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: **Zehnder Group AG**
Paul Wärmerückgewinnung GmbH
08141 Reinsdorf, GERMANY

Product name: **ComfoAir 70 with second room connection**

This certificate was awarded based on the following criteria:

Thermal comfort	$\theta_{supply\ air} \geq 16.5$ °C at $\theta_{outdoor\ air} = -10$ °C
Effective heat recovery rate	$\eta_{HR,eff} \geq 75$ %
Electric power consumption	$P_{el} \leq 0.45$ Wh/m³
Airtightness	Interior and exterior air leakage rates of 3 % of nominal air flow rate met
Balancing and adjustability	Air flow balancing possible: yes Automated air flow balancing: no
Sound insulation	Sound pressure level in functional rooms ≤ 30 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 $\theta_{outdoor\ air} = -15$ °C [2)]

1) The required sound pressure level in the installation room can be exceeded in demand operation mode.

2) Frost protection strategy suitable for outdoor air temperatures down to -10°C.

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

Certified for air flow rates of

15 - 25 m³/h (continuous operation)

15 - 40 m³/h [1)] (on-demand operation)

$\eta_{HR,eff}$
85 %

Average moisture recovery
$\eta_x = 0,64$

Electric power consumption
0.24 Wh/m³

CERTIFIED COMPONENT
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Appendix Zehnder Group AG, Paul Wärmerückgewinnung GmbH, ComfoAir 70

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Moisture recovery

By means of moisture recovery the indoor air humidity can be higher than without moisture recovery. Especially during the winter months that could lead to reduced heating demand caused by less evaporation of water from construction components and furniture. This energy relevant influence is considered, depending on the moisture recovery rate, with a bonus on the heat recovery rate of the ventilation device.

- Adjustment of air flow by means of moisture control:
  - This ventilation slightly exceeds a moisture recovery rate > 0.6. In order to prevent damage from occasional excessive humidity, a humidity controlled air flow control is recommended.
  - The device being tested does not provide such a function.
- Application of moisture recovery:
  - In cool temperate climates, heat exchanger with moisture recovery in general should only be used if the internal moisture load of the building is low compared to normal utilization (e.g. residential building with occupancy rate (far) below average).
  - If planning the application of moisture recovery in building with average occupancy rate, the energy balance of the building is to be calculated with an increased air flow rate according to following formula.

$$V_{eff} = V_{hyg} \cdot \frac{0{,}4}{1-\eta_x}$$

  - Adjustment of air flow by means of moisture control required, even though that in case of low internal moisture the increased air flow rate is not needed often.

Passive House comfort criterion

Temporarily lower supply air temperatures (14 °C) might occur due to the type of heat exchanger and frost protection strategy. Once the frost protection is active, the supply air temperature increases again to more than 16.5 °C.

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.

$$\eta_{WRG,eff} = \frac{(\vartheta_{Ab} - \vartheta_{Fo}) + \frac{P_{el}}{m \cdot c_p}}{(\vartheta_{Ab} - \vartheta_{Au})} + 0{,}08 \cdot \eta_x$$

Annotation: For moisture recovery $\eta_x > 0{,}6$ the bonus is limited to a maximum of 4.8 %.

The (dry) ventilation heating load (the house is the system boundary) can be calculated using $\eta_{HR,eff}$ based on the formula $\dot{V}_{supply\_air} * (1 - \eta_{HR,eff}) * 0.34 * \Delta\vartheta$ (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:

$$\eta_{HR,eff} = 85\ \%$$

Efficiency criterion (power consumption)

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

For this device: **0.24 Wh/m³**

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 following result was obtained for the device being tested at an external pressure difference of 50 Pa:

Internal leakage: 0.64 %

External leakage: 1.88 %

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 **15 - 25 m³/h** (continuous operation) or **15-40 m³/h** (on-demand operation)
- Balancing the air flow rates of the unit is possible
- The device being tested here has a standby power consumption of **3 W** and therefore does not comply with the target value of 1 W. The device should be equipped with an additional external switch to separate the device from the electric circuit if required.
- After a power failure the device automatically continues to operate in the mode that was set before the power failure. The unit should be equipped with an additional switch.

Acoustical testing

Since it can be assumed that the unit will be installed in a functional or secondary room the sound pressure level should be restricted to 30 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 [m³/h]	15	25	40	65
Sound level unit Lw [dB(A)]	25.7	31.6	43.6	54.4

The criteria for the sound pressure level (30 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 air flow rate of 25 m³/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 G4
- ✓ Extract Air filter G4

As standard the unit is equipped with G4 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.

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 is based on reducing the supply air flow rate depending on the outdoor air temperature. The frost protection strategy, due to the type of heat exchanger with moisture recovery, starts operation at rather low outdoor air temperatures (start of frost protection during the laboratory test at -8.2 °C). Down to an outdoor air temperature of -10 °C, the misbalance is ≤ 25%. Lower outdoor air temperatures will cause higher misbalances and will finally lead to a supply air shut down (at about -13 °C).

Abbreviations

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