

STN	Ventilátory Skúšanie výkonnosti s použitím normalizovanej skúšobnej trate (ISO 5801: 2017)	STN EN ISO 5801 12 2022
------------	---	---

Fans - Performance testing using standardized airways (ISO 5801:2017)

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 03/18

Obsahuje: EN ISO 5801:2017, ISO 5801:2017

Oznámením tejto normy sa ruší
STN EN ISO 5801 (12 2022) z marca 2009

126271

EUROPEAN STANDARD

EN ISO 5801

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2017

ICS 23.120

Supersedes EN ISO 5801:2008

English Version

**Fans - Performance testing using standardized airways
(ISO 5801:2017)**Ventilateurs - Essais aérauliques sur circuits
normalisés (ISO 5801:2017)Ventilatoren - Leistungsmessung auf genormten
Prüfständen (ISO 5801:2017)

This European Standard was approved by CEN on 18 May 2017.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

EN ISO 5801:2017 (E)

Contents	Page
European foreword.....	3

European foreword

This document (EN ISO 5801:2017) has been prepared by Technical Committee ISO/TC 117 “Fans” in collaboration with Technical Committee CEN/TC 156 “Ventilation for buildings” the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2018, and conflicting national standards shall be withdrawn at the latest by April 2018.

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

This document supersedes EN ISO 5801:2008.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Endorsement notice

The text of ISO 5801:2017 has been approved by CEN as EN ISO 5801:2017 without any modification.

INTERNATIONAL STANDARD

ISO 5801

Third edition
2017-09

Fans — Performance testing using standardized airways

Ventilateurs — Essais aérauliques sur circuits normalisés



Reference number
ISO 5801:2017(E)

© ISO 2017

ISO 5801:2017(E)**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2017, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

	Page
Foreword	vii
Introduction	viii
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Symbols, abbreviated terms and subscripts	10
4.1 Symbols and abbreviated terms.....	10
4.2 Subscripts.....	12
5 General	13
6 Test configurations	14
6.1 General.....	14
6.2 Category A configuration.....	15
6.3 Category B configuration.....	15
6.4 Category C configuration.....	15
6.5 Category D configuration.....	15
6.6 Inlets and outlets.....	15
6.7 Fans with significant swirl.....	15
6.8 Airways.....	15
6.9 Test space.....	16
6.10 Leakage.....	16
6.11 Test report.....	16
7 Carrying out the test	16
7.1 Working fluid.....	16
7.2 Rotational speed.....	16
7.3 Steady operation.....	16
7.4 Ambient conditions.....	16
7.5 Pressure readings.....	17
7.6 Test for a specified duty.....	17
7.7 Test for a fan characteristic curve.....	17
7.8 Operating range.....	17
8 Airways for duct simulations	17
8.1 General.....	17
8.2 Common segments at fan inlet (iCS).....	17
8.3 Inlet duct simulation (iDS).....	19
8.4 Common segment at fan outlet (oCS).....	20
8.5 Outlet duct simulation (oDS).....	21
8.6 Long duct (LD).....	22
8.7 Loss allowances for standardized airways.....	23
8.7.1 Loss allowances for an inlet common segment (iCS).....	23
8.7.2 Loss allowances for inlet duct simulation (iDS).....	24
8.7.3 Loss allowances for outlet common segments (oCS).....	24
8.7.4 Loss allowances for duct simulation at outlet (oDS).....	25
8.7.5 Loss allowances for long duct (LD).....	25
9 Standardized test chambers	25
9.1 General.....	25
9.2 Pressure tappings.....	25
9.3 Flow-settling means.....	25
9.3.1 General.....	25
9.3.2 Piezometer ring check.....	26
9.3.3 Blow through verification test.....	26
9.3.4 Outlet chamber reverse flow verification test.....	26

ISO 5801:2017(E)

9.4	Standardized inlet test chambers (iTC)	26
9.4.1	Test chambers	26
9.4.2	Fan under test	29
9.5	Standardized outlet test chambers (oTC)	30
9.5.1	Test chambers	30
9.5.2	Fan under test	30
10	Various component parts for a laboratory setup	31
10.1	General	31
10.2	Variable supply system	31
10.2.1	General	31
10.2.2	Throttling device	31
10.2.3	Auxiliary fan	31
10.3	Straightener	31
10.3.1	General	31
10.3.2	Cell straightener	31
10.3.3	Star straightener	32
10.4	Transition parts	33
10.4.1	General	33
10.4.2	Rectangular/circular transition	34
10.4.3	Circular/circular transition	34
10.4.4	Connection for double-inlet fans	35
11	Standard test configurations	35
11.1	Units	35
11.2	Measuring flow rate	40
11.3	Standard test configurations A	41
11.4	Standard test configurations B	42
11.5	Standard test configurations C	42
11.6	Standard test configurations D	42
12	Measurements	43
12.1	Calibration	43
12.2	Dimensions and cross-sectional areas	43
12.2.1	Tolerance on dimensions	43
12.2.2	Cross-sectional area	43
12.3	Rotational speed	44
12.4	Power input	44
12.4.1	General	44
12.4.2	Motor input power	44
12.4.3	Fan shaft power	45
12.4.4	Impeller power	46
12.4.5	Transmission systems	46
12.5	Mass flow rate	46
12.6	Temperature	47
12.6.1	General	47
12.6.2	Accuracy of temperature measurement	47
12.6.3	Correction for high velocities	47
12.7	Humidity	48
12.8	Pressure	48
12.8.1	Barometers	48
12.8.2	Manometers	49
12.8.3	Damping of manometers	49
12.8.4	Checking of manometers	49
12.8.5	Position of manometers	49
12.8.6	Average pressure in an airway	50
12.8.7	Construction of tappings	50
12.8.8	Position and connections	51
12.8.9	Methods of measurement	51
12.8.10	Checks for compliance	51

12.8.11	Use of Pitot-static tube.....	51
12.9	Air properties.....	52
12.9.1	General.....	52
12.9.2	Density of air at section x.....	52
12.9.3	Air viscosity.....	53
12.9.4	Standard air.....	53
13	Reference conditions.....	53
14	General rules for conversion of test results.....	54
14.1	General.....	54
14.2	Laws on fan similarity.....	54
14.2.1	General.....	54
14.2.2	Geometrical similarity.....	54
14.2.3	Reynolds number similarity.....	55
14.2.4	Mach number and similarity of the velocity triangles.....	55
15	Calculations.....	55
15.1	Test results.....	55
15.1.1	General.....	55
15.1.2	Temperature.....	56
15.1.3	Pressure.....	58
15.1.4	Set of formulae.....	58
15.1.5	Simplified sets of formulae, which can be used for $v_{2,ref} \leq 65\text{m/s}$	60
15.1.6	Fan pressure.....	61
15.1.7	Fan static pressure.....	62
15.1.8	Volume flow rate of the fan.....	62
15.1.9	Fan air power and efficiency.....	62
15.2	Efficiencies.....	65
15.2.1	General.....	65
15.2.2	Fan static air power and static efficiency.....	66
15.3	Conversion rules.....	66
15.3.1	General.....	66
15.3.2	Shaft power and impeller power.....	66
16	Fan characteristic curves.....	67
16.1	Methods of plotting.....	67
16.2	Characteristic curves at constant speed.....	67
16.3	Characteristic curves at inherent speed.....	68
16.4	Complete fan characteristic curve.....	68
16.5	Test for a specified duty.....	69
16.6	Specific fan types.....	69
17	Uncertainty analysis.....	70
17.1	Principle.....	70
17.2	Pre-test and post-test analysis.....	70
17.3	Analysis procedure.....	70
17.4	Propagation of uncertainties.....	70
17.5	Reporting uncertainties.....	71
17.6	Maximum allowable uncertainties for measurements.....	71
17.7	Maximum allowable uncertainty of results.....	72
Annex A	(normative) Determination of air flow rate.....	73
Annex B	(informative) Fan-powered roof exhaust ventilators.....	90
Annex C	(informative) Chamber leakage test procedure.....	91
Annex D	(informative) Fan outlet elbow in the case of a non-horizontal discharge axis.....	97
Annex E	(informative) Input power calculation for driven fans at design point.....	100
Annex F	(informative) Motor fed from a variable frequency speed device.....	109

ISO 5801:2017(E)

Annex G (informative) Axial fans without outlet guide vanes	110
Annex H (informative) Vapour pressure, p_v	112
Annex I (informative) Clearances	113
Annex J (normative) Polytropic approach for the calculation of p_{fC} from p_{fTe}	115
Annex K (informative) Examples for test setups	117
Annex L (informative) Measurement of plenum fans and plug fans	125
Annex M (informative) Comparison of NEMA methodology for calculation motor efficiency with IEC	127
Annex N (informative) Report and results of test	128
Bibliography	136

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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

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

This third edition cancels and replaces the second edition (ISO 5801:2007), which has been technically revised. It also incorporates the Technical Corrigendum ISO 5801:2007/Cor.1:2008.

ISO 5801:2017(E)

Introduction

This document is the result of almost 50 years of discussion, comparative testing and detailed analyses by leading specialists from the fan industry and research organizations throughout the world.

It was demonstrated many years ago that the codes for fan performance testing established in different countries do not always lead to the same results.

The need for an International Standard has been evident for some time and Technical Committee ISO/TC 117 started its work in 1963. Important progress has been achieved over the years and, although the International Standard itself was not yet published, the successive revisions of various national standards led to much better agreement among them.

It has become possible since 1997 to complete this document by agreement on certain essential points. It is to be borne in mind that the test equipment, especially for large fans, is very expensive and it was necessary to include in this document many setups from various national codes in order to authorize their future use. This explains the sheer volume of the first edition (ISO 5801:1997).

The second edition (ISO 5801:2007) of this document was the result of a survey of ISO members, deleting those methods that were the least frequently used. A significant reduction in the number of pages had been achieved.

For the third edition, the contents were reorganized to define and allow all possible configurations of defined component parts as standardized test setups. A further significant reduction of volume has been achieved by streamlining the content.

Essential features of this document are as follows.

— **Installation categories and test configurations** (see [Clause 5](#) and [Clause 6](#)).

Since the connections of a duct to a fan inlet and/or outlet affect the fan's performance, a number of installation categories and test configurations need to be recognized.

— **Common segments** (see [Clause 8](#)).

It is essential that all standardized test airways to be used with fans need to have portions in common adjacent to the fan inlet and/or outlet sufficient to ensure consistent determination of fan pressure.

Geometric variations of these common segments are strictly limited.

— **Flow rate measurement** (see [12.5](#) and [Annex A](#)).

Determination of flow rate has been separated from the determination of fan pressure. A number of standardized methods may be used.

— **Test results** (see [Clause 15](#)).

Methods of measurement and calculation for the flow rate, for the fan pressure and for the fan efficiencies are established taking into account all compressibility effects of the air. For fan pressure less than 2 000 Pa, the change of density between fan inlet and fan outlet is allowed to be neglected. Other compressibility effects are allowed to be neglected for reference velocity values not higher than 65 m/s (see [Clause 13](#)).

Fans — Performance testing using standardized airways

1 Scope

This document specifies procedures for the determination of the performance of fans of all types except those designed solely for air circulation, e.g. ceiling fans and table fans. Testing of jet fans is described in ISO 13350.

This document provides estimates of uncertainty of measurement and rules for the conversion, within specified limits, of test results for changes in speed, gas handled and, in the case of model tests, size are given.

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 5136, *Acoustics — Determination of sound power radiated into a duct by fans and other air-moving devices — In-duct method*

ISO 5167-1, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full — Part 1: General principles and requirements*

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

ISO 13347 (all parts), *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 13349, *Fans — Vocabulary and definitions of categories*

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

IEC 60034-1:2010, *Rotating electrical machines — Part 1: Rating and performance*

IEC 60034-2-1:2014, *Rotating electrical machines — Part 2-1: Standard methods for determining losses and efficiency from tests (excluding machines for traction vehicles)*

IEC 60051-2, *Direct acting indicating analogue electrical measuring instruments and their accessories — Part 2: Special requirements for ammeters and voltmeters*

IEC 60051-3, *Direct acting indicating analogue electrical measuring instruments and their accessories — Part 3: Special requirements for wattmeters and varmeters*

koniec náhľadu – text ďalej pokračuje v platenej verzii STN