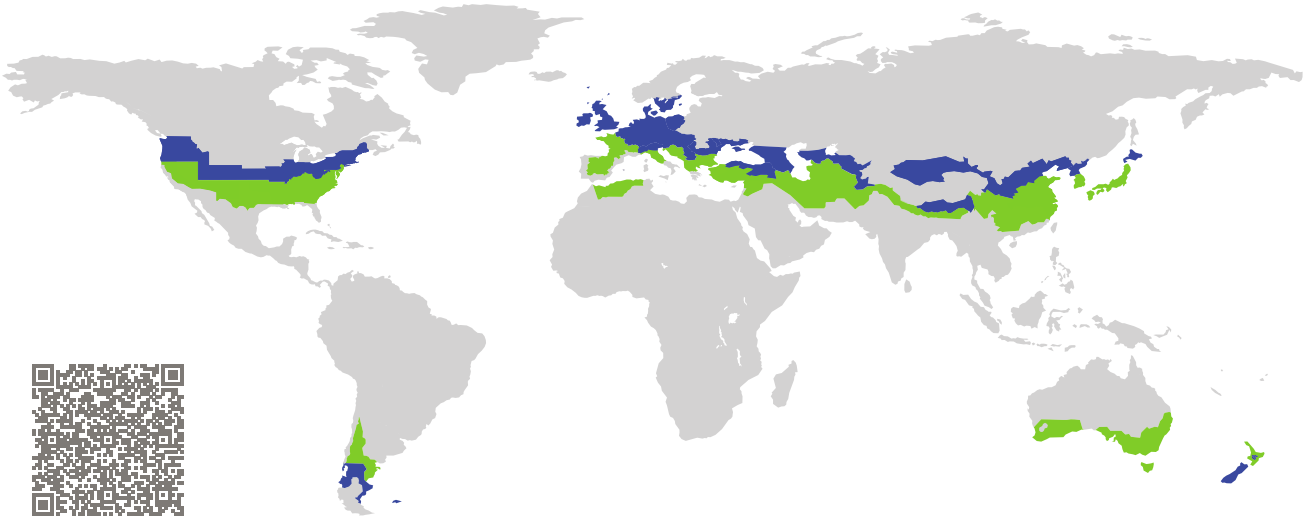
CERTIFICATE

Certified Passive House Component

Component-ID 2099vs03 valid until 31st December 2025

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
Germany



Category:	**Air handling unit with heat recovery**
Manufacturer:	**Zehnder Group Nederland B.V. Netherlands**
Product name:	**ComfoAir 225 ERV**
Specification:	Airflow rate < 600 m^3/h
Heat exchanger:	Recuperative

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

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

Airflow range
61–150 m^3/h
Heat recovery rate
η_{HR} = 87 %
Specific electric power
$P_{el,spec}$ = 0.30 Wh/m^3
Humidity recovery
η_x = 73 %

cool, temperate climate

CERTIFIED COMPONENT

Passive House Institute

Zehnder Group Nederland B.V.
Lingenstraat 2, 8028 PM Zwolle, Netherlands
☎ +31 38 429 6911 | ✉ info@zehnder-systems.de | http://www.comfosystems.de |

Humidity recovery

Indoor air humidity can be increased by using a system with moisture recovery in a cool, temperate climate, 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 = 73 %

In case the unit's moisture recovery rate is larger than 60 % its airflow rate must be controlled based on the indoor air humidity, in order to prevent temporarily elevated humidity levels.
Application of humidity recovery:

- In cool temperate climates, heat exchangers with moisture recovery should generally only be used 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.

Passive House comfort criterion

A supply air temperature of 15.3 °C was maintained at an outdoor air temperature of -10 °C. The required temperature of 16.5 °C was not reached. However, the average exhaust temperature during this investigation reached only 0.6 °C (compared to 5 °C accepted as maximum). This means that there is potential of increasing heat capacity of internal electric preheater to reach 16.5 °C. Another approach is a use of special air temrinal devices using coanda effect to disperse the fresh air into the room. In case long ducting system is installed, this will also lead to preheating of supply air.

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 W h/(kg K)
η_x	Humidity recovery in %
	for $\eta_x \geq 60$ %, the heat recovery increase $(0.08 \cdot \eta_x)$ is limited to a maximum of 4.80 %

Heat recovery rate
η_{HR} = 87 %

Efficiency criterion (electric power)

The overall electrical power consumption of the device is measured at the test facility at an external pressure of 100 Pa (50 Pa, respectively, for the intake and outlet). This includes the general electrical power consumption for operation and control but not for frost protection.

Specific electric power
$P_{el,spec}$ = 0.30 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
ϵ_L = 0.73

Leakage

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

Internal leakage	External leakage
2.10 %	3.00 %

Settings and airflow balance

It must be possible to adjust the balance of airflows at the unit itself (either between the exhaust and the outdoor airflows or between the supply and the extract airflows, if the unit is respectively placed inside or outside of the insulated thermal envelope of the building).

- This unit is certified for airflow rates of 61–150 m^3/h.
- Balancing the airflow rates of the unit is possible.
- The user should have at least all the following setting options:

- ✓ Switching the system on and off.
- ✓ Synchronized adjustment of the supply and extract airflows to basic ventilation (70–80 %), standard ventilation (100 %) and increased ventilation (130 %) with a clear indication of the current setting.

- The device has a standby power consumption of 4.60 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

The required limit for the sound power level of the device is 35 dB(A) in order to limit the sound pressure level in the installation room. The sound level target value of less than 25 dB(A) in living spaces and less than 30 dB(A)in functional spaces must be ensured by installing commercial silencers.The following sound power levels are met at an airflow rate of 150 m^3/h:

Device	Duct			
	Outdoor	Supply air	Extract air	Exhaust air
48.9 dB(A)	43.2 dB(A)	55.9 dB(A)	53.5 dB(A)	65.3 dB(A)

- The unit does not fulfil the requirements for the sound power level. The unit must therefore be installed acoustically separated from living areas.
- One example of suitable silencers for supply and extract air ducts is mentioned in the detailed test report or can be obtained from the manufacturer. It is recommended to identify suitable silencers for each individual project.

Indoor air quality

This unit is to be equipped with the 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.

Frost 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.

- Frost protection of the heat exchanger:
  - ✓ The frost protection starts by outdoor air temperature of -12.7 °C. The measured temperature of exhaust air during testing of frost protection was -1.2 °C. In order to protect the heat exchanger from freezing up, the unit can be optionally equipped with an internal electric preheater with a power output of up to 870 W at the upper limit of the airflow range.
- Frost protection of downstream hydraulic heater coils:

✓ In order to protect a downstream hydraulic heater coil the device is switched off as soon as the supply air temperature falls below 5.3 °C. In this case the display will show an error.