SLOVENSKI STANDARD
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Ventilatorji - Klasifikacija učinkovitosti ventilatorjev - 4. del: Ventilatorji s pogonom pri največji obratovalni hitrosti (ISO/DIS 12759-4:2018)

Fans - Efficiency classification for fans - Part 4: Driven fans at maximum operating speed (ISO/DIS 12759-4:2018)

Ventilatoren - Effizienzklassifizierung für Ventilatoren (ISO/DIS 12759-4:2018)

Ventilateurs - Classification du rendement des ventilateurs - Partie 4: Ventilateurs entraînés à vitesse maximale de fonctionnement (ISO/DIS 12759-4:2018)

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Fans — Efficiency classification for fans —

Part 4:
Driven fans at maximum operating speed

Ventilateurs — Classification du rendement des ventilateurs —

Partie 4: Titre manque

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 12759 was prepared by Technical Committee ISO/TC 117, *Fans*, Subcommittee SC , .

This second/third/... edition cancels and replaces the first/second/... edition (), [clause(s) / subclause(s) / table(s) / figure(s) / annex(es)] of which [has / have] been technically revised.

Introduction

The last decade has seen not only an escalation in the price, but also an increasing recognition of the finite life of many of the fossil fuels currently used. There is also a belief by many that climatic change is due to an increase of carbon dioxide in the atmosphere. This has lead to many nations reviewing methods of energy generation and usage.

To maintain economic growth there is therefore a need to promote energy efficiency. This requires better selection of equipment by users and therefore better design of this equipment by its manufacturers.

Fans of all types are used for ventilation and air conditioning, for process engineering – drying, pneumatic conveying, and combustion air supply and for agriculture etc. Indeed, the energy usage by fans has been calculated to be nearly 20% of the worldwide usage.

The fan industry is of a global nature, with a considerable degree of exporting and licensing. To ensure that the definition fan performance characteristics are common throughout the world a series of standards have been developed, it is the belief of the industry that there is now a need for minimum efficiency standards to be recognised. To encourage their implementation, a classification system is proposed which incorporates a series of efficiency bands. With improvements in technology and manufacturing processes the minimum efficiency levels may be reviewed and increased in time

Fans — Efficiency classification for fans —

Part 4:
Driven fans at maximum operating speed

1 Scope

This international standard deals with the classification of fan efficiency for all fan types driven by motors of nominal rating 0.125kW and above. This standard may be used by legislators or regulatory bodies for defining future energy saving targets. This applies to the fan (driven) only but not to the system (finished Original Equipment Manufacturer's product, e.g. box fans and roof fans or ventilation system) in which it is installed.

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.

ISO 5801, *Fans — Performance testing using standardized airways*

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

ISO 13349, *Fans — Vocabulary and definitions of categories*

IEC 60034-2-1, *Rotating electrical machines — Part 2-1: Standard methods for determining losses and efficiency from tests (excluding machines for traction vehicles)*

IEC 60034-30, *Rotating electrical machines — Part 30: Efficiency classes of single speed, three phase, cage induction motors*

3 Terms and definitions.

See tables 6 and 7 of ISO 13349 and associated formulae in ISO 5801 and clause 5 of this international standard.

For the purposes of this International Standard, the following definitions apply.

3.1
fan
a rotary bladed machine which receives mechanical energy and utilizes it by means of one or more impellers fitted with blades to maintain a continuous flow of air or other gas passing through it and whose work per unit mass does not normally exceed 25 kJ/kg

Note 1 to entry: Fans are defined according to their installation category, function, fluid path and operating conditions (see ISO 13349).

3.2
fan size
fan size is the nominal diameter of the impeller.

3.3
drives (transmission and motor)
any mechanism used to power the fan including the motor, belts, couplings, chains, transmission, VFDs, etc.

3.4
driven fan
an impeller fitted to or connected to a motor, with or without the following, a drive mechanism, a housing, a means of variable speed drive, figure 1.

3.5
air
in this International Standard, an abbreviation for the expression "air or other gas"

3.6
standard air
by convention, air with a density of 1.2 kg/m^3

3.7
fan installation categories according to the arrangement of ducting
for details of all installation categories see figure 2 and ISO 13349.

3.7.1
installation category A
installation with free inlet and free outlet

3.7.2
installation category B
installation with free inlet and ducted outlet

3.7.3
installation category C
installation with ducted inlet and free outlet

3.7.4
installation category D
installation with ducted inlet and ducted outlet

3.8
average density at fan inlet
ρ_1
fluid density calculated from the absolute pressure and the static temperature at the fan inlet.

3.9
atmospheric pressure
p_a
pressure, measured with respect to absolute zero pressure, which is exerted at a point at rest relative to the air around it.

3.10
fan pressure
p_f
difference between the stagnation pressure at the fan outlet and the stagnation pressure at the fan inlet.

3.11
fan static pressure
p_{sf}
conventional quantity defined as the fan pressure minus the fan dynamic pressure corrected by the Mach factor.

3.12
absolute stagnation pressure at a point
p_{sg}
absolute pressure which would be measured at a point in a flowing gas if it were brought to rest via an isentropic process.

3.13
conventional dynamic pressure at a section
p_d
dynamic pressure calculated from the average velocity and the average density of the air at the specified airway cross-section.

3.14
mass flow rate
q_m
mean value, over time, of the mass of air which passes through the specified airway cross-section per unit of time

3.15
inlet volume flow rate
q_{v1}
mass flow rate at the inlet divided by the corresponding mean value, over time, of the average density at the inlet

3.16
fan work per unit mass
W_m
increase in mechanical energy per unit mass of fluid passing through the fan

3.17
compressibility coefficient
k_p
ratio of the mechanical work done by the fan on the air to the work that would be done on an incompressible fluid with the same mass flow, inlet density and pressure ratio.

3.18
fan air power
P_u
conventional output power which is the product of the mass flow rate and the fan work per unit mass, or the product of the inlet volume flow rate, the compressibility coefficient and the fan pressure.

3.19
impeller power
P_r
mechanical power supplied to the fan impeller

3.20
fan shaft power
P_a
mechanical power supplied to the fan shaft

3.21
motor output power
P_o
shaft power output of the motor or other prime mover

3.22
motor input power
P_e
Electrical power supplied at the terminals of an electric motor drive

3.23
drive/control electrical input power
P_{ed}
The power supplied by electrical mains or equivalent energy supply to a motor system.

3.24

fan efficiency definitions.

3.24.1
fan impeller efficiency
η_r
fan air power divided by the impeller power P_r

3.24.2
fan shaft efficiency
η_a
fan air power divided by the fan shaft power.

3.24.3
overall efficiency (fan and motor)
η_e
fan air power divided by the motor input power for the fan and motor combination.

Note 1 to entry: The efficiency should be referred to the installation category, see figure 2 and ISO 13349.

Note 2 to entry: For the purposes of this standard efficiency should be expressed as a proportion of unity. To obtain a % value multiply the efficiency result by 100.

Note 3 to entry: The motor input power as defined in section 3.23 or 3.24 dependant on electrical drive.

3.24.4
overall static efficiency (fan and motor)
η_{es}
fan static air power divided by the motor input power for the fan and motor combination.

3.25
optimum efficiency
η_{opt}
maximum efficiency achieved on the fan air characteristic with all operational parameters, except the air system resistance, being fixed

3.26

fan efficiency grade

3.26.1
fan motor efficiency grade (FMEG)
the efficiency grade for a driven fan.

Note 1 to entry: The definitions given in 3.24.3 shall apply.

4 Units and symbols

The following primary units and symbols for the parameters listed shall be used.

Symbol Term Unit

