version

**Power transformers - Part 22-6: Power transformer and reactor fittings - Electric fans for transformers
(IEC 60076-22-6:2021)**

Transformateurs de puissance - Partie 22-6: Accessoires pour transformateurs de puissance et bobines d'inductance - Ventilateurs électriques pour transformateurs
(IEC 60076-22-6:2021)

Leistungstransformatoren - Teil 22-6: Kühleinrichtungen für Leistungstransformatoren und Drosselspulen - Ventilatoren
(IEC 60076-22-6:2021)

This European Standard was approved by CENELEC on 2021-02-22. 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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, 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 14/1022/CDV, future edition 1 of IEC 60076-22-6, prepared by IEC/TC 14 "Power transformers" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60076-22-6:2021.

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) 2021-11-22
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2024-02-22

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

The text of the International Standard IEC 60076-22-6:2021 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 60076-6 NOTE Harmonized as EN 60076-6

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.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60034-1	-	Rotating electrical machines - Part 1: Rating and performance	-	-
IEC 60076-1	2011	Power transformers - Part 1: General	EN 60076-1	2011
IEC 60076-10	-	Power transformers - Part 10: Determination of sound levels	EN 60076-10	-
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)	-	-
ISO 281	-	Rolling bearings - Dynamic load ratings and rating life	-	-
ISO 5801	2017	Fans - Performance testing using standardized airways	EN ISO 5801	2017
ISO 9227	-	Corrosion tests in artificial atmospheres - Salt spray tests	EN ISO 9227	-
ISO 12944	series	Paints and varnishes - Corrosion protection of steel structures by protective paint systems	-	-
ISO 13347-1	-	Industrial fans - Determination of fan sound power levels under standardized laboratory conditions - Part 1: General overview	-	-
ISO 13347-3	-	Industrial fans - Determination of fan sound power levels under standardized laboratory conditions - Part 3: Enveloping surface methods	-	-

EN IEC 60076-22-6:2021 (E)

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
ISO 13348	-	Industrial fans - Tolerances, methods of conversion and technical data presentation	-	-
ISO 13857	2019	Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs	EN ISO 13857	2019
ISO 14694	-	Industrial fans - Specifications for balance quality and vibration levels	-	-

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Power transformers –

Part 22-6: Power transformer and reactor fittings – Electric fans for transformers

Transformateurs de puissance –

Partie 22-6: Accessoires pour transformateurs de puissance et bobines d'inductance – Ventilateurs électriques pour transformateurs

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.180

ISBN 978-2-8322-9252-5

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	3
1 Scope.....	5
2 Normative references	5
3 Terms and definitions	6
4 Service conditions	6
4.1 General.....	6
4.2 Degree of protection of electrical components (IP)	6
4.3 Corrosion protection	6
5 General characteristics and requirements.....	7
5.1 Main components and characteristics	7
5.1.1 Nameplate and rating plates	7
5.1.2 Motor drive	7
5.1.3 Connection box.....	8
5.1.4 Housing	8
5.1.5 Fan wheel.....	8
5.1.6 Protective grating	8
5.1.7 Materials	9
5.1.8 Vibration limits.....	9
5.2 Supply conditions.....	9
5.2.1 Transport and storage	9
5.2.2 Installation and operation, operational performance.....	9
5.2.3 Technical documentation	9
5.3 Performance requirements.....	10
5.3.1 General	10
5.3.2 Rated values	10
5.3.3 Ambient conditions for rated power and noise.....	10
5.4 Tests	10
5.4.1 General	10
5.4.2 List of tests.....	11
5.4.3 Routine tests	11
5.4.4 Type tests.....	11
Annex A (normative) Ordering designations	12
A.1 Minimal ordering designations.....	12
A.2 Additional specifications (if necessary)	12
Annex B (informative) Performance of the fans – Typical fan characteristic speed controlled curves	13
Annex C (informative) Design examples.....	14
Bibliography.....	16
Figure B.1 – Performance of the fans.....	13
Figure C.1 – Fan design example	14
Figure C.2 – Fan design example with guide vane	15
Table C.1 – Common selection of materials used in the construction	15

INTERNATIONAL ELECTROTECHNICAL COMMISSION

POWER TRANSFORMERS –**Part 22-6: Power transformer and reactor fittings –
Electric fans for transformers**

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.

IEC 60076-22-6 has been prepared by IEC technical committee 14: Power transformers. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
14/1022/CDV	14/1041A/RVC

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts in the IEC 60076 series, published under the general title *Power transformers*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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

POWER TRANSFORMERS –

Part 22-6: Power transformer and reactor fittings – Electric fans for transformers

1 Scope

This part of IEC 60076 covers the electric fans used in the cooling circuits of power transformers and reactors. It applies to electric fans mounted on liquid immersed power transformers according to IEC 60076-1 and reactors according to IEC 60076-6 with and without conservator for indoor or outdoor installation. It outlines the service conditions and the mechanical and electrical requirements that are common to all the equipment.

The electric fans concerned by this document are of the axially operating type and are for use on liquid to air coolers and for blowing out radiators.

This document also outlines the operation requirements specific to each equipment as well as the preferred dimensions relevant for interchangeability and uniform fan assembly and the type and routine tests to be performed.

2 Normative references

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.

IEC 60034-1, *Rotating electrical machines – Part 1: Rating and performance*

IEC 60076-1:2011, *Power transformers – Part 1: General*

IEC 60076-10, *Power transformers – Part 10: Determination of sound levels*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

ISO 281, *Rolling bearings – Dynamic load ratings and rating life*

ISO 5801:2017, *Fans – Performance testing using standardized airways*

ISO 9227, *Corrosion tests in artificial atmospheres – Salt spray tests*

ISO 12944 (all parts), *Paints and varnishes – Corrosion protection of steel structures by protective paint systems*

ISO 13347-1, *Industrial fans – Determination of fan sound power levels under standardized laboratory conditions – Part 1: General overview*

ISO 13347-3, *Industrial fans – Determination of fan sound power levels under standardized laboratory conditions – Part 3: Enveloping surface methods*

ISO 13348, *Industrial fans – Tolerances, methods of conversion and technical data presentation*

ISO 13857:2019, *Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs*

ISO 14694, *Industrial fans – Specifications for balance quality and vibration levels*