Press Release

German laboratories examine test standards of ventilation units with reversible direction of fan rotation

German Centre of Competence for Construction initiated research to compare the reliability of prEN 13141-8 tests and purge air tests according to German approval standards

Picture1: pic_purge_boxes.jpg

Planning the modernisation of their buildings, many builder-owners choose reversible single room units as mechanical ventilation of their dwelling. Testing of these new ventilation systems with heat recovery has only recently been described with testing standards. Commissioned by the German Centre of Competence for Construction (DIBt) and headed by TZWL, a test laboratory of ventilation units based in Dortmund, Germany, the official test laboratories have examined, whether these regulations are suitable to deliver correct and reliable measuring.

Research report defines requirements for testing of residential ventilation units with reversible fan rotation

Reversible ventilation units recover thermic energy of the exhaust air with a regenerative heat exchanger and lead it back into the dwelling by cyclical reversion of flow direction. To ensure a levelled energy balance in the ventilated rooms, at least two units, working in opposite direction, are necessary.

Standards so far mostly concentrate on residential ventilation units with static volume flows, reversible fan rotations are scarcely considered. As part of German approval tests, the test centre HLK at the IGE at University of Stuttgart developed a purge air test method. This method is especially aimed to appropriately test reversible units. The renewed European standard prEN 13141-8 defines a differing, direct test method for these systems.

The conducted round robin tests of both methods clarify, how comparable and reliable the measured results of thermodynamic testing of one exemplary unit are.

Slight deviations at purge air testing

The purge air test method is gaining test data by balancing of energy flows. The setup consists of two test boxes, each divided into two chambers. The tested unit is built in between the boxes, possible leakages are sealed. One test box functions as the outside area, the other as the dwelling area. Purge air, matching the standardised air conditions of exhaust and ambient air flows, is streaming through the chambers. Balancing of energy is based on temperature and absolute humidity of in- and outflowing purge air.

The efficiency of heat recovery is determined by comparative analysis. For both operating modes, with and without cyclical reversion of volume flows,

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the differences of in- and outgoing temperature and absolute humidity are calculated. The proportions of both differences indicate the temperature respectively humidity ratio.

Measured data at all three tested volume flows showed comparable values at two of the three laboratories. The third laboratory delivered similar values only at few measuring points. Tests were repeated, with the temperature of the air surrounding the test chambers adapted to the temperature of exhaust air. This resulted in a tolerable standard deviation of 2.1 percentage points.

Tests according to prEN 13141-8: Different placing of temperature sensors results in inaccurate measuring

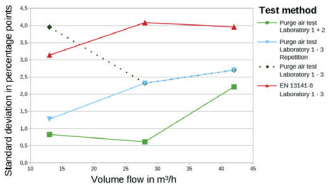
The test boxes were also used for the prEN 13141-8 test method. Unlike the purge air method, testing of temperature measures of in- and outflowing air was conducted directly during the charging and discharging cycles of the unit. Testers have calculated the average temperature ratio basing on these values.

Reversible ventilation units can be equipped with different interior cover designs and weatherproof hoods, therefore no generally valid specification for the placement of temperature sensors can be given. Each test laboratory decided on their own behalf where to place the sensors reasonably.

The measured data deliver similar values at all test laboratories, the maximum standard deviation lies at 3.7 percentage points.

Conclusion: Extension of test standards could ensure comparable and reliable measuring of reversible ventilation units

Picture 2: graph_deviation.pdf



With a standardised temperature of air surrounding the test chambers, the purge air method delivered a lesser standard deviation than the direct measuring according to prEN 13141-8. The DIBt by now recognises the purge air method as standard testing method for approvals for reversible units. To guarantee comparable results, the test laboratories suggest that differences between purge air and surrounding air temperature are minimised, especially at low volume flows.

During the direct testing method according to prEN 13141-8, the different placement of sensors leads to measuring inaccuracies. For reliable results, it would be necessary to measure the air current for every volume flow and place the sensors at the most suitable spot. This would lead to vastly higher testing effort and cost.

A description of these round robin tests can be taken from the short version of the official research paper at the Fraunhofer IRB Verlag at www.baufachinformationen.de.

Pictures:

1) Picture 1: pic_purge_boxes.jpg
   Caption: Test setup of comparative tests with purge air boxes
   Source: TZWL e. V.
2) Picture 2: graph_deviation.pdf
   Caption: Comparison of standard deviation at three volume flows between direct and purge air tests
   Source: TZWL e. V.

Further pictures and graphs are available at the website of TZWL.