DRAFT INTERNATIONAL STANDARD ISO/DIS 16494

ISO/TC **86**/SC **6** Secretariat: **ANSI**

Voting begins on **2012-10-17** Voting terminates on **2013-01-17**

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Heat recovery ventilators and energy recovery ventilators — Method of test for performance

Ventilateurs-récupérateurs de chaleur et ventilateurs-récupérateurs d'énergie — Méthode d'essai des performances

ICS 23.120; 27.080

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.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

Contents

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 was prepared by Technical Committee ISO/TC 86, *Refrigeration and air-conditioning*, Subcommittee SC 6, *Testing and rating of air-conditioners and heat pumps*.

This second/third/... edition cancels and replaces the first/second/... edition (), [clause(s) / subclause(s) / table(s) / figure(s) / annex(es)] of which [has / have] been technically revised.

Introduction

TBD

Heat recovery ventilators and energy recovery ventilators — Method of test for performance — Complementary element

1 Scope

This International Standard prescribes a method of testing the ventilation and energy related performance of Heat Recovery Ventilators and Energy Recovery Ventilators that do not contain any supplemental heating, cooling, humidification or dehumidification components.

2 Normative References

The following Standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All Standards are subject to revision, and Parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the Standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO5801:2007,Industrial fans -- Performance testing using standardized airways

ISO3966:2008,Measurement of fluid flow in closed conduits -- Velocity area method using Pitot static tubes

ISO5167-1:2003,Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full. General principles and requirements

3 Terms and definitions

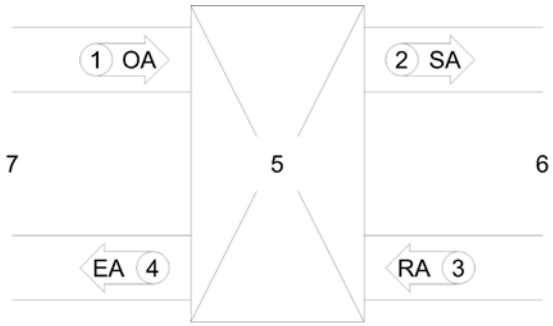
For the purposes of this document, the following terms and definitions apply.

3.1
outdoor airflow (OA)
indicated in Figure 3.1 as 1. The outside air entering the ventilator, also referred to as the entering supply air. Measured in units of (m3/h).

3.2
supply airflow (SA)
indicated in Figure 3.1 as 2. The outside air after passing through the ventilator, also referred to as the leaving supply air. Measured in units of (m3/h).

3.3
return airflow (RA)
indicated in Figure 3.1 as 3. The indoor air entering the ventilator, also referred to as the entering exhaust air. Measured in units of (m3/h).

3.4
exhaust airflow (EA)
indicated in Figure3.1 as 4. The indoor air after passing through the ventilator, also referred to as the leaving exhaust air. Measured in units of (m3/h).



1	Outdoor Airflow (OA) (Entering)
2	Supply Airflow (SA) (Leaving)
3	Return Airflow (RA) (Entering)
4	Exhaust Airflow (EA) (Leaving)
5	Ventilator
6	Indoor Side
7	Outdoor Side

Figure 3.1 – Schematic numbering of airflows for heat and energy recovery ventilators

3.5
station
for each of the airflows defined in 3.1, the location in the test apparatus at which conditions such as temperature, humidity, pressure, or airflow are measured. These locations are identified as “station 1”, “station 2”, “station 3” and “station 4”.

3.6
coefficient of energy (COE)
total exchanged energy between the airstreams plus the work value of moving air, divided by the power input. The equation for determining the coefficient of energy is given in 8.6.

3.7
rating points
the sets of supply and return airflows, static pressures at inlets and outlets, and speed control setting, achieved during the airflow performance measurement, at which thermal performance tests and (and exhaust air transfer tests, if applicable) are performed.

3.8
effective work (EW)
total exchanged energy between the airstreams plus the work value of moving air minus the power input expressed in W. The equation for determining the effective work is given in 8.7.

3.9
power value of moving air
the rate of pressure energy and kinetic energy of the air delivered by the ventilator, expressed in kJ/hr. The equation that determines the power value of moving air is given in 8.6.

3.10
gross effectiveness
the measured effectiveness, not adjusted for leakage, motor heat gain, or heat transfer through the unit casing. The sensible, latent or total gross effectiveness of an HRV or ERV, at equal airflows, is described in section 8.5

3.11
maximum rated airflow
the largest supply and return airflows, specified by the manufacturer, at which an airflow test is performed. For ventilators with speed control devices, different maximum rated airflows may be defined for each speed control setting at which the test is performed.

3.12
minimum rated airflow
the smallest supply and return airflows, specified by the manufacturer, at which an airflow test is performed. For ventilators with speed control devices, different minimum rated airflows may be defined for each speed control setting at which the test is performed.

3.13
net supply airflow
the portion of the leaving supply airflow that originated as entering supply airflow. The net supply airflow is represented by the variable Q_{SANet}, measured in m^3/h. The equations for determining net supply airflow are given in 8.4.1 (ducted units) and 8.4.2 (unducted units).

3.14
net supply airflow ratio
determined by dividing net supply airflow by supply airflow. Expressed as a percentage, and described in 8.4.2

3.15
speed control device
a device incorporated into the ventilator which controls the speed of the fan.

3.16
standard air
dry air with a density of 1.204 kg/m^3. These conditions approximate dry air at 20°C and 101.325 kPa absolute.

3.17
static pressure differential
absolute difference between inlet static pressure and outlet static pressure for each of the two airstreams. (e.g,: Static pressures measured at $|X_2-X_1|$, or $|X_4-X_3|$)

3.18
thermal performance measurement
a test procedure which measures the temperature and humidity of the supply air when a ventilator is operating with the outside air and return air a specific psychrometric conditions.

3.19
unit exhaust air transfer ratio (UEATR)
the tracer gas concentration difference between the supply airflow and the outdoor airflow divided by the tracer gas concentration difference between the return airflow and the outdoor airflow, at a specified airflow, expressed as a percentage. The equation for UEATR is given in 8.3.

3.20
ventilator
the ventilator is a self contained unit that includes fans to move air through the heat/energy exchanger.

3.21
energy recovery ventilator (ERV)
ventilators which are designed to transfer both heat and moisture between two isolated airstreams.

3.22
heat recovery ventilator (HRV)
ventilators which are designed to transfer only heat between two isolated airstreams.

3.23
unducted ventilator
a heat recovery ventilator or energy recovery ventilator which is not intended for connection of ducts to any of the airflow inlets or outlets except for model specific exterior termination systems as defined in 3.26.

3.24
ducted ventilator
a heat recovery ventilator or energy recovery ventilator which is intended for connection of ducts to one or more of the airflow inlets or outlets and intended to address a range of static pressure differentials from the duct(s).

3.25
duct
an insulated or uninsulated closed passage for air that is installed as part of the ventilation system in lengths determined by the needs of application, and is separate, prior to installation from exterior terminations such as weather hoods.

3.26
model-specific exterior termination system
weather hoods, fittings and through-wall penetrations designed by the ventilator manufacturer specifically for installation with a specific model of ventilator, that comprise the complete passageway connecting the ventilators Outside Air inlet and/or exhaust air outlet to the ventilator.

4 Symbols and abbreviated terms

Symbol	Definition	Units
C_i	Initial tracer gas concentration in the test chamber (average of all measurement points)	
C_o	Tracer gas concentration in outdoor air (OA)	
C_{OA}	Tracer gas concentration at outdoor air inlet (station 1)	
C_p	Specific heat at supply airflow	kJ/kg K
C_{RA}	Tracer gas concentration at return air inlet (station 3)	
C_{SA}	Tracer gas concentration at supply air outlet (station 2)	
C_t	Tracer gas concentration in the test chamber after t hours (average of all measurement points)	
h_1	Enthalpy of the air at station 1	kJ/kg of dry air
h_2	Enthalpy of the air at station 2	kJ/kg of dry air
M_s	Fresh air mass flow rate at station 2	kg/h
M_{snet}	net supply mass flow rate	kg/h
NSAR	Net supply air flow ratio	%
P_{aux}	Input power to any other electrical components in the ventilator	W
P_{em}	Input power to all electric motors in the ventilator	W
P_{in}	Input power to ventilator	W
P_{vma}	Power value of moving air	kJ/h
Q	Net supply airflow rate	m^3/h
Q_1	Average of the three calculated overall air flow rates with the unit under test in operation as described in B.2.1.1 and B.2.1.2	m^3/h
Q_2	Average of the three calculated natural air flow rates of the test chamber with the ventilator removed as described in B.2.2.1 and B.2.2.2	m^3/h
Q_i	air flow rate calculated using the data from a test i as described in B.2.1.1, B.2.1.2, B.2.2.1 and B.2.2.2	m^3/h
Q_{SA}	Supply airflow	m^3/h
Q_{SANet}	Net supply air flow	m^3/h
SP_n	External static pressures at the inlet(s) and outlet(s)	Pa
t	Length of time elapsed since the start of test unit operation	h
T_1	Temperature of the outdoor airflow at station 1	K
T_2	Temperature of the supply airflow at station 2	K
UEATR	Exhaust air transfer ratio	%
V	Air volume in the test chamber	m^3
v_s	Specific volume of the supply air	m^3/kg
x	Dry-bulb temperature (for sensible effectiveness); or absolute humidity ratio (for latent effectiveness); or total enthalpy (for total effectiveness).	°C kg water/kg dry air J/kg

5 Airflow test

5.1General conditions

All tested equipment within the scope of this International Standard shall have the airflows determined in accordance with the following provisions:

ISO/DIS 16494

5.1.1Temperature conditions

When measuring airflow, the laboratory ambient conditions shall be 20 ±15 ºC and 30 to 95%RH.