Certificate

Passive House suitable component

For cool, temperate climates, valid until 31 December 2018

Passive House Institute
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Category: **Heat recovery unit**

Manufacturer: **Helios Ventilatoren GmbH+Co KG**
78056 Villingen Schwenningen,
GERMANY

Product name: **KWL EC 2000 D**

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
Performance number	≥ 10
Airtightness	Interior and exterior air leakage rates less than 3% of nominal air flow rate
Balancing and adjustability	Air flow balancing possible: yes Automated air flow balancing: yes
Sound insulation	It is assumed that large ventilation units are installed in a separate building services room. Sound levels documented in the appendix of this certificate
Indoor air quality	Outdoor air filter F7 Extract air filter G4
Frostprotection	Frost protection required Different strategies mentioned in the appendix of this certificate

1) Available pressure difference with installed filter: **200 Pa**. Additional components (e.g. heater coil) decrease the available pressure difference accordingly.

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

Certified for air flow rates of 650-1650 m³/h
At an external pressure of **250 Pa** [1)]
Requirements non residential buildings (Therewith device also applicable for residential building)

$\eta_{HR,eff}$ 84%

Electric power consumption 0.43 Wh/m³

Performance number 10

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www.passivehouse.com

Appendix of the certificate Helios Ventilatoren GmbH+Co KG, KWL EC 2000 D

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Passive House comfort criterion
A minimum supply air temperature of 16.5 °C is maintained at an external air temperature of -10 °C.

Effective heat recovery rate

The effective dry heat recovery efficiency is measured at the test facility using balanced mass flows on the external 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 $\dot{V}_{SUP}$*(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.

In this case:

$\eta_{HR,eff}$= 84%

Air flow range and external pressure difference

The air flow range of this device is limited by the required maximum electric power consumption. Referred to the PHI-criteria for ventilation units > 600 m³/h different external pressure differences according to the upper limit of the air flow range and the application (residential building ore non-residential building) are required.

Thereby the external pressure difference is defined by all pressure losses in the ventilation system (whole ducting system) outside of the tested unit, which only consists of casing, heat exchanger and fans. If filters are already installed in the appliance, the external pressure difference can be reduced by the average filter pressure drop. (it is assumed that the average filter pressure drop in operation is 30% higher than the filter pressure drop of the clean filter).

- This device was tested according to the requirement of non-residential building with an air flow range of 650-1650 m³/h at an external pressure difference of 250 Pa. The available pressure difference with installed filters is about **201 Pa**

Efficiency criterion (power consumption)

The overall electrical power consumption of the device including that for regulation, but without that for the frost protection heating, is tested at the test facility for the requirements of non-residential buildings at an external pressure difference of 250 Pa.

Measurement results:

0.43 Wh/m³ (average value)

Based on the measured values for the calculation of heat recovery efficiency and power consumption and on the climatic data of middle Europe (Gt: 84 kKh, heating time: 5400 h/a), an average performance number at the air flow range was determined:

- ✓ **Performance number: 10**

Airtightness and insulation

Before starting the thermodynamic test, the air tightness test should be carried out for under pressure as well as for over pressure (according to the measurement requirements). 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:

Internal leakage: 1.27%

External leakage: 0.16%

This appliance meets the air tightness requirements.

Balancing and adjustability

All units must have a possibility to adjust the balance between the exhaust air flow rate and the outdoor air flow rate.

- Balancing the air flow rates of the unit:
  - ✓ Automated air flow balancing (by measurement of pressure differences at the fan's injections)
  - ✓ Manual by the installer
- Standby losses of the ventilation appliance can reach relevant share of the overall consumption if the device is operated intermittently. The standby consumption of this ventilation appliance was measured. With 17 W it is considerably high. In order to avoid unnecessary standby losses a manual switch for complete disconnection from supply should be installed.
- After a power failure the device automatically continues to operate in the mode that was set before the power failure.

Schallschutz

For ventilation units > 600 m³/h an installation in a separate room for building services could be assumed, which is planned according to the valid regulation. Following sound levels have been determined at an air flow rate of **1650 m³/h**:

Sound level unit [dB(A)]	Sound level ODA [dB(A)]	Sound level SUP [dB(A)]	Sound level ETA [dB(A)]	Sound level EHA [dB(A)]
66	56.1	70.3	55.7	69.9

- For complying with the required sound level in the supply air and extract air rooms, dimensioning of suitable silencer is required for the specific project on the basis of the measured sound level.

Indoor air quality

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), relevant information should be provided and suppliers of filters should be listed in the manual. At least the following filter types should be provided for protection from pollutants:

- ✓ Outdoor Air filter at least F7
- ✓ Extract Air filter F5

If the device is not operated during the summer, the filter should be replaced before the next operation. The manufacturer is responsible for ensuring indoor air hygiene based on the latest findings, either by means of device components or by providing the obligatory equipment with the device.

For the operation of ventilation systems a strategy for avoiding permanent moisture penetration of the outdoor air filter need to be considered. The strategies are mentioned in the full report and can be implemented through installations of either additional components of the ventilation device or on the ventilation site system.

Frostprotection

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 (there is no interrupt circuit for outdoor air in the Passive House, as the heating loads caused by the forced infiltration would become too high). If heater coils for hot water are used, a suitable frost protection circuit should ensure prevention of frost damage to these heater coils. In the process, the possibility of failure of the pre-heating coils and extract air fans must also be taken into consideration.

- Frost protection circuit for the heat exchanger:
  - ✓ An electric pre-heater of 7000 W is preinstalled in each device. It is economically easier to provide a ventilation device > 600 m³/h with a frost protection system with less demand for primary energy than for smaller ventilation units. The manufacturer for this purpose recommends completing the ventilation system either with a brine heat exchanger or an air-earth-heat exchanger, that is dimensioned appropriately. In that case the internal frost protection must be deactivated.
- Frost protection circuit for downstream hydraulic heater coils:
  - ✓ As described in the technical manual this appliance shuts down the supply air fan if the supply temperature drops below +5°C.

  It should be noted that cold air can also lead to freezing up of stationary fans due to free circulation; this can only be ruled out if the air duct is closed (by means of a shut-off flap).

Bypass of the heat recovery

A summer bypass of the heat recovery is part of this appliance. It is controlled automatically.

The effectiveness of this appliance's bypass for night cooling of buildings has not been tested within the scope of this testing.

Abbreviations: ODA = Outdoor air, EHA = Exhaust air, SUP = Supply air, ETA = Extract air