Certificate

Certified Passive House Component

For cool, temperate climates, valid until 31 December 2015

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

Manufacturer: **Paul Wärmerückgewinnung GmbH**
08141 Reinsdorf, GERMANY

Product name: **novus 300**

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 less than 3% of nominal air flow rate
Balancing and adjustability	Air flow balancing possible: yes Automated air flow balancing: yes
Sound insulation	Sound level $L_w \leq 35$ dB(A) not met Here $L_w = 43.0$ dB(A) Unit should be installed so that it is acoustically separated from living areas
Indoor air quality	Outdoor air filter F7 Extract air filter G4
Frostprotection	Frost protection for the heat exchanger with continuous fresh air supply down to $\theta_{outdoor\ air} = -15$ °C

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

Certified for air flow rates of

121 - 231 m³/h

$\eta_{HR,eff}$

93%
(94% bei 144 m³/h)

Electric power consumption

0.24 Wh/m³

CERTIFIED COMPONENT
Passive House Institute

Appendix to the certificate Paul Wärmerückgewinnung GmbH , novus 300

Manufacturer: Paul Wärmerückgewinnung GmbH
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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.

Efficiency criterion (heat recovery efficiency)

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 $\dot{V}_{supply\_air}$ * (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:

$\eta_{HR,eff}$ = 93 %

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 at an external pressure of 100Pa (50Pa for each of the pressure/intake sides).

For this device: **0.24 Wh/m³**

Air tightness and insulation

Before starting the thermodynamic test in accordance with the DIBt guidelines, the air tightness test should be carried out for under pressure as well as for over pressure. 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 according to DIBt guidelines:

Internal leakage: 0.54 %

External leakage: 1.43 %

This ventilation unit meets the airtightness requirements.

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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 **121 - 231 m³/h**
- Balancing the air flow rates of the unit is possible
  - ✓ the air flow rates are hold steady automatically (by constant flow 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 air flow to basic ventilation (= 70-80 %), standard ventilation (= 100 %) and increased ventilation (= 130 %) with clear readability of the set status.
  - ✓ Depending on the demand, the user can choose between several operating levels that can be set manually at the control unit of the operating element.
- The device being tested here has a standby power consumption of **0.95 W** and therefore complies with the target value of 1 W. After a power failure the device automatically continues to operate in the mode that was set before the power failure.

Acoustical testing

In order to restrict the sound pressure level in the installation room, the sound power level should be restricted to 35 dB(A). With an equivalent room absorption area of 4 m² the amounts of sound power level and sound pressure level are nearly the same (the exact value of the sound pressure level in the specific installation room can be calculated with the help of the sound protection tool (download on www.passivehouse.com)).

Installation instructions must be provided which describe how the sound level can be kept below 25 dB(A) in living areas and below 30 dB(A) in functional areas. The following sound power levels have been determined at an air flow rate of **200 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)]
43.0	47.2	64.9	46.0	64.8

- The sound level of the unit exceeds the limit value of 35 dB(A). Therefore the unit should be installed so that it is acoustically separated from living areas.
- Silencers are recommended by the manufacturer for complying with the required sound level in the supply air and extract air rooms. Detailed information about these can be found in the full report. Dimensioning of a suitable silencer is required for the specific project on the basis of the measured sound intensity level.

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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), 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 at least G4

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.

Filter replacement is recommended after an interval of 6 months.

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 (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:
  - ✓ In order to protect the heat exchanger from freezing an additional frost protection system must be installed in the outdoor air duct. For this purpose the manufacturer recommends the device Paul iso-Defrosterheizung with a heating power of 2 kW combined with the universal thermostat (Paul) which allows a variable power regulation and is suitable for Sole-Defroster and electrical preheating coils. The preheater is regulated by the outdoor air temperature and it starts operation as soon as the outdoor air temperature drops below -0.5 °C.
- Frost protection circuit for 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 4.8 °C. In this case the display will show an error.

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).

Abbreviations

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