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Fans — Efficiency classification for fans —

Part 2: Standard losses for drive components

Ventilateurs — Classification du rendement des ventilateurs —

Partie 2: Détermination à charge partielle

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Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Normative references **1**
3 Terms, definitions and symbols **1**
3.1 Terms and definitions 1
3.2 Symbols 2
4 Fan system efficiency calculations **3**
4.1 General 3
4.2 Components 3
4.2.1 Fan 3
4.2.2 Power transmission 3
4.2.3 Motor and controller 4
4.3 System integration 6
5 Reporting of results **6**
Annex A (informative) **Fan system power losses** **8**
Annex B (informative) **EPCA nominal motor efficiency (60 Hz motors)** **9**
Annex C (informative) **IEC 60034-30-1 nominal motor efficiency at 50 Hz** **10**
Annex D (informative) **Nominal motor efficiency according to Reference [7] for China** **14**
Annex E (normative) **Horsepower rated polyphase induction motor performance constants when fed from VFD** **15**
Annex F (normative) **Kilowatt rated polyphase induction motor performance constants when fed from VFD** **16**
Annex G (normative) **Horsepower rated VFD performance constants** **17**
Annex H (normative) **Kilowatt rated VFD performance constants** **18**
Annex I (normative) **Polyphase induction motor performance constants (DOL, hp rated motors)** **19**
Annex J (normative) **Polyphase induction motor performance constants (DOL, kW rated motors)** **20**
Bibliography **21**

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

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

This first edition of ISO 12759-2, together with ISO 12759-1 and ISO 12759-3 to ISO 12759-6, cancels and replaces ISO 12759:2010, which has been technically revised. It also incorporates the Amendment ISO 12759:2010/Amd.1:2013.

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.

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Introduction

This document provides a method to estimate the input power and overall efficiency of an extended fan system.

An extended fan system is composed of a fan and an electric motor, but may also include a transmission and a motor controller. While direct measurement of fan system performance is preferred, the large number of fan system configurations often makes testing impractical. This document offers a standardized method to estimate fan system performance by modelling commonly used components. Calculations reported in accordance with this document offer fan users a tool to compare alternative fan system configurations in a consistent and uniform manner.

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Fans — Efficiency classification for fans —

Part 2: Standard losses for drive components

1 Scope

This document establishes a classification for fan efficiency. It applies to all electric-motor-driven fan systems that utilize a specific combination of components as defined below:

a) fan airflow performance determined in accordance with an accepted performance standard;

b) polyphase induction motors with nominal motor efficiency specified in this document;

NOTE 1 Other types of motors are explicitly excluded.

c) pulse-width modulated variable frequency drives (VFDs) for use with single motors;

NOTE 2 Single VFDs that service multiple, parallel fan motors are excluded.

d) mechanical power transmissions that utilize V-belts, flat belts, cog belts or couplings.

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, *Fans — Performance testing using standardized airways*

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

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

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

3 Terms, definitions and symbols

3.1 Terms and definitions

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

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

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

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

3.1.1
fan system
fan product that includes all appurtenances, accessories, motors, drives and controllers necessary or applied to the fan

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3.1.2
V-belt transmission
drive belts having a substantially trapezoidal cross section that uses sheaves (pulleys) having smooth contact surfaces

Note 1 to entry: Conventional V-belts have a constant cross section along their length, while notched V-belts (also known as cogged V-belts) have slots running perpendicular to their length. The slots reduce bending resistance and offer improved efficiency over conventional V-belts.

3.1.3
synchronous belt transmission
drive belts having a substantially rectangular cross section that contains teeth that engage corresponding teeth on the sheaves (pulleys) resulting in no-slip power transmission

Note 1 to entry: These belts are sometimes called timing or toothed belts.

3.2 Symbols

Symbol	Description	Unit
η_T	Transmission efficiency (see NOTE)	dimensionless
η_m	Motor efficiency	dimensionless
η_c	Motor controller efficiency	dimensionless
η_{es}	Overall static efficiency	dimensionless
η_e	Overall efficiency	dimensionless
η_{mc}	Combined motor and motor control efficiency	dimensionless
η_{mrat}	Motor rated full load efficiency	dimensionless
P_e	Fan system input power	kW
P_a	Fan input power	kW
P_u	Fan output power	kW
P_{mo}	Motor output power	kW
P_{mrat}	Motor rated output power (nameplate)	kW
P_{mi}	Motor input power	kW
P_{ci}	Motor controller input power	kW
P_{co}	Motor controller output power	kW
P_{crat}	Motor controller rated output power	kW
P_{ti}	Transmission input power	kW
P_{to}	Transmission output power	kW
L_m	Motor load ratio	dimensionless
L_c	Motor controller load ratio	dimensionless
N	Fan speed	1/min
f_L	Mains line frequency	Hz
η_s	Fan static efficiency	dimensionless
η	Fan efficiency	dimensionless
n	Number of poles in induction motor	dimensionless
NOTE The symbol η_T, transmission efficiency, should not be confused with η, fan efficiency.		

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