

# Certificate

## Certified Passive House Component

For cool, temperate climates, valid until 31 December 2017

Passive House Institute  
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Category: **Heat recovery unit**  
Manufacturer: **bluMartin GmbH**  
**82234 Wessling, GERMANY**  
Product name: **freeAir100 with second room connection**

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

Thermal comfort	$\theta_{\text{supply air}} \geq 16.5 \text{ °C}^{1)}$ at $\theta_{\text{outdoor air}} = -10 \text{ °C}$
Effective heat recovery rate	$\eta_{\text{HR,eff}} \geq 75 \%$
Electric power consumption	$P_{\text{el}} \leq 0.45 \text{ Wh/m}^3$
Airtightness	Interior and exterior air leakage rates of 3 % of nominal air flow rate $\text{met}^{2)}$
Balancing and adjustability	Air flow balancing possible: yes Automated air flow balancing: yes
Sound insulation	Sound pressure level in living room $\leq 25\text{db(A)}$
Indoor air quality	Outdoor air filter at least F7 Extract air filter at least G4
Frost protection	frost protection for the heat exchanger with continuous fresh air supply down to $\theta_{\text{outdoor air}} = -15 \text{ °C}^{3)}$

- 1) Because of the unit specific frost protection strategy the supply air temperature could be temporary below 16.5 °C at extreme winter temperatures.
- 2) Proved with the tracer gas-method
- 3) The acceptability of the frost protection strategy was proved at an average air flow rate of 20 m<sup>3</sup>/h.
- 4) At an air flow rate > 30 m<sup>3</sup>/h the sound pressure level exceeds the requirements for a living room.
- 5) With an optional sound absorber "Premium Cover" a wider air flow range can be applied as follows: continuous operation 20 - 50 m<sup>3</sup>/h, on-demand operation 20 - 85 m<sup>3</sup>/h. At an airflow of 85 m<sup>3</sup>/h the  $\eta_{\text{HR,eff}}$  achieves 86 % and  $P_{\text{el}}$  of 0,43 Wh/m<sup>3</sup>.

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

**Certified for air flow rates of**

**20-30 m<sup>3</sup>/h<sup>5)</sup>**  
(continuous operation)

**20-50 m<sup>3</sup>/h<sup>4)5)</sup>**  
(on-demand operation)

$\eta_{\text{HR,eff}}$

**87 %**

**Electric power consumption**

**0.26 Wh/m<sup>3</sup>**



**CERTIFIED COMPONENT**

Passive House Institute

## Appendix to the certificate bluMartin GmbH, freeAir100

**Manufacturer:** bluMartin GmbH  
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### Passive House comfort criterion

A minimum supply air temperature of 16.5 °C is maintained at an outdoor air temperature of -10 °C. It should be noted that because of the unit specific frost protection strategy (bypassing the heat recovery) the supply air temperature could be temporary below 16.5 °C at extreme winter temperatures.

### Efficiency criterion (heat recovery rate)

The effective dry heat recovery rate is measured at the test facility using balanced mass flows on the outdoor air/extract air side. The boundary conditions for the measurement should be taken from the documents relating to the testing procedure.

$$\eta_{HR,eff} = \frac{(\vartheta_{ETA} - \vartheta_{EHA}) + \frac{P_{el}}{\dot{m} \cdot c_p}}{(\vartheta_{ETA} - \vartheta_{ODA})}$$

The (dry) ventilation heating load (the house is the system boundary) can be calculated using  $\eta_{HR,eff}$  based on the formula  $\dot{V}_{supply\_air} \cdot (1 - \eta_{HR,eff}) \cdot 0.34 \cdot \Delta\vartheta$  (multiplied by the infiltration rate). The rates of heat recovery are usually greater if condensation occurs in the heat exchanger. Initially, this will not be taken into account on purpose.

For this device:

$$\eta_{HR,eff} = 87 \%$$

### Efficiency criterion (power consumption)

The unit was examined with the following conditions, which are according to the standard installation situation of the unit. Outdoor air and exhaust air free air intake and discharge, supply air free air intake, extract air with duct connection according to manufacture recommendations. (Pressure difference 50 Pa)

For this device:

$$0.26 \text{ Wh/m}^3$$

### Air tightness and insulation

Before starting the thermodynamic test, the device was tested respecting internal and external leakages. The leakage air flows must not be greater than 3 % of the average air flow volume of the operating range of the ventilation device. The internal leakages have been determined with the tracer gas method based on EN 308.

The following result was obtained for the device being tested:

**Internal leakage: 1.6 %**

**External leakage: 3.3 %**

## Appendix to the certificate bluMartin GmbH, freeAir100

### Adjustability

It must be possible to adjust the balance between the exhaust air flow rate and the outdoor air flow rate for all units.

- This unit is certified for air flow rates of 20-30 **m<sup>3</sup>/h** (continuous operation) or **20-50 m<sup>3</sup>/h** (on-demand operation)
- Balancing the air flow rates of the unit is possible
  - ✓ The air flow rates are hold steady automatically (by constant flow fans)
- The users should have at least have following possibilities for adjustment:
  - ✓ Switching the system on and off
  - ✓ Depending on the demand, the user can choose between 5 comfort level
- The device being tested here has a standby power consumption of **1 W** and therefore complies with the target value of 1 W.
- After a power failure the device automatically continues to operate in the mode that was set before the power failure.

### Acoustical testing

Since it can be assumed that the unit will be installed in a living room the sound pressure level should be restricted to 25 db(A). The following sound levels for the unit with second room connection have been determined depending on the air flow rate.

Air flow rate [m <sup>3</sup> /h]	20	30	50	60
Sound level unit L <sub>w</sub> [dB(A)]	22.4	27.3	40.2	44.5
Sound pressure level at 10 m <sup>2</sup> room absorption area (eg living room) L <sub>p</sub> [dB(A)]	19.3	24.4	37.4	41.6

The criteria for the sound pressure level (25 dB(A)) in the specific installation room with an equivalent room absorption area of 10 m<sup>2</sup> are met for the unit with second room connection up to an air flow rate of 30 m<sup>3</sup>/h (continuous operation).

### Indoor air hygiene

Inspection and cleaning of the central device including the heat exchanger is simple. The filter can be replaced by the user himself/herself (no specialist required). The unit is equipped with following filter qualities:

- Outdoor Air filter M5
- ✓ Extract Air filter M5

As standard the unit is equipped with M5 filter at the extract and supply air side. For the installation in a Passive House the unit should be equipped with an Outdoor Air filter F7 (available as an accessory from manufacturer)

If the device is not operated during the summer, the filter should be replaced before the next operation.

## Appendix to the certificate bluMartin GmbH, freeAir100

### Frost protection

Appropriate measures should be taken to ensure prevention of icing over of the heat exchanger and freezing up of hydraulic post-heater coils during extreme winter temperatures (-15 °C). The regular functioning of the device should be permanently ensured during uninterrupted operation of the frost protection circuit (the interruption of the outdoor air flow is no adequate frost protection strategy for passive houses, as the heating loads caused by the forced infiltration would become too high).

- Frost protection circuit for the heat exchanger:
  - ✓ The frost protection strategy of the unit works with a steady regulated outdoor-supply air bypass. Through a higher extract air flow rate the heat exchanger is protected against freezing. The bypass is regulated depending on the exhaust air temperature. The nominal value is set by 1 °C. The suitability of the frost protection strategy was proved at an average air flow rate of 20 m<sup>3</sup>/h.

It needs to be noted that the frost protection strategy could lead to an automatic balanced reduction of the air flow rates or to a short operation interruption which results to a reduction of the average air flow rate (reduced minimum-ventilation, reduced nominal values of the control variables).

Cold outdoor air temperatures might lead to condensation in the heat exchanger. The condensate is drained outside. Because of this the location of the unit needs to be selected that icicles and freezing wetness on the ground will not be any danger. By choice the condensation can also be drained through a hose.

### Abbreviations

- AU/ODA = Outdoor air
- FO/EHA = Exhaust air
- ZU/SUP = Supply air
- AB/ ETA = Extract air