SLOVENSKI STANDARD
oSIST prEN ISO 5801:2015

01-januar-2015

Industrijski ventilatorji - Preskušanje lastnosti s standardiziranimi zračnimi cevkami (ISO/DIS 5801:2014)

Fans - Performance testing using standardized airways (ISO/DIS 5801:2014)

Industrieventilatoren - Leistungsmessung auf genormten Prüfständen (ISO 5801:2007 einschließlich Cor 1:2008)

Ventilateurs - Essais aérauliques sur circuits normalisés (ISO/DIS 5801:2014)

Ta slovenski standard je istoveten z: **prEN ISO 5801:2014**

ICS:

23.120	Zračniki. Vetrniki. Klimatske naprave	Ventilators. Fans. Air-conditioners

oSIST prEN ISO 5801:2015 **en**

DRAFT INTERNATIONAL STANDARD

ISO/DIS 5801

ISO/TC **117**

Secretariat: **BSI**

Voting begins on:
2014-10-16

Voting terminates on:
2015-03-16

Fans — Performance testing using standardized airways

Ventilateurs — Essais aérauliques sur circuits normalisés

ICS: 23.120

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Reference number
ISO/DIS 5801:2014(E)

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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 5801 was prepared by Technical Committee ISO/TC 117, *Fans*, Working Group 7.

This third edition cancels and replaces the second edition (ISO 5801:2007-12-15) which has been technically and editorial revised.

Introduction

This International Standard 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 International Standard by agreement on certain essential points. It must be borne in mind that the test equipment, especially for large fans, is very expensive and it was necessary to include in this International Standard 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 International Standard 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 reorganised to define and allow all possible configurations of defined component parts as standardised test setups. A further significant reduction of volume has been achieved by streamlining of the content.

Essential features of this International Standard are as follows:

Installation categories and test configurations (see 5 and 6)

Since the connections of a duct to a fan inlet and/or outlet affect the fan's performance, it has been agreed that a number of installation categories and test configurations shall be recognized.

Common segments (see 8)

It is essential that all standardized test airways to be used with fans 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 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 2000 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 13).

Fans — Performance testing using standardized airways

1 Scope

This International Standard deals with 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.

Estimates of uncertainty of measurement are provided 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 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 2533, *Standard Atmosphere*

ISO 3966, *Measurement of fluid flow in closed conduits — Velocity area method using Pitot static tubes*

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

ISO 5167, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full*

ISO 5168, *Measurement of fluid flow — Procedures for the evaluation of uncertainties*

ISO 5389:2005, *Turbocompressors — Performance test code*

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

ISO 12759, *Fans – Efficiency classification for fans*

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

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

ISO 13350, *Industrial fans – Performance testing of jet fans*

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

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 60034-2-2, *Rotating electrical machines – Part 2-2: Specific methods for determiningseparate losses of large machines from tests – Supplement to IEC 60034-2-1*

IEC 60034-30, *Rotating electrical machines – Part 30: Efficiency classes of single-speed, three-phase, cage-induction motors (IE-code)*

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*

IEC 60051-4, *Direct acting indicating analogue electrical measuring instruments and their accessories — Part 4: Special requirements for frequency meters*

3 Terms and definitions

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

3.1
air
The working fluid for tests with standardized airways shall be atmospheric air

3.2
standard air
by convention, air with a density of 1,2 kg/m^3 defined in 12.9.3

3.3
upstream
direction from where the air flow comes

3.4
downstream
direction to where the air flow discharges

3.5
cross sectional area
A

3.6
fan inlet area
A_1
cross sectional area of fan inlet as defined in ISO 13349

3.7
fan outlet area
A_2
cross sectional area of fan outlet as defined in ISO 13349

3.8
hydraulic diameter
D_h
hydraulic diameter of a duct

$$D_h = \frac{4 \cdot \text{Area}}{\text{Perimeter}}$$

3.9
hydraulic mean depth
H_h
hydraulic mean depth of a duct

$$H_h = \frac{\text{Area}}{\text{Perimeter}}$$

3.10
absolute temperature
θ
absolute temperature

$$\theta = T + 273{,}15$$

3.11
absolute temperature of moving air
θ
absolute temperature registered by a thermal sensor theoretically moving at the air velocity

$$\theta = \theta_{sg} - \frac{v^2}{2 \cdot c_p}$$

3.12
stagnation temperature
θ_{sg}
absolute temperature at an isentropic stagnation point

$$\theta_{sg} = \theta \cdot \left(1 + \frac{\kappa - 1}{2} \cdot Ma^2\right)$$

Note 1 to entry: The stagnation temperature is constant along an airway without addition of energy or heat

3.13
specific heat at constant pressure
c_p

3.14
specific heat at constant volume
c_v

3.15
isentropic exponent
κ

$$\kappa = \frac{c_p}{c_v}$$ 3.16

3.16
specific gas constant
R

$$R = c_p - c_v$$

3.17
specific gas constant for humid air
R_{wet}

$$R_{wet} = \frac{p_a}{\rho_a \cdot \theta_a}$$

3.18
air density
ρ
air density calculated from the absolute pressure, *p*, and the air temperature, *θ*

$$\rho = \frac{p}{R_{wet} \cdot \theta}$$

3.19
stagnation density
ρ_{sg}
air density calculated from the stagnation pressure, p_{sg}, and the stagnation temperature, θ_{sg}

$$\rho_{sg} = \frac{p_{sg}}{R_{wet} \cdot \theta_{sg}}$$

3.20
mean density
ρ_m
mean value of the air densities of the fan

$$\rho_m = \frac{\rho_1 + \rho_2}{2}$$

3.21
mean stagnation density
ρ_{sgm}
mean value of the stagnation densities of the fan

$$\rho_{sgm} = \frac{\rho_{sg1} + \rho_{sg2}}{2}$$

3.22
mass flow rate
q_m
mean value, over time, of the mass of air which passes through the airway per unit of time

3.23
volume flow rate
q_{V1}
mass flow rate divided by the density at fan inlet

$$q_{V1} = \frac{q_m}{\rho_1}$$

3.24
volume flow rate at stagnation conditions
q_{Vsg1}
mass flow rate divided by the stagnation density at fan inlet

$$q_{Vsg1} = \frac{q_m}{\rho_{sg1}}$$

3.25
average velocity
v

$$v = \frac{q_m}{\rho \cdot A}$$

3.26
reference velocity
$v_{2.ref}$
velocity calculated at fan outlet, A_2, for the maximum mass flow rate of the fan, $q_{m,max}$, and for the reference density of standard air, ρ_{ref} = 1,200 kg/m^3 (see 12.9.3)

$$v_{2.ref} = \frac{q_{m.max}}{\rho_{ref} \cdot A_2}$$