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Armatura za energetske transformatorje in dušilke - 12. del: Ventilatorji

Power transformer and reactor fittings - Part 12: Fans

Zubehör für Transformatoren und Drosselspulen - Teil 12: Ventilatoren

Accessoires pour transformateurs de puissance et bobines d'inductance - Partie 12: Ventilateurs

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This draft European Standard is submitted to CENELEC members for CENELEC enquiry.
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It has been drawn up by CLC/TC 14.

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CENELEC

European Committee for Electrotechnical Standardization
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Europäisches Komitee für Elektrotechnische Normung

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Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 14, Power transformers. It is submitted to the CENELEC enquiry.

EN 50216-12 is to be read in conjunction with EN 50216-1:2002, *Power transformer and reactor fittings – Part 1: General*.

Contents

Figures

1 Scope

EN 50216–12 deals with fans for oil-to-air coolers used for transformers as well as fans used for blowing out radiators. Only fans operating axially are dealt with in this standard specification.

This standard specification defines the dimensions and requirements for ensuring fan-interchangeability and uniform fan assembly.

2 Normative references

The following referenced documents are indispensable for the application 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.

EN 50216-1	Power transformer and reactor fittings - Part 1: General
EN 50216-6	Power transformer and reactor fittings - Part 6: Cooling equipment - Removable radiators for oil-immersed transformers
EN 50216-10	Power transformer and reactor fittings - Part 10: Oil-to-air heat exchangers
EN 50262	Cable glands for electrical installations
EN 60034–1	Rotating electrical machines - Part 1: Rating and performance (IEC 60034-1)
EN 60076–1	Power transformers - Part 1: General (IEC 60076-1)
EN 60076-10 [1)]	Power transformers - Part 10-1: Determination of sound levels (IEC 60076-10)
EN 60529	Degrees of protection provided by enclosures (IP - Code) (IEC 60529)
EN 60721-3-4	Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 4: Stationary use at non–weather protected locations (IEC 60721-3-4)
EN 294	Safety of machinery, Safety distances to prevent danger zones being reached by the upper limbs
EN 10204	Metallic products - Types of inspection documents
EN ISO 2409	Paints and varnishes - Cross-cut test (ISO 2409)
EN ISO 3506 series	Mechanical properties of corrosion - resistant stainless - steel fasteners (ISO 3506 series)
EN ISO 4042	Fasteners - Electroplated coatings (ISO 4042)
ISO 2768 series	General tolerances
ISO 5801	Industrial fans - Performance testing using standardized airways
ISO 10816-1	Mechanical vibration - Evaluation of machine vibration by measurements on non-rotating parts - Part 1: General guidelines
ISO 13347 series	Industrial fans - Determination of fan sound power levels under standardized laboratory conditions
ISO 13348	Industrial fans - Tolerances, methods of conversion and technical data presentation
ISO 14694	Industrial fans - Specifications for balance quality and vibration levels
DIN 24166	Fans, technical delivery conditions
DIN 45635-1	Measurement of noise emitted by machines; airborne noise emission; enveloping surface method; basic method, divided into 3 grades of accuracy

[1)] At draft stage.

3 Definitions

For the purposes of this document, the following terms and definitions apply.

3.1
drive
depending on the specification the motor used to drive the fan wheel can be either a three-phase a.c. motor, an a.c. motor or a d.c. motor. The motor is mounted rigidly in the housing

3.2
connection box
the electrical connection between the external power supply (and control system if this exists) and the internal connection is made in the terminal box. The terminal board is located in the connection box

3.3
housing
the housing is used for attaching the fan to the radiator or cooler; the housing also supports the motor. In addition the protective grating and / or basket guard is / are attached to it

3.4
fan wheel
the fan wheel is mounted rigidly on the motor axle / rotor

3.5
protective grating / basket guard
the protective grating or basket guard is used to prevent accidental contact with the rotating parts. Furthermore, the protective grating or basket guard also prevents large foreign bodies from coming into contact with the parts

4 Requirements

4.1 Rated values

The following designations are used:

- F	[Hz]	=	frequency
- U_N	[V]	=	rated voltage
- I	[A]	=	operating current during free blowing
- I_N	[A]	=	rated current of the motor
- P_1	[W]	=	active-power input during free blowing
- η	[%]	=	overall efficiency of the fan
- N	[1/min]	=	rotational speed
- q_V	[m^3/s]	=	volume flow of the fan during free blowing
- p_{sF}	[Pa]	=	maximum static pressure which the fan can produce, in producing static pressure volume flow is reduced
- L_{WA}	[dB(A)]	=	A-weighted sound power level of a fan during free blowing
- D	[mm]	=	diameter of the fan wheel

NOTE The characteristic curve is also to be delivered by the supplier ($p_{sF} = f(q_V)$). The noise is dependent on the working point and the installation conditions.

4.2 Rated power and noise

The values for air power and noise apply when protective gratings are fitted. The volume flow refers to an air density = 1,20 kg/m^3 at a temperature of t = 20 °C and an air pressure of 101,325 kPa (this corresponds to a site altitude above NN < 1 000 m). They are to be measured at rated voltage with the associated frequency provided that no other operating data has been specified in the order.

4.3 Design of the drive

The motor must comply with EN 60034-1 and suitable for unprotected outdoor installation. The provided degree of protection is to be at least IP54 or above as per the order specification in accordance with EN 60529.

Insulation class F as per EN 60034-1 applies to all motors.

Condensation water and any other intrusive water must be able to run off without any damaging effect. This applies to both horizontal and vertical mounting of the fan (blowing upwards). The bearings of the motor must be made in such a way that they are able to guarantee a trouble- and maintenance-free running time (continuous operation) of at least 4 years (at least 3 years for four-pole operation) or rather as agreed upon.

The connecting lead between the winding space of the motor and the cable compartment of the terminal box can be run on both the inside and the outside.

4.4 Design of the connection box

The connection box (if present) must be mounted in such a way that it is easily accessible. The connection box is to provide protection to at least IP54 as per EN 60529. Condensation water in the connection box must not affect operation or lead to any damage.

Each of the terminals must be suitable for holding down two 2,5 mm^2 leads at I < 1,5 A. At I > 1,5 A each terminal must be suitable for holding down two 4 mm^2 leads.

The earthing screw in the connection box must be easily accessible.

Captive screws must be used for the cover of the connection box.

Screwed cable glands (at least 2) as per EN 50262 made from nickel-plated brass are to be used for the connecting lead inlet.

The cover seal must be secured using suitable measures so that overpressing or slipping is prevented at all times.

4.5 Design of the housing

As a rule the housing is cylindrical. The motor with fan wheel (chosen by the manufacturer) is mounted on to the housing. The fixing points of the fan are likewise located on the housing. If a connection box is mounted on the outside of the housing then the connection cables are to be suitably fixed.

The direction of air flow (in connection with the rotational direction) is to be indicated on the housing using a durable marking (can also be combined with the rating plate).

4.6 Design of the fan wheel

The fan wheel must be designed in such a way that no water is able to gather. This applies to both horizontal and vertical mounting of the fan (blowing upwards).

4.7 Design of the protective grating / basket guard

Fans for radiator cooling systems are to be fitted with 2 protective gratings (inlet and discharge sides), fans for oil-to-air coolers are to be fitted with 1 protective grating (either inlet or discharge side). The opening widths of the protective gratings on both the inlet and discharge sides are to provide protection to IP2X as per EN 60529.

The protective grating or the basket guard is to be rigidly mounted on the housing.

4.8 Materials

Fan housing:	Chosen by manufacturer
Fan wheel:	Aluminium seawater-resistant or plastic, e.g. PP10.20 VT.- black with approx. 25 % solid body content (glass)
Connection box:	Cast iron, steel or aluminium seawater-resistant
Protective grating / basket guard	Inlet side: steel or stainless steel; Discharge side: stainless steel
Terminal board:	Insulating material ceramic or equivalent material
Motor housing:	Chosen by manufacturer
Threaded bolts, washers, nuts for electrical connections:	Made from material which is not dangerous on contact and which is non-corrosive
Screws, washers, nuts, except for electrical connections:	Stainless steel, e.g. A2-70 in accordance with ISO 3506-1
Strain washers:	Non-rusting spring steel.

Other materials are to be agreed upon.

4.9 Mechanical design

- To prevent rusting underneath the surface all external components must be welded completely without breaks.
- The vibration severity determined at the outer perimeter of the fan housing in accordance with ISO 14694 (BV – 3) or ISO 10816-1 (class 1 zone B).
- Tolerances as per ISO 2768.

4.10 Surface protective coating

The buyer and manufacturer are to agree upon the corrosion protection treatment and coating.

At the same time the necessary environmental conditions are to be observed.

The environmental conditions must correspond to EN 60721-3-4.

5 Identification

5.1 Specifications for the fan rating plate

- The fans must have a clearly visible all-weather rating plate displaying the ratings for 50 and/or 60 Hz operation.
- Type designation and serial number of the manufacturer and year of manufacture

  - volume flow in m^3/s during free blowing,
  - rotational speed in min^{-1} during free blowing,
  - active-power input in W during free blowing,
  - rated current consumption at rated voltage given in A.

- It must be evident from the rating plate whether or not there is an internal, thermal circuit breaker present, which will disconnect the current in the event of a fault.
- A direction arrow indicating the direction of air-flow (in connection with the rotational direction) must either be attached to the rating plate or mounted in its immediate vicinity (see 4.6).

5.2 Specifications for the motor rating plate

Motor rating plate according to EN 60034-1.

A separate rating plate for the motor must be attached to the fan housing if this is specified in the order.

NOTE The data of fan and motor must not be identical.

6 Tests

The tests are to be carried out at the fully assembled fan (with protective grating).

Performance measurements (volume flow, static pressure, active-power input and rotational speed) are to be carried out in accordance with ISO 5801.

Noise measurements are carried out according to ISO 13347-3.

Terms, quantities, measuring instruments as per ISO 13347-1.

Test object: fan (total noise during free suction and free blowing).

The buyer and manufacturer are to agree upon special tests e.g. frequency analysis.

NOTE The sound power level of transformer is measure according to EN 60076-10.

6.1 Routine tests

- Active-power input
- Rotational speed
- Current

6.2 Type tests

- Characteristic curve ($p_{sF} = f(q_V)$)
- Noise measurement

7 Transport and storage

The fan is to be delivered in assembled condition ready for mounting.

Fans must be dispatched in such a way that no damage and contamination can occur.

The fan must also be suitable for outdoor storage without having to take a certain position into account.

NOTE In principle the instruction of the supplier having to take into account.

8 Installation and operation, operational performance

All of the fan properties given in this standard specification – above all the volume flow and noise level – assume that there is no disturbance to the air flow as a result of mounting or installation.

Ambient temperature range: -25 °C to +40 °C.

Other ambient temperatures are to be specified in the order.