Technical Report

ISO/TR 16219

Fans — System effects and system effect factors

Ventilateurs — Effet système et facteurs d'effet système

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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 document 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).

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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 second edition cancels and replaces the first edition (ISO 16219:2020), which has been technically revised.

The main changes are as follows:

— Annex C has been added.

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

ISO 5801 provides the information for accurately measuring the performance of fans when tested under standardised laboratory conditions. The ducting where specified ensures a fully developed symmetrical velocity profile at the fan inlet. There can also be sufficient straight ducting at the fan outlet to ensure efficient conversion of the distorted velocity profile at the fan outlet to a measurable stable and homogeneous profile at the measuring station.

This document shows how fan performance is affected by both inlet and outlet connections to it. System designers must not only look at the ideal performance curve and calculated system pressure drop but also take into account the losses at the entry and exit points of the fan. These are described in the document.

The concept of the system effect factor (SEF) was introduced to the fan industry by AMCA in 1973. Since its inception it has become widely accepted worldwide. In more recent years, it has been realized that the SEF depends not only on the fan type and the fitting geometry but also on the fan design and manufacturing. Some less efficient fans can sometimes be less sensitive to system effect induced by poor inlet flow conditions than more efficient fans of the same type.

Furthermore, the origin of the system effect induced by a fitting at the fan inlet is different from the one due to the same fitting located on the fan outlet. That is why two different definitions of SEF are proposed in this document according to whether the appurtenance is at the fan inlet or fan discharge.

Fans — System effects and system effect factors

1 Scope

This document deals with the likely degradation of air performance of fans tested in standardized airways according to ISO 5801 when compared with the performance of fans tested under actual site conditions. It deals with the performance of a number of generic types of fan and fittings. The results given are intended as guidelines and only provide trends, as the system effect depends on the exact geometry of the fan and disturbing component.

The test data presented in this document are taken from an extensive experimental program conducted 20 years ago by NEL (National Engineering Laboratory, UK), mainly on axial and centrifugal fans. Data are also taken from several research projects financially supported by ASHRAE, some of them being carried out in the AMCA laboratory in Chicago, as well as from results published previously by individual fan manufacturers.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and symbols

No terms and definitions are listed in this document.

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/

The following symbols are used:

Symbol	Description	SI units	I-P units
A_2	Fan outlet area	m^2	ft^2
C	System effect (SE) coefficient (see 5.2)	Dimensionless	Dimensionless
p_C	Conventional pressure loss (see 5.2)	Pa	in. wg
p_f	Fan pressure	Pa	in. wg
p_{fd}	Fan dynamic pressure (see Clause 4)	Pa	in. wg
p_{fs}	Fan static pressure	Pa	in. wg
p_{SE}	System effect (see 5.2)	Pa	in. wg
p_{SEo}	Additional pressure loss due to non-uniform flow (see 5.2)	Pa	in. wg
q_{V1}	Volume flow rate of the fan	m^3/s	cfm
S_{EF}	System effect factor	Dimensionless	Dimensionless
ξ	Loss coefficient (see 5.1)	$(m^3/s)/(Pa^{0,5})$	
ρ	Density of air	kg/m^3	lbm/ft^2
ρ_{std}	Standard air density	kg/m^3	lbm/ft^2
NOTE The term “fan dynamic pressure” or “dynamic pressure” is used throughout this document and is equivalent to the term “velocity pressure” as used in some countries.			