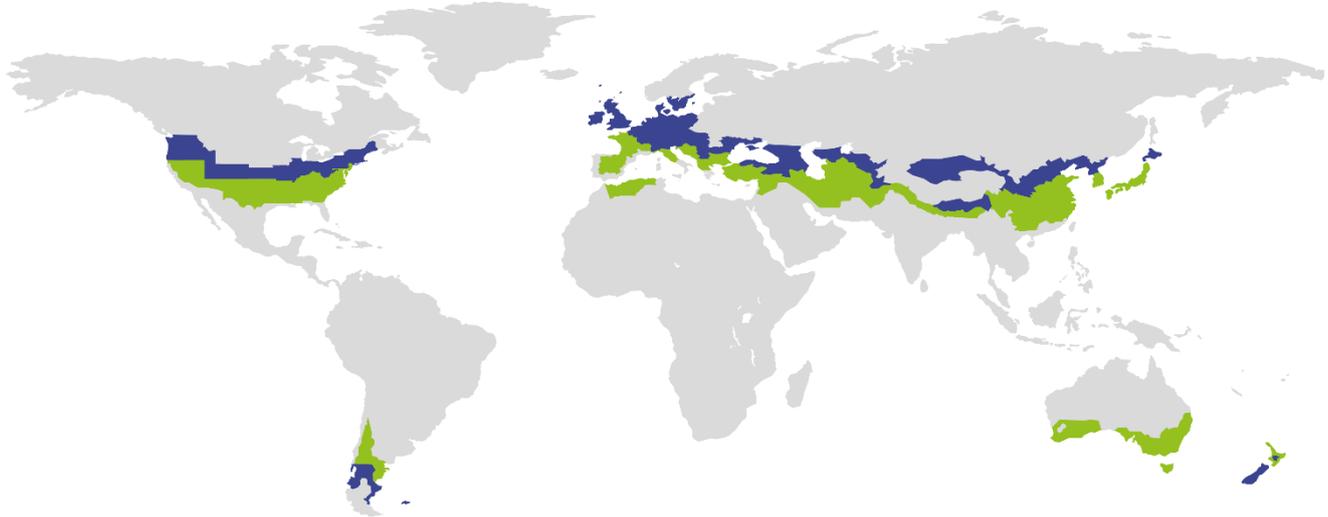


CERTIFICATE

Certified Passive House Component

Component-ID 0641s03 valid until 31st December 2019

Passive House Institute
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Category: **Air handling unit with heat recovery**
Manufacturer: **bluMartin GmbH**
Germany
Product name: **freeAir 100 with second room connection**
Specification: Decentralised single room ventilation system
Heat exchanger: Recuperative

This certificate was awarded based on the product meeting the following main criteria

Heat recovery rate $\eta_{HR} \geq 75\%$
Specific electric power $P_{el,spec} \leq 0.45 \text{ Wh/m}^3$
Leakage $< 3\% \text{ }^1$
Comfort Supply air temperature $\geq 16.5\text{ }^\circ\text{C}$
at outdoor air temperature of $-10\text{ }^\circ\text{C} \text{ }^2$

Airflow range
20-30 m ³ /h (continuous operation)
20-50 m ³ /h (on-demand operation for elimination of increased loads)
Heat recovery rate
$\eta_{HR} = 87\%$
Specific electric power
$P_{el,spec} = 0.26 \text{ Wh/m}^3$

¹) Proved with the tracer-gas method.

²) Because of the unit specific frost protection strategy the supply air temperature could be temporary below 16.5 °C at extreme winter temperatures.



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 heat recovery rate is measured at a test facility using balanced mass flows of the outdoor and exhaust air. The boundary conditions for the measurement are documented in the testing procedure.

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

With

η_{HR}	Heat recovery rate in %
θ_{ETA}	Extract air temperature in °C
θ_{EHA}	Exhaust air temperature in °C
θ_{ODA}	Outdoor air temperature in °C
P_{el}	Electric power in W
\dot{m}	Mass flow in kg/h
c_p	Specific heat capacity in Wh/(kg.K)

Heat recovery rate

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

Efficiency criterion (electric power)

The unit was examined with the following conditions, which correspond to the standard installation situation of the unit: Free outdoor/exhaust air intake and exhaust, free supply air intake, extract air side equipped with a ducting for connection of second room according to the manufacturer recommendations (pressure difference 50 Pa).

Specific electric power

$$P_{el,spec} = 0.26 \text{ Wh/m}^3$$

Efficiency ratio

The efficiency ratio provides information about the overall energy performance of the respective ventilation unit. It specifies the achieved reduction in ventilation heat losses by using a ventilation unit with heat recovery rather than without.

Efficiency ratio
$\varepsilon_L = 0.69$

Leakage

The leakage airflow must not exceed 3 % of the average airflow of the unit's operating range. The internal leakages have been determined with the tracer-gas method based on EN 308.

Internal leakage	External leakage
1.60 %	3.30 %

Settings and airflow balance

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

- This unit is certified for airflow rates of 20-30 m³/h (continuous operation) resp. 20-50 m³/h (on-demand operation for elimination of increased loads).
- Balancing of the airflow rates of the unit is possible.
 - ✓ The airflow volumes can be held steady automatically (by constant airflow volume fans).
- The users should have at least have following possibilities for adjustment:
 - ✓ Switching the system on and off
 - ✓ Synchronized adjustment of the supply air and extract airflow to basic ventilation (70-80 %), standard ventilation (100 %) and increased ventilation (130 %) with a clear indication of the current setting.
- The standby power consumption of this device makes 1.0 W.
- After a power failure, the device will automatically resume operation.

Acoustical testing

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

Airflow rate	Sound power level L_W	Sound pressure level L_p at 10 m ² of room absorption area (e.g. living room)
20 m ³ /h	22.4 dB(A)	19.3 dB(A)
30 m ³ /h	27.3 dB(A)	24.4 dB(A)
50 m ³ /h	40.2 dB(A)	37.4 dB(A)
60 m ³ /h	44.5 dB(A)	41.6 dB(A)

- The criteria for the sound pressure level (25 dB(A)) in the specific installation room with an equivalent room absorption area of 10 m² are met for the unit with second room connection up to an airflow rate of 30 m³/h (continuous operation).

Indoor air quality

This unit is equipped with following filter qualities by default:

Outdoor air filter	Extract air filter
M5	M5

The unit is equipped with M5 filter on both extract and supply air side as default. For installation in passive houses, use of an outdoor air filter with efficiency of ISO ePM1 50% (F7 according to EN 779) or better is recommended (available as accessory part).

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

Frosts protection

Appropriate measures should be taken to prevent the heat exchanger and optional downstream hydraulic heater coil from getting damaged by frost during extreme winter temperatures ($-15\text{ }^{\circ}\text{C}$). It must be ensured that the unit's ventilation performance is not affected during frost protection cycles.

- Frosts protection of the heat exchanger:
 - ✓ The frost protection strategy of the unit works with a steady regulated outdoor-supply air bypass. Through a higher extract airflow rate the heat exchanger is protected against freezing. The bypass is regulated depending on the exhaust air temperature. The nominal value is set by $1\text{ }^{\circ}\text{C}$. The suitability of the frost protection strategy was proved at an average airflow rate of $20\text{ m}^3/\text{h}$.
 - ✓ It needs to be noted that the frost protection strategy could lead to an automatic balanced reduction of the airflow rates or to a short operation interruption which results to a reduction of the average airflow rate (reduced minimum-ventilation, reduced nominal values of the control variables).

Peculiarity

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.