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Fans — Efficiency classification for fans —

Part 1:
General requirements

Ventilateurs — Classification du rendement des ventilateurs —

Partie 1: Exigences générales

Reference number
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Foreword

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This document was prepared by Technical Committee ISO/TC 117, *Fans*.

A list of all parts in the ISO 12759 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The last decade has seen an escalation in the price and an increasing recognition of the finite life of many of the fossil fuels currently used. This has led 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 thus better design of this equipment by manufacturers.

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

The fan industry is global in nature, with a considerable degree of exporting and licensing. To ensure that the definitive fan performance characteristics are common throughout the world, a series of standards has been developed.

Fans — Efficiency classification for fans —

Part 1:
General requirements

1 Scope

This document deals with the classification of fan power consumption and efficiency for many fan types given in the ISO12759 series. In addition, it details specific application efficiency classification information.

This document does not describe a method to compare these classifications and minimum efficiency limits (MELs).

This document applies to the fans, not to the system in which they are installed.

Air curtains are excluded from this standard.

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.

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

ISO 5802, *Industrial fans — Performance testing in situ*

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

ISO 13349-1, *Fans — Vocabulary and definitions of categories — Part 1: Vocabulary*

ISO 13349-2, *Fans — Vocabulary and definitions of categories. Part 2: Categories*

ISO 13350, *Fans — Performance testing of jet fans*

ANSI/AMCA Standard 230-23, *Laboratory Methods of Testing Air Circulating Fans for Rating and Certification*

ANSI/AMCA Standard 260-20, *Laboratory Methods of Testing Induced Flow Fans for Rating*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5801, ISO 13349-1 and ISO 13349-2 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
fan
rotary bladed machine that 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: The term "fan" is taken to mean the fan as supplied, without any addition to the inlet or outlet, except where such addition is specified.

Note 2 to entry: Fans are defined according to their installation category, function, fluid path and operating conditions.

Note 3 to entry: If the work per unit mass exceeds a value of 25 kJ/kg, the machine is termed a turbo-compressor. This means that, for a mean stagnation density through the fan of 1,2 kg/m^3, the fan pressure does not exceed 1,2 × 25 kJ/kg, i.e. 30 kPa, and the pressure ratio does not exceed 1,30, since atmospheric pressure is approximately 100 kPa.

3.2
fan without drives
fan without a motor, a drive, an attachment or accessories

Note 1 to entry: Also known as a bare shaft fan.

[SOURCE: ISO 12759-3:2019]

3.3
driven fan
fan driven by an electrical motor.

Note 1 to entry: One or more impellers fitted to or connected to a motor with a stationary element, with or without transmission or variable speed drive (VSD), (ISO 13349).

3.4
impeller
rotating part of the fan that is imparting energy into the gas flow

3.5
stationary element
stationary part which interacts with the air stream passing through the impeller,

Note 1 to entry: It is an element, or a combination of elements, that interacts with the airstream directing and/or guiding the gas stream towards, through and/or from the impeller, an element may also assist in the conversion of energy

EXAMPLE Housing, orifice ring, orifice panel, inlet bell (also known as venturi), inlet cone, inlet radius, inlet ring, inlet guide vane, outlet guide vane, outlet diffuser, nozzle.

Note 2 to entry: In some standards a stationary element is called a stator.

3.6
housing
stationary part which interacts with the air stream passing through the impeller

Note 1 to entry: A housing can be an element around the impeller which guides the gas stream towards, through and from the impeller.

Note 2 to entry: A housing can have additional parts included within or attached to it that affect the performance of the fan, such as inlet bell (also known as venturi), inlet cone, inlet radius, inlet ring, inlet guide vane, outlet guide vane or outlet diffuser.

3.7
inlet guide vane
vane positioned before the impeller to guide the gas stream towards the impeller

Note 1 to entry: The inlet guide vane can be adjustable.

3.8
outlet guide vane
vane positioned after the impeller to reduce the swirl from the impeller

Note 1 to entry: The outlet guide vane can be adjustable.

3.9
orifice ring
ring with an opening in which the fan sits and which allows the fan to be fixed to other structures

Note 1 to entry: An orifice is a plain hole in the physical partition (e.g. orifice panel) between the upstream and downstream airflow of the fan. It is a divide between the negative pressure and positive pressure areas that occur across the fan when there is a pressure difference between the fan inlet and fan outlet.

3.10
orifice panel
panel with an opening in which the fan sits and which allows the fan to be fixed to other structures

3.11
diffuser
device that improves the fan performance through static recovery

3.12
inlet cone
device that steers the air into the impeller and reduces the vena contracta and turbulence that can occur at a sharp edge of the housing

Note 1 to entry: Also known as venturi inlet, inlet bell or inlet radius.

3.13
nozzle
aperture or ajutage of the fan through which air or gas is discharged

3.14
fan without housing
fan designed not to rely upon a housing for its correct operation

Note 1 to entry: Includes at least an impeller and a stationary element, such as an inlet cone.

3.15
fan with housing
fan designed to rely upon a housing for its correct operation

3.16
measurement category
fan test configuration according to the arrangement of standardised test airways

Note 1 to entry: Also known as installation category, see ISO 5801 and ISO 13349.

3.17
measurement category A
installation with free inlet and free outlet with a partition

3.18
measurement category B
installation with free inlet and ducted outlet

3.19
measurement category C
installation with ducted inlet and free outlet

3.20
measurement category D
installation with ducted inlet and ducted outlet

3.21
measurement category E
installation with free inlet and free outlet without a partition

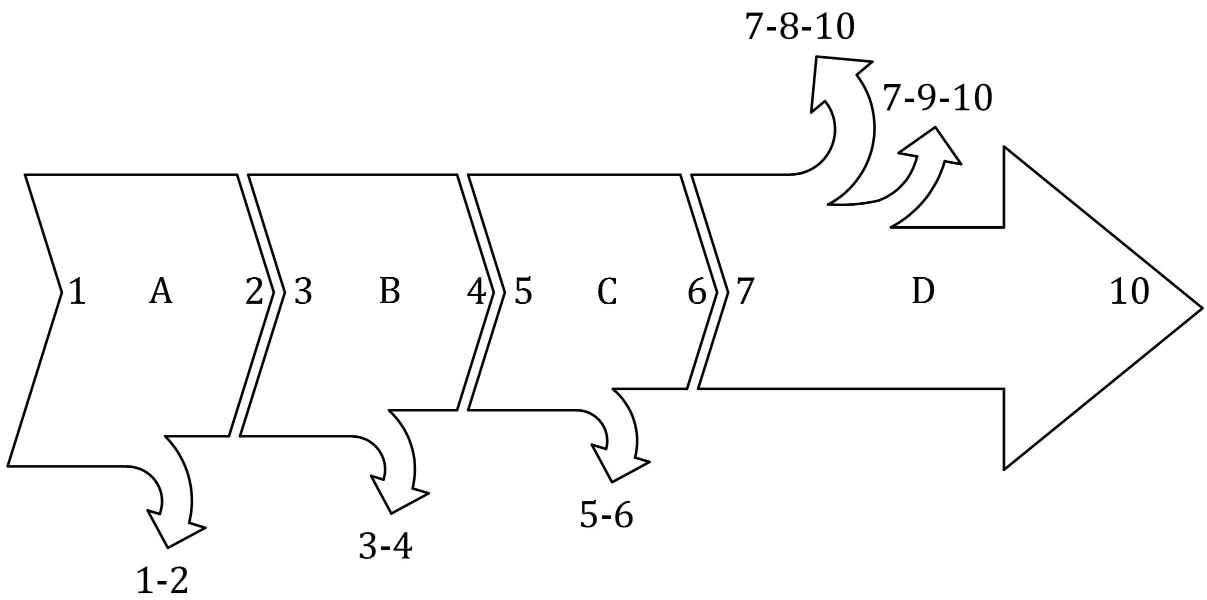
Note 1 to entry: Also known as test configuration category E.

Note 2 to entry: For jet fans, ISO 13350 is used for determining product efficiencies.

Note 3 to entry: In this measurement category a fan cannot produce any static pressure rise.

3.22
power
the amount of energy transferred or converted per unit of time

Note 1 to entry: The key in Figure 1 gives a fuller explanation to fan experts and non-fan experts on the losses within a fan system in terms that are understood by relevant industries.



Key

Key	**Term**	**Symbol**	**Source**
A	complete drive module (CDM)		
B	electric motor		
C	mechanical transmission		
D	fan		
1	drive control electrical input power	P_{ed}	ISO 5801
	motor controller input power	P_{ci}	ISO 12759-2
	input power of the CDM	$P_{in,CDM}$	IEC 61800-9-2
2	motor controller output power	P_{co}	ISO 12769-2
	output power of CDM	$P_{out,CDM}$	IEC 61800-9-2
1 – 2	CDM losses		
3	motor input power	P_e	ISO 5801
	motor input power	P_{mi}	ISO 12759-2
	motor input power	P_1	IEC 60034-2-1
4	motor output power	P_{mo}	ISO 12759-2
	motor output power	P_2	IEC 60034-2-1
3 – 4	Motor losses		
5	transmission input power	P_{ti}	ISO 12759-2
6	transmission output power	P_{to}	ISO 12759-2
5 – 6	Mechanical transmission losses		
7	fan shaft power	P_a	ISO 5801
8	Power	-	-
7 – 8	bearing losses		
9	impeller power	P_r	ISO 5801
10	fan air power	P_u	ISO 5801
7 - 9 – 10	fan losses		
7 – 8 -10	fan losses including bearings		
3 – 10	driven fan losses		