

# Certificate

## Certified Passive House Component

For cool, temperate climates, valid until 31 December 2018

Passive House Institute  
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Category: **Heat recovery unit**  
Manufacturer: **AirXpert**  
**68300 St. Louis , FRANCE**  
Product name: **RTV 3400**

### This certificate was awarded based on the following criteria:

Thermal comfort	$\Theta_{\text{supply air}} \geq 16.5 \text{ °C}^2)$ at $\theta_{\text{outdoor air}} = -10 \text{ °C}$
Effective heat recovery rate	$\eta_{\text{HR,eff}} \geq 75\%$
Electric power consumption	$P_{\text{el}} \leq 0.45 \text{ Wh/m}^3$
Performance number	$\geq 10$
Airtightness	Interior and exterior air leakage rates less than 3% of nominal air flow rate
Balancing and adjustability	Air flow balancing possible:    yes Automated air flow balancing:   yes
Sound insulation	It is assumed that large ventilation units are installed in a separate building services room. Sound levels documented in the appendix of this certificate
Indoor air quality	Outdoor air filter F7 Extract air filter G4
Frostprotection	No frost protection strategy is required until falling under $-15\text{°C}$ .

- 1) Available pressure difference with installed filter: **266 Pa**. Additional components (e.g. heater coil) decrease the available pressure difference accordingly.
- 2) At middle and lower air flow rates the comfort criterion might not be met.
- 3) At minimum flow the performance number is only 9.
- 4) Regenerative heat recovery – applicability to be checked

Further information can be found in the appendix of this certificate.

**Certified for air flow rates of 1600 – 3400 m<sup>3</sup>/h**  
At an external pressure of **298 Pa** <sup>1)</sup>  
Requirements non residential buildings (Therewith device also applicable for residential building)

**$\eta_{\text{HR,eff}}$  85%**  
**(2300 / 3400 m<sup>3</sup>/h)**

**$\eta_{\text{HR,eff}}$  81%**  
**(1600 m<sup>3</sup>/h)**

**Electric power consumption**  
**0.45 Wh/m<sup>3</sup>**

**Performance number**  
**10** <sup>3)</sup>



**CERTIFIED COMPONENT**

Passive House Institute

## Appendix of the certificate AirXpert, RTV 3400

**Manufacturer** AirXpert  
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### Passive House comfort criterion

At an outdoor air temperature of -10 °C a minimal supply air temperature of 16.5 °C is met at the upper air flow rate. At middle and lower air flow rates the comfort criterion might not be met. Therefore for operation at middle and lower air flow rates the installation of a supply air heater coil is recommended.

### Effective heat recovery rate

The effective dry heat recovery efficiency is measured at the test facility with balanced mass flows on the external air/extract air side. The boundary conditions for the measurement are defined in the testing procedure. The rotor heat exchanger is provided with a double purging chamber (2 x 7.5°)

$$\eta_{WRG,t,eff} = \frac{m_{SUP} \cdot \vartheta_{SUP} + m_{purge} \cdot \vartheta_{ODA} - m_{ODA} \cdot \vartheta_{EHA} + \frac{P_{el}}{c_p}}{m_{SUP} \cdot (\vartheta_{ETA} - \vartheta_{ODA})}$$

The (dry) ventilation heating load (building is the system boundary: Plus Infiltration) can be calculated:

$$Q_{Ventilation,dry} = V \cdot (100\% - \eta_{HR,eff}) \cdot 0,34 \Delta \vartheta$$

In case of condensation the heat recovery rate usually is higher. For the thermodynamic testing air conditions are chosen which exclude condensation. The heat recovery rate of this device amounts to

$\eta_{HR,eff} = 85\%$  (measurement point 2300/3400 m<sup>3</sup>/h)

$\eta_{HR,eff} = 81\%$  (measurement point 1600 m<sup>3</sup>/h)

at a rotor speed n = 10.

### Air flow range and external pressure difference

The operational range of the device results from the efficiency criterion (see below). As per the certification criteria for ventilation units > 600 m<sup>3</sup>/h the applicable pressure differences vary with the nominal range of operation (as declared by the producer) and the application (residential or non-residential building)

The external pressure difference includes all pressure losses of the ventilation system caused by components apart from the tested unit (consisting of casing, heat exchanger and fans). If filters are installed inside of the unit, their pressure losses are to be reduced accordingly. The average filter pressure drop of an operational filter is assumed to be 30% higher than of the clean filter.

- This device was tested according to the requirements of non-residential buildings with an air flow range of 1600 – 3400 m<sup>3</sup>/h at an external pressure difference of 298 Pa. The available pressure difference with installed filters is about **266 Pa**

### Efficiency criterion (power consumption)

The overall electrical power consumption of the device at an external pressure difference of 298 Pa does not exceed 0.45 Wh/m<sup>3</sup> at the middle and upper air flow rate. At minimum flow the nominal value of 0.45 Wh/m<sup>3</sup> is slightly exceeded.

## Appendix of the certificate AirXpert, RTV 3400

Based on the measured values for the calculation of heat recovery efficiency and power consumption and on the climatic data of middle Europe (Gt: 84 kWh, heating time: 5400 h/a), an average performance number at the air flow range was determined:

✓ **Performance number: 10**

Annotation: At minimum flow a performance number of only 9 is achieved.

### Air tightness and insulation

The air tightness of the unit is tested for under pressure and over pressure before the thermodynamic test is conducted. As per the certification criteria the leakage air flows must not exceed 3 % of the average air flow of the device's operating range.

Following leakage rates were measured:

**Internal leakage: 1.5%**

**External leakage: 1.8%**

This appliance meets the air tightness requirements.

### Balancing and adjustability

The ventilation unit must provide the opportunity to adjust the balance between the exhaust and outdoor air flow (unit located inside of the thermal envelope) or the extract and supply air flow (unit located outside of the thermal envelope). Possible operation modes are explained in detail in the operation manual.

- Balancing the air flow rates of the unit is possible
  - ✓ the air flow rates are hold steady automatically (by measurement of pressure differences at the fan's injections)
- The standby consumption of this ventilation appliance is 22 W. In order to avoid unnecessary standby losses a manual switch for complete disconnection from supply should be installed.
- After a power failure the device automatically continues to operate in the mode that was set before the power failure.

### Acoustic testing

A ventilation unit > 600 m<sup>3</sup>/h is assumed to be operated in an installation room, for which sound limits are defined in the applicable regulations. For this device following sound level values have been derived from the measurements at an air flow rate of **3400 m<sup>3</sup>/h**:

Sound level unit [dB(A)]	Sound level ODA [dB(A)]	Sound level SUP [dB(A)]	Sound level ETA [dB(A)]	Sound level EHA [dB(A)]
67.4	75.6	83.7	69.3	83.6

- In order to not exceed sound level limits silencers might be required and need to be dimensioned as per the project requirements and on basis of these sound levels.

## Appendix of the certificate AirXpert, RTV 3400

### Indoor air quality

This device is equipped with following filter qualities:

- ✓ Outdoor Air filter F7
- ✓ Extract Air filter G4

If the device is not operated during summer, the filter should be replaced before the next operation. The producer of the device has to ensure that based on the latest state of knowledge room air hygiene can be maintained by means of integrated or obligatory components

For the operation of ventilation systems a strategy for avoiding permanent moisture penetration of the outdoor air filter need to be considered. The strategies are mentioned in the full report and can be implemented through installations of either additional component of the ventilation device or on the ventilation site system.

### Frost protection

Appropriate measures must be provided in order to avoid icing inside the heat exchanger and freezing of the hydraulic post-heater coil during winter at extreme temperatures (-15°C). The actual function of the ventilation device must not be impaired by the regular operation of the frost protection system. A sufficient air supply must be provided with balanced air flows. Infiltration due to excess extract air would cause an unacceptable heat load. For the frost protection of the hydraulic post-heater coil the failure of a pre-heater coil or the exhaust air fan needs to be considered.

- Frost protection circuit for the heat exchanger:
  - ✓ In cold temperate climates, this heat exchanger won't freeze until outdoor air temperatures reach -20 °C (manufacturer information).
  - ✓ In order to ensure a safe operation of the unit even at lower outdoor air temperatures in cold climates, the manufacturer recommends either a controlled momentary reduction of the rotor speed for de-icing the heat exchanger or (for very cold climates) the utilization of special equipment with annulus heating. With those additional measures, the device could be used down to outdoor air temperatures of -50 °C (manufacturer information).
- Frost protection circuit for post heater coil:
  - ✓ In order to protect a supply air heater coil from freezing, this appliance shuts down if the supply air temperature drops below +5°C (manufacturer information).

It should be noted that cold air can also lead to freezing up of stationary fans due to free circulation; this can only be ruled out if the air duct is closed (by means of a shut-off flap).

### Switching off of the heat recovery

The heat recovery can also be controlled by the shutting-off of the heat exchanger.

The effectiveness of this appliance's shutoff for night-cooling of buildings has been tested under the following boundary conditions:

Extract air temperature = 24°C, outdoor air temperature = 16.1°C, air flow at the upper limit of the certified airflow range and with switched off heat recovery.

Under test conditions, a supply air temperature of 17.2°C has been achieved. Therefore, the shutting-off of the heat exchanger is suitable for night-cooling of buildings.

**Abbreviations:** ODA = Outdoor air, EHA = Exhaust air, SUP = Supply air, ETA = Extract air