



SLOVENSKI STANDARD
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Prezračevanje stavb - Preskušanje lastnosti komponent za stanovanjske stavbe - Večnamenske uravnotežene prezračevalne enote za posamezna stanovanja, vključno s toplotnimi črpalkami

Ventilation for Buildings - Performance testing of components for residential buildings - Multifunctional balanced ventilation units for single family dwellings, including heat pumps

Lüftung von Gebäuden - Leistungsprüfung von Bauteilen für Wohnbauten - Multifunktionale Zu-/Abluft-Lüftungseinheiten für Einzelwohnungen, einschließlich Wärmepumpen

Ventilation des bâtiments - Essais de performance des composants pour les bâtiments résidentiels - Dispositifs multifonctionnels de ventilation équilibrée pour les logements individuels, comprenant des pompes à chaleur

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**Ventilation for Buildings - Performance testing of components for
residential buildings - Multifunctional balanced ventilation units
for single family dwellings, including heat pumps**

Ventilation des bâtiments - Essais de performance des
composants pour les bâtiments résidentiels - Dispositifs
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für Wohnbauten - Multifunktionale Zu-/Abluft-
Lüftungseinheiten für Einzelwohnungen, einschließlich
Wärmepumpen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 156.

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Foreword

This document (prEN 16573:2013) has been prepared by Technical Committee CEN/TC 156 "Ventilation for buildings", the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

1 Scope

This Standard specifies the laboratory test methods and test requirements for aerodynamic, energy rating and acoustic performance, of multifunctional balanced units intended for use in a single dwelling.

In the case of units consisting of several parts, this standard applies only to those designed and supplied as a complete package with the mount instructions.

It covers unit that contain at least, within one or more casing:

- supply and exhaust air fans;
- air filters
- common control system.

And one or more of the additional components

- Air to water heat pump;
- Air to air heat pump
- air-to-air heat exchanger

except units including either an air to air heat exchanger and/or exhaust air to supply air heat pump which are already covered by EN 13141-7.

A non-exhaustive list of possible configurations of multifunctional units covered by this standard is given in Clause 5.

The standard does not cover the thermal aspects of humidity transfer in the air-to-air heat exchanger.

This standard does not deal with non-ducted units on supply and extract air side.

This standard does not deal with collective units (centralised or semi-centralised systems)

These multifunctional balanced units can be connected to ground heat exchanger for air preheating, solar collector or other heating systems. This standard does not cover the testing of these additional components.

This standard does not cover units including combustion engine driven compression heat pumps and sorption heat pump.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 12102, *Air conditioners, liquid chilling packages, heat pumps and dehumidifiers with electrically driven compressors for space heating and cooling — Measurement of airborne noise — Determination of the sound power level*

EN 12792, *Ventilation for buildings — Symbols, terminology and graphical symbols*

EN 13141-7, *Ventilation for buildings — Performance testing of components/products for residential ventilation — Part 7: Performance testing of a mechanical supply and exhaust ventilation units (including heat recovery) for mechanical ventilation systems intended for single family dwellings*

EN 14511-1, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling — Part 1: Terms and definitions*

EN 14511-2, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling — Part 2: Test conditions*

EN 14511-3, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling — Part 3: Test methods*

EN 16147, *Heat pumps with electrically driven compressors — Testing and requirements for marking of domestic hot water units*

EN ISO 5135, *Acoustics — Determination of sound power levels of noise from air-terminal devices, air-terminal units, dampers and valves by measurement in a reverberation room (ISO 5135)*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions given in EN 12792, EN 13141-7, EN 14511-1 and EN 16147 apply.

3.1.1

declared maximum air volume flow

maximum of the removed or fresh air volume flow corresponding to the declared total pressure of the unit at the maximum setting for standard air conditions (20°C, 101325 Pa).

3.1.2

multifunctional balanced ventilation unit

unit intended for use in a single family dwelling to primarily provide balanced ventilation and in addition heating and/or cooling and/or hot water production

NOTE It contains at least, within one or more modular casing supply and exhaust air fans, air filters, common control system and one more of the additional components, air to water heat pump, air to air heat pump, air-to-air heat exchanger. Units including either an air to air heat exchanger and/or air to air heat pump are already covered by EN 13141-7 and excluded.

3.1.3

hydronic heating/cooling

heating or cooling supplied by a water or brine circuit

prEN 16573:2013 (E)**3.1.4****air heating/cooling**

heating or cooling supplied by an air stream

3.1.5**Air supply free cooling**

recovering of cooling energy produced by the heat pump while producing hot water.

NOTE Hot water has priority.

3.1.6**reference fresh air volume flow**

fresh air volume flow $q_{V,ref, fresh}$ at the reference point defined at $P_{tUd/2}$ and 70 % of declared maximum air volume flow according EN 13141-7.

3.2 Symbols

ODA, 21	Outdoor Air
SUP, 22	Supply Air
RCA,	Recirculation air (add airflow for example for air heating or air cooling function)
ETA, 11	Extract Air
EHA, 12	Exhaust Air
OEA	Outdoor to Exhaust Air (add airflow for example to raise the thermal capacity of the heat pump)

List of symbols

P	capacity or power input, in kW
Q	thermal energy, in kWh
t	time duration, in s
W	electrical work, in kWh
h	spec. enthalpy in kJ/kg
q_m	mass flow rate kg/s
q_v	volume flow rate m ³ /h
T	temperature in °C

List of indices used for the individual and combined functions in the symbols:

AC	supply Air Cooling
AH	supply Air Heating
AFC	supply air free cooling

C	cooling
WH	(Domestic) hot water production
el	electric
H	heating
HC	Hydronic Cooling
HH	Hydronic Heating
HR	heat recovery
V	Ventilation
es	stand by

The combination of indices indicates simultaneous operation of the corresponding functions.

4 Functions

A multifunctional ventilation unit provides ventilation for single dwelling as a leading function. This means, that all additional functions

- Hydronic Heating/Air Heating
- Hydronic Cooling/Air Cooling
- Hot water production

shall be only operating if ventilation is operating.

The multifunctional ventilation unit shall be designed and controlled to provide the hygienic ventilation rate for a dwelling or part of a dwelling. That means for example, that the ventilation rate shall not be controlled according to the hydronic heating demand.

According to the declaration of the manufacturer, the unit can use an additional outdoor air volume flow, to provide a higher thermal capacity if needed.

1. The higher outdoor air volume flow does not affect the ventilation function (fresh air volume ventilation flow and balance of the fresh air volume flow for the dwelling).
Additional tests shall be performed according to the declaration of manufacturer. No further correction needed
2. The air volume flows for ventilation increase. In this case the air volume flows shall be measured and documented as a percentage of reference air volume flow.

NOTE This may be needed to allow a correction of system performance according to the EPBD calculation.

5 Description of multifunctional units

Table 1 shows a non-exhaustive list of relevant combinations of multifunctional units with the corresponding applicable test procedures according to clause 7 and 8 for thermal and acoustic performance.

The leading function is ventilation at reference air volume flow. The heat pump can use any air source: outdoor air, exhaust air, recirculation air or any mixture.

Table 1 — Units and test procedures (1 of 5)

	Description Balanced ventilation including:	Function scheme	Test procedure clause:
1.	+ Air to air heat exchanger		Fully covered by EN 13141-7
2.	+ Air to air heat pump		Fully covered by EN 13141-7
3.	+ Air to air heat exchanger + Air to supply air heat pump		Fully covered by EN 13141-7
4.	+ Air to water heat pump for the domestic hot water production		6 7.4 8.3 8.7 Key 1 Water system
5.	+ Air to water heat pump for hydronic heating or cooling		6 7.5 8.3 8.4 Key 1 Water system

Table 1 — Units and test procedures (2 of 5)

	Description Balanced ventilation including:	Function scheme	Test procedure clause:
6.	+ Air to water heat pump for alternative: – hydronic heating and cooling – domestic hot water production		6 7.4 7.5 8.3 8.4 Key 1 Water system
7.	+ Air to water heat pump for simultaneous: – hydronic heating or cooling – domestic hot water		6 7.8 8.3 8.6 Key 1 Water system 2 Domestic hot water
8.	+ air to air heat exchanger + Air source heat pump heating or cooling		6 7.3 7.6 8.3 8.5
9.	+ air to air heat exchanger + Air to water heat pump for domestic hot water production		6 7.3 7.4 8.3 8.7 Key 1 Water system

Table 1 — Units and test procedures (3 of 5)

	Description Balanced ventilation including:	Function scheme	Test procedure clause:
10.	+ air to air heat exchanger + Air to water heat pump for hydronic heating or cooling		6 7.3 7.5 8.3 8.4 Key 1 Water system
11.	+ air to air heat exchanger + Air to water heat pump for alternative: – hydronic heating or cooling – domestic hot water production		6 7.3 7.4 7.5 8.3 8.4 Key 1 Water system
12.	+ air to air heat exchanger + air to water heat pump for simultaneous: – hydronic heating or cooling – domestic hot water production		6 7.3 7.8 8.3 8.4 Key 1 Water system 2 Domestic hot water
13.	+ air to air heat exchanger + Air source heat pump for: – supply air heating or cooling – for alternative: – hydronic heating or cooling – domestic hot water production		6 7.3 7.6 7.7 7.8 8.3 8.6 Key 1 Water system or Domestic hot water

Table 1 — Units and test procedures (4 of 5)

	Description Balanced ventilation including:	Function scheme	Test procedure clause:
14.	+ air to air heat exchanger + Air source heat pump for: – supply air heating or cooling – domestic hot water production		6 7.3 7.8 8.3 8.5 Key 1 Domestic hot water
15.	+ air to air heat exchanger + Air source heat pump for: – supply air heating or cooling – for simultaneous: – hydronic heating – domestic hot water production		6 7.3 7.6. 7.7 7.8 8.3 8.6 Key 1 Water system and/or Domestic hot water
16.	+ air to air heat exchanger + Air source heat pump for: – supply air heating or cooling – domestic hot water production		6 7.3 7.7 7.8 8.3 8.5 Key 1 Split system 2 Domestic hot water
17.	+ air to air heat exchanger + Air source heat pump for: – supply air heating or cooling – for alternative: – domestic hot water production – hydronic heating or cooling		6 7.3 7.6 7.7 7.8 8.3 8.6 Key 1 Split system 2 Water system or Domestic hot water

Table 1 — Units and test procedures (5 of 5)

	Description Balanced ventilation including:	Function scheme	Test procedure clause:
18.	+ air to air heat exchanger + Air source heat pump for: – supply air heating or cooling and simultaneous domestic hot water production		6 7.3 7.4 7.6 7.9 8.3 8.5 Key 1 2 Domestic hot water
NOTE EHA – Exhaust air, ETA – Extract air, ODA - Outdoor air, RCA – Recirculation air, SUP – Supply air			

6 Performance testing of aerodynamic characteristics

6.1 Leakages

6.1.1 Test method

Pressure testing method applies to classify leakages of the unit as defined in Annex B of EN 13141-7.

For internal leakage, if the pressure method is not applicable, e.g. units using recirculation air, the unit shall be tested as category 2 heat exchanger (tracer gas method).

6.1.2 Requirements

To set the declared maximum air volume flow, the declared total pressure shall correspond to 100 Pa, or to a lower total pressure if the intended use declared by the manufacturer is less than 100 Pa.

The declared maximum air volume flow shall be equal to the smaller in case the supply and extract air volume flows are different.

In addition, to assess correctly the thermal performance, aerodynamic characteristics, shall be tested before or together with any thermal characteristics testing.

Aerodynamic characteristics shall include:

- external leakage or total recirculated fraction in supply air;
- internal leakage or recirculated fraction from extract to supply air or total recirculated fraction in supply air.

The tests for air flow/pressure curve and thermal performances shall not be made because of measurement uncertainty when leakages according to 6.1.1 are too high. The external and internal leakage of the unit shall comply with Class A1 or A2, B1 or B2, C1 or C2 depending on the test method.

6.2 Air flow/pressure curve

Tests shall be performed according EN 13141-7 with the following parameters:

1. Ventilation function only.
That means the heat pump is not operating. Any additional fan is off and any bypass damper is closed ($q_{V, OEA} = 0$ and $q_{V, RCA} = 0$) or any other recirculation air flow is off.
2. In case of additional air flow rates for the other functions the pressure curves shall be repeated with different damper positions and/or additional fans speeds (minimum 3 points each at $q_{V, \text{fresh air}}$ at reference air volume flow).

6.3 Reference point for aerodynamic conditions

For all the thermal tests of the multifunctional unit, the reference fresh air volume flow point shall be used.

In addition, if the multifunctional ventilation unit is operating with an additional outdoor air flow at the evaporator side (heating mode) / condenser (cooling mode), this additional air flow rate shall also be specified by the manufacturer.

In addition, if the multifunctional ventilation unit is operating with an additional recirculation air flow at the condenser side (heating mode) / evaporator (cooling mode), this additional air flow rate shall also be specified by the manufacturer. This situation is possible only if the recirculated air is separated from extract air as the following figure 1

NOTE Extract air is coming from kitchen, toilets, bathroom and shall not be recirculated in the house for hygienic reasons

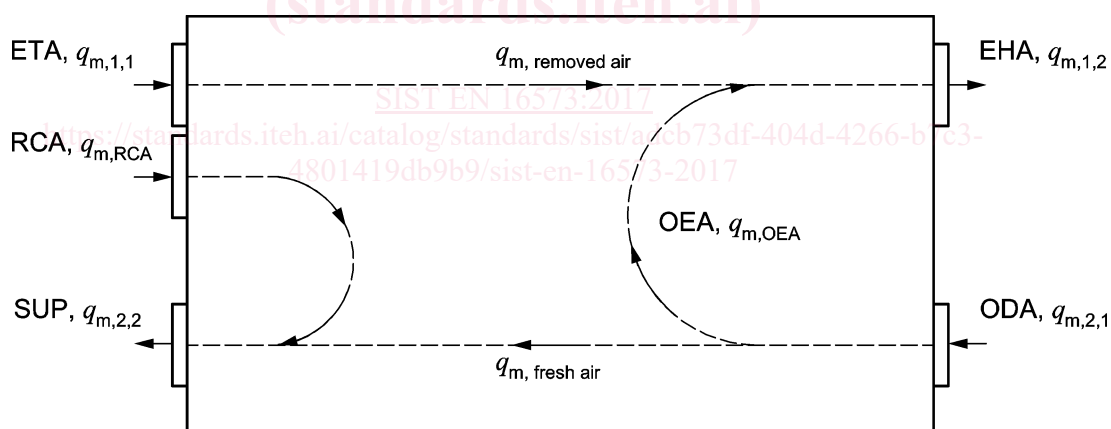


Figure 1 — Definition of reference fresh air volume flow

The reference fresh air volume flow $q_{V, \text{ref, fresh}}$ point shall be defined at $p_{tUd} / 2$ and 70% of declared maximum air volume flow. If this point cannot be set, pressure shall remain at $p_{tUd} / 2$ and airflow shall be adjusted just over (see EN 13141-7).

Depending on different situations (see 7.2) the reference fresh air volume flow $q_{V, \text{ref, fresh}}$ is measured directly or calculated

Maximum air volume flow point shall be adjusted at p_{tUd} and declared maximum air volume flow. If this point cannot be set, pressure shall be adjusted just over p_{tUd} .

Minimum air volume flow point shall be adjusted at $p_{tUd} / 2$ and declared minimum air volume flow.