

Requirements and testing procedures for energetic and acoustical assessment of Passive House ventilation systems < 600 m³/h for Certification as “Passive House suitable component”

Supplementary test of frost protection - Preliminary

Preface

The existent document complements the requirements and testing procedures for passive house ventilation systems < 600 m³/h [1]. This document replaces the testing of the frost protection according to [1] point 8 as well as the testing of the comfort criterion according to [1] point 9.

Within the next revision of the requirements and testing procedure [1], the existent document will be considered, and supplementary sheet and testing procedure will be combined to one document.

Requirements concerning the frost protection strategy for the heat exchanger

In order to utilize heat recovery ventilation units in passive houses with optional supply air heating, an operation of the heat recovery unit without interruption of the supply air flow rate is mandatory. The mass flows must remain in balance even at low outdoor air temperatures. The maximum imbalance allowed is 10%.

The automatic threshold for activating the frost protection strategy can vary depending on the heat recovery rate and the frost protection strategy. In order to achieve an efficient operation of the device during low outdoor air temperatures, the automatic threshold should be $\leq -3^{\circ}\text{C}$. The efficiency of the frost protection strategy mainly depends on the control strategy. Controlling the frost protection energy only based on the outdoor air temperature (before the heater coil) without controlling the power output can't be an acceptable frost protection strategy.

Furthermore the average exhaust air temperature mustn't exceed 5°C.

Requirements concerning a comfortable supply air temperature at low outdoor air temperatures

A minimum supply air temperature of 16,5°C should be maintained at outdoor air temperatures of -10°C and extract air temperatures of 21°C ¹⁾ (under standard frost protection settings).

1) The requirement doesn't comply with the measurement. Proving the requirements is generated with calculations based on the measurement.

With some frost protection strategies the comfort criterion might not be full filled (e.g. outdoor – supply air bypass, rotor heat exchanger). In this case the manufacturer should provide measures for compensation (e.g. supply air heater).

Required data/ documentation to be provided by the manufacturer

In order to evaluate the frost protection strategy as well as to check possible deviation from the testing requirements, a detailed description of the frost protection strategy with recommendations respecting the nominal values of the control variable as well as the capacity of pre heater or supply air heater (if installed in the device) is mandatory.

In case that the frost protection strategy is based on an external heat exchanger, a data sheet of the pre heater is required with technical data and installation instruction.

In order to check possible deviation from the testing requirements, the manufacturer documentation of the frost protection strategy should be handed in preferentially before the measurement starts.

Description of the measurements

a) Settings of ventilation device

The settings of the ventilation device especially the settings respecting the frost protection strategy should remain as default/ should be set according to manufacturer information. If changes of the default settings should be required in order to fulfill the requirements, the documentation of the changes in the measurement report is mandatory.

If the frost protection strategy is based on an external heating device, it must be installed according to manufacturer recommendations. The documentation of the installation situation as well as optional minimum distance between heater and ventilation device (if required) in the measurement report is required.

b) Measurement condition

The measurement of the frost protection strategy should be conducted under following conditions, in accordance with DIN EN 13141-7:

- Air flow rate at the upper limit of the certified air flow range (in accordance to [1]) or, alternatively, at a higher air flow rate
- Outdoor air temperature: -15°C
- Extract air temperature: 20°C/ relative humidity: 25% – 40%
- Duration of measurement from steady state of the air flow rates at -15°C outdoor air temperature on: minimum 6 h

The air flow rates must be adjusted to a balanced operation mode before the measurement or in the beginning of the measurement.

From 0°C on the outdoor air temperature should decrease gradually until reaching the test temperature of -15°C. The activation of the frost protection strategy should be documented with time, outdoor air temperature and exhaust air temperature.

The air condition should remain constant temporary at an outdoor air temperature of -10°C. When reaching a steady state (e.g. after 30 minutes), the supply air temperature is to be documented in the measurement report.

Afterwards the outdoor air temperature decreases until the testing temperature of -15°C.

Alternatively to the before described procedure the test for determining the supply air temperature at an outdoor air temperature of -10°C could also be conducted separately (lowering the outdoor air temperature during the test of the frost protection strategy should occur without interruption, then).

During the whole measurement the following parameter must be logged:

- Air flow rates (SUP, ODA, ETA, EHA)
- Temperatures (ODA, SUP, ETA, EHA)
- Electric power input of frost protection strategy or optional of the whole ventilation device (including frost protection)

In order to evaluate the frost protection efficiency in future, recording the power consumption of the frost protection strategy (alternatively of the whole device) in a defined time frame (recommendation: 6h) is required.

The power consumption should be logged as soon as the outdoor air temperature reaches -15°C until the end of the test.

At an outdoor air temperature of -10°C the power consumption should be logged additionally for a defined time frame (30 min).

Required data/ documentation to be provided from the laboratory

The test and documentation of the frost protection strategy should follow the existent description. The laboratory should provide the measured values in a form that allows examination (e.g. ms excel file).

Source

- [1] Requirements and testing procedures for energetic and acoustical assessment of Passive House ventilation systems $< 600 \text{ m}^3/\text{h}$ for Certification as „Passive House suitable component, Passivhaus Institut, 2009