CERTIFICATE

Certified Passive House Component

Component-ID 0826vs03 valid until 31st December 2026

Passive House Institute
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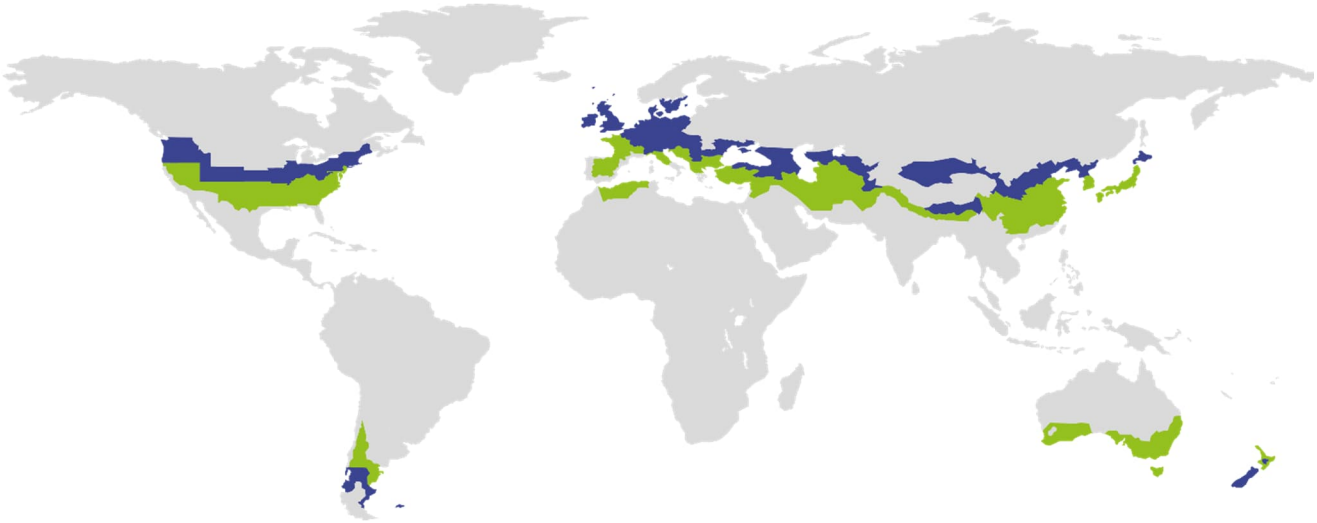

Category:	**Air handling unit with heat recovery**
Manufacturer:	**Zehnder Group Deutschland Holding GmbH Germany**
Product name:	**ComfoAir 70**
Specification:	Single room ventilation system with optional second room connection
Heat exchanger:	Recuperative

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

Heat recovery rate	η_{HR}	≥	75 %
Specific electric power	$P_{el,spec}$	≤	0.45 Wh/m³
Leakage		<	3 %
Performance number		≥	10
Comfort	Supply air temperature ≥ 16.5 °C at outdoor air temperature of -10 °C		

Airflow range
15-25 m³/h (continuous operation)
15-40 m³/h [1)] (on-demand operation for elimination of increased loads)
Heat recovery rate
η_{HR} = 85 %
Specific electric power
$P_{el,spec}$ = 0.24 Wh/m³
Humidity recovery
η_x = 64 %

cool, temperate climate

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Humidity recovery

Indoor air humidity can be increased by using a system with moisture recovery in a cool, temperateclimate, especially during the winter. These higher humidity levels will reduce evaporation from building elements and furniture during the heating period and thus have a positive effect on the building's heating demand. In order to account for this effect, the heat recovery efficiency is increased by a certain percentage, depending on the achieved level of moisture recovery.

Humidity recovery
η_x = 64 %

- Adjustment of airflow by means of moisture control:
  - ✓ Since the moisture recovery of the heat exchanger exceeds a humidity ratio of 0.6, humidity controlled volume flow adjustment is required in order to avoid damage due to temporarily excessive indoor air humidity.
  - ✓ The device being tested does not provide this function.
- Application of moisture recovery:
  - ✓ In cool temperate climates, heat exchangers with moisture recovery should generally only beused if the moisture load inside the building is comparatively low (e.g. in a residential building with an occupancy rate significantly below the average).
  - ✓ If moisture recovery > 60 % is to be used in a building with an average occupancy rate and typical use, the energy balance of the building is to be calculated with an increased airflow rate.
  - ✓ Adjustment of airflow by means of moisture control is required, even though that in case of low internal moisture the increased airflow 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 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.

$$\eta_{HR} = \frac{(\theta_{ETA} - \theta_{EHA}) + \frac{P_{el}}{\dot{m} \cdot c_p}}{(\theta_{ETA} - \theta_{ODA})} + 0.08 \cdot \eta_x$$

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)

η_x Humidity recovery in %

for η_x > 60 %, the heat recovery increase (0.08 . η_x) is limited to a maximum of 4.80 %

Heat recovery rate
η_{HR} = 85 %

Efficiency criterion (electric power)

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

Specific electric power
$P_{el,spec}$ = 0.24 Wh/m³

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
ε_L = 0.74

Leakage

The leakage airflow must not exceed 3 % of the average airflow of the unit's operating range.

Internal leakage	External leakage
0.64 %	1.88 %

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 15-25 m³/h (continuous operation) resp. 15-40 m³/h (on-demand operation for elimination of increased loads).
- Balancing of the airflow rates of the unit is possilbe.
- The standby power consumption of this device makes 3.0 W. The target value of 1 W was exceeded. The device should be equipped with an additional external switch so that it can be disconnected from the mains, if required.
- 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 functional or secondary room, the sound pressure level in installation room should be restricted to 30 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
15 m³/h	25.7 dB(A)
25 m³/h	31.6 dB(A)
40 m³/h	43.6 dB(A)
65 m³/h	54.4 dB(A)

- 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 airflow rate of 25 m³/h (continuous operation).

Indoor air quality

This unit is to be equipped with following filter qualities:

Outdoor air filter	Extract air filter
ISO ePM1 50%	ISO Coarse 60%

On the outdoor air side, the filter efficiency of ISO ePM1 50% (F7 according to EN 779) or better is recommended. For the extract air side, a filter efficiency of at least ISO Coarse 60% (G4 according to EN 779) is recommended. If not in standard configuration, the recommended filter is available as an accessory part.

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 °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 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).