

Certificate

Passive House Suitable Component

For cool temperate climates, valid until 31. December 2018

Category: **Compact Heat Pump System**
 Manufacturer: **AEREX HaustechnikSysteme GmbH**,
 78056 Villingen-Schwenningen, Germany
 Product name: **AEREX PHK 180 mit AEREX PHS 300**

This certificate was awarded based on the following criteria (limit values*):

Thermal Comfort: $\theta_{\text{supply air}} \geq 16.5^{\circ}\text{C}$
 Heat Recovery of ventilation system: $\eta_{\text{WRG,eff}} \geq 75\%$
 Electric efficiency ventilation system: $P_{\text{el}} \leq 0.45 \text{ Wh/m}^3$
 Air tightness (internal/external): $V_{\text{Leakage}} \leq 3\%$
 Total Primary Energy Demand (**): $PE_{\text{total}} \leq 55 \text{ kWh/ (m}^2\text{a)}$
 Control and calibration (*)
 Air pollution filters (*)
 Anti freezing strategy (*)
 Noise emission and reduction (*)

Measured values to be used in PHPP
useful air flow rates 130 to 230 m³/h

Heating

		Test point 1	Test point 3	Test point 3	Test point 4	
Outside Air Temperature	T_{amb}	0	2	7		$^{\circ}\text{C}$
Thermal Output Heating Heat Pump	$P_{\text{WP,Heiz}}$	1.37	1.48	1.73		kW
COP number Heating Heat Pump	COP_{Heiz}	2.85	3.02	3.31		-
Maximum available supply air temperature with Heat Pump only(*)		41				$^{\circ}\text{C}$

Hot water

		Test point 1	Test point 3	Test point 3	Test point 4	
Outside Air Temperature	T_{amb}	0	2	7	20	$^{\circ}\text{C}$
Thermal Output Heat Pump for heating up storage tank.	$P_{\text{DHW heating up}}$	1.12	1.21	1.41	1.54	kW
Thermal Output Heat Pump for reheating storage tank	$P_{\text{DHW reheating}}$	1.10	1.02	1.17	1.27	kW
COP Heat Pump for heating up storage tank	$\text{COP}_{\text{DHW, heating up}}$	2.81	2.96	3.25	3.20	-
COP Heat Pump for reheating storage tank	$\text{COP}_{\text{DHW reheating}}$	2.58	2.42	2.63	2.45	-
Average storage tank temperature		AEREX PHS 300 36.5				$^{\circ}\text{C}$
Specific storage heat losses		AEREX PHS 300 1.75				W/K
Exhaust air addition (if applicable)						m^3/h

(*) detailed description of criteria and key values see attachment.

(**) for heating, domestic hot water (DHW), ventilation, auxiliary electricity in the reference building, explanation see attachment.

Heat Recovery

$$\eta_{\text{WRG,eff}} = 80\%$$

Electric efficiency

$$0.28 \text{ Wh/m}^3$$

Air tightness

$$V_{\text{leak, internal}} = 0.7\%$$

$$V_{\text{leak, external}} = 1.1\%$$

Frost protection

down to 0°C (*)

Total Primary Energy Demand (**)

46 kWh/(m²a)



CERTIFIED COMPONENT

Passive House Institute

Attachment to the Certificate(***)

AEREX PHK 180 with AEREX PHS300

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Thermal Comfort: A minimum supply air temperature of 16.5°C is reached only with use of an underground air channel (see frost protection strategy). This must ensure an intake air temperature higher than 0°C all year round. Measurements: $T_{\text{supply}} = 17.3 \text{ °C}$ at $T_{\text{outside}} = 0 \text{ °C}$, WITHOUT heating.

Efficiency Criterion – heat: The heat recovery of the ventilation system incorporated in the unit demonstrates an efficiency of $\eta_{\text{eff}} = 80 \%$ at supply air flow rate of 185 m³/h.

Efficiency Criterion – electricity: With a power consumption of 0.28 Wh/m³ at supply air flow rate of 185 m³/h the unit complies with the maximum consumption of 0.45 Wh/m³. The consumption of 3 W in a standby-mode slightly exceeds the target value of 1 W.

Air tightness and thermal insulation: The testing of a ventilation system showed that the limiting values of 3% for both the internal and external leakages were not exceeded.

Control and calibration: The flow rate and balance can be adjusted for each fan speed during a commissioning. The setting of the balance is a responsibility of the installer or building services planner who should oversee the commissioning. The user can then adjust amount of air via the fan speeds. The amount of air can be additionally controlled by moisture or CO₂ sensors. The device allows a time-limited intensive ventilation if necessary.

Sound insulation: The acoustic pressure level was evaluated as 48 dB (A) in the room where the unit is installed with an equivalent absorption area of 4 m² and at an air flow rate of 230 m³/h. This is significantly higher than the threshold value of 35 dB(A). The unit must therefore be installed in an adequately sound insulated room separated from the living area. The appropriate silencers should be provided to reduce the noise (Figure 1) and ventilation designers are responsible for their dimensioning. The producer will offer a configuration of the silencer.

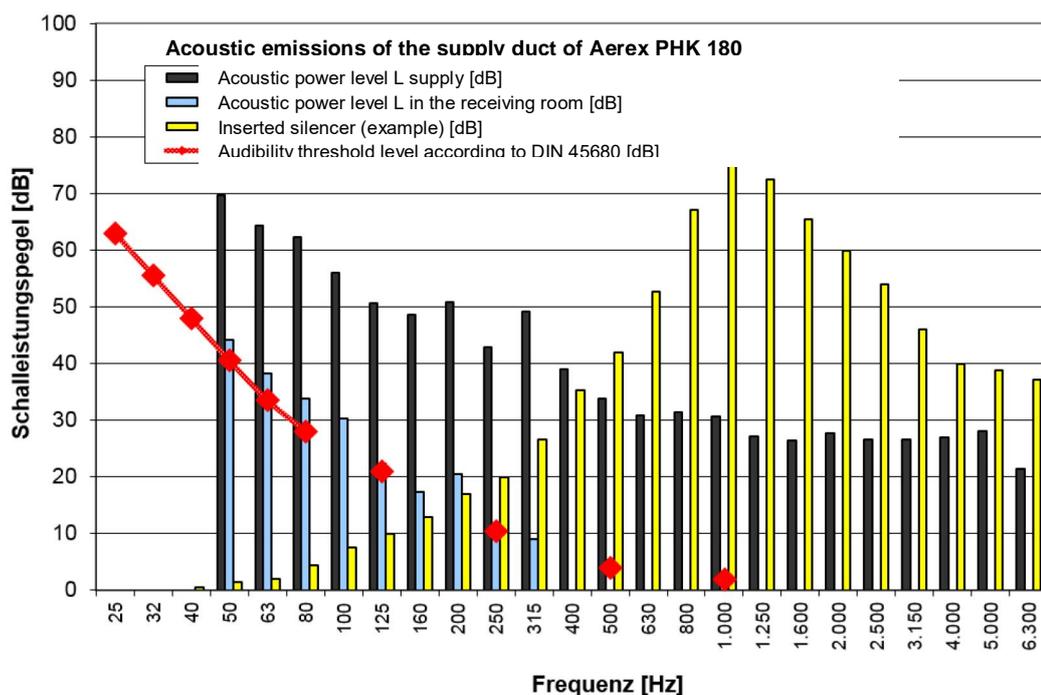


Figure 1:
Acoustic emissions of supply duct of the unit Aerex PHK 180 [dB]

Attachment to the Certificate(***) AEREX PHK 180 with AEREX PHS300

Hygienic Indoor Air: The central ventilation unit, including the heat exchanger, can be easily accessed and cleaned. The filters can be replaced by the user (rather than by a technical expert), instructions and suppliers are included in the manual. The following filter qualities should be used: intake air filter minimum F7, attached in front, exhaust air filter G4. The filter should be replaced, before recommissioning the unit after a summer period when it has not been in use. The manufacturer carries the responsibility to ensure that, through the use of either integral components or mandatory additional fittings, the hygienic quality of the air is sufficiently high. An F7 and G4 filter are installed respectively in the intake and exhaust air streams within the unit. The configuration of a F7 filter complies with the recommendations for use in passive houses.

Frost protection: The icing protection for the device must be implemented externally. The manufacturer states that the device PHK 180 needs either a ground heat exchanger, a geothermal heat exchanger or another energy neutral pre-heater, which ensures that incoming air temperature will not drop below 0°C at any time.

Assessment of the heat pump: The seasonal performance factor (SPF) of the system installed in the reference building is 2.2 with use of a ground heat exchanger. The primary energy consumption for the reference building is 46 kWh/(m²a) with use of a ground heat exchanger. This compact heat pump unit can be used in Passive Houses with an air flow rate between 130 m³/h and 230 m³/h, based on an air flow rate of 30 m³/h/person and a heating load of 12 W/m². The device was measured and evaluated using a hot water tank provided by a producer of the device. In case that other type of a hot water tank is used the certified characteristics of the device can differ. The COP factor, area of application and SPF obtained for used reference building should be particularly checked and changed accordingly.

The **maximum available supply air temperature** at maximum heat load, when the heat pump is running exclusively, was found to be **41 °C** at the operating points mentioned in the certificate. In case a higher heat output and hence a higher intake air temperature is needed, this can be realized for example by means of a direct electric heater (a supply air electric heater or external electric radiator).

In each case, the electrical circuit must ensure that a direct electrical heater can be only activated by the user when the heat pump operates at full power. The supply air temperature cannot be under any circumstances increased above 52 °C.

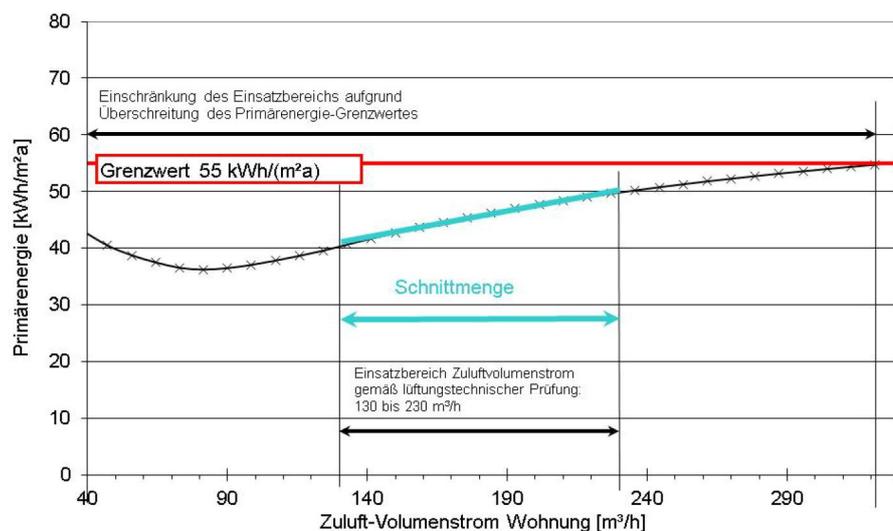


Figure 2: Application range of the unit AEREX PHK 180

(***) A full description of measured results (test report of PHI) is available from the manufacturer