

Certificate

Passive House Suitable Component

For cool temperate climates, valid until 31. December 2019

Category: **Compact Heat Pump System**
 Manufacturer: **Genvex A/S**
6100 Haderslev, DENMARK
 Product name: **Combi 185L (150 m³/h)**

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 Ddemand (**): $PE_{\text{total}} \leq 55 \text{ kWh}/(\text{m}^2\text{a})$
 Control and calibration (*)
 Air pollution filters (*)
 Anti freezing strategy (*)
 Noise emission and reduction (*)

**Measured values to be used in PHPP (set point 150 m³/h)
 useful air flow rates 110 to 175 m³/h**

Heating

		Test point 1	Test point 3	Test point 3	Test point 4	
Outside Air Temperature	T_{amb}	-7	4	8		°C
Thermal Output Heating Heat Pump	$P_{\text{WP,Heiz}}$	–	1.24	1.35		kW
COP number Heating Heat Pump	COP_{Heiz}	–	2.35	2.42		-
Maximum available supply air temperature with Heat Pump only(*)		41				°C

Hot water

		Test point 1	Test point 3	Test point 3	Test point 4	
Outside Air Temperature	T_{amb}	-7	4	8	20	°C
Thermal Output Heat Pump for heating up storage tank.	$P_{\text{DHW heating up}}$	–	1.00	1.13	1.56	kW
Thermal Output Heat Pump for reheating storage tank	$P_{\text{DHW reheating}}$	–	0.90	1.07	1.48	kW
COP Heat Pump for heating up storage tank	$\text{COP}_{\text{DHW heating up}}$	–	2.28	2.45	2.87	
COP Heat Pump for reheating storage tank	$\text{COP}_{\text{DHW reheating}}$	–	1.98	2.19	2.54	
Average storage tank temperature		46.4				°C
Specific storage heat losses		1.90				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

$$\eta_{\text{WRG,eff}} = 76\%$$

Electric efficiency

$$0.31 \text{ Wh/m}^3$$

Air tightness

$$V_{\text{leak, internal}} = 1.6\%$$

$$V_{\text{leak, external}} = 0.9\%$$

Frost protection

down to +4 °C

Total Primary Energy Demand (**)

51.9 kWh/(m²a)



CERTIFIED COMPONENT

Passive House Institute

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Passive House Suitable Component

For cool temperate climates, valid until 31. December 2019

Category: **Compact Heat Pump System**
 Manufacturer: **Genvex A/S**
6100 Harderslev, DENMARK
 Product name: **Combi 185L (200 m³/h)**

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 Ddemand (**): $PE_{\text{total}} \leq 55 \text{ kWh}/(\text{m}^2\text{a})$
 Control and calibration (*)
 Air pollution filters (*)
 Anti freezing strategy (*)
 Noise emission and reduction (*)

**Measured values to be used in PHPP (set point 200 m³/h)
 useful air flow rates 110 to 190 m³/h**

Heating

		Test point 1	Test point 3	Test point 3	Test point 4	
Outside Air Temperature	T_{amb}	-7	4	8		°C
Thermal Output Heating Heat Pump	P_{heating}	–	1.32	1.47		kW
COP number Heating Heat Pump	$\text{COP}_{\text{Heating}}$	–	2.54	2.53		-
Maximum available supply air temperature with Heat Pump only(*)		41				°C

Hot water

		Test point 1	Test point 3	Test point 3	Test point 4	
Outside Air Temperature	T_{amb}	-7	4	8	20	°C
Thermal Output Heat Pump for heating up storage tank.	$P_{\text{DHW heating up}}$	–	1.00	1.24	1.58	kW
Thermal Output Heat Pump for reheating storage tank	$P_{\text{DHW reheating}}$	–	0.90	1.17	1.49	kW
COP Heat Pump for heating up storage tank	$\text{COP}_{\text{DHW heating up}}$	–	2.28	2.52	2.82	
COP Heat Pump for reheating storage tank	$\text{COP}_{\text{DHW reheating}}$	–	1.98	2.24	2.52	
Average storage tank temperature		46.4				°C
Specific storage heat losses		1.90				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

$$\eta_{\text{WRG,eff}} = 76\%$$

Electric efficiency

$$0.31 \text{ Wh/m}^3$$

Air tightness

$$V_{\text{leak, internal}} = 1.6\%$$

$$V_{\text{leak, external}} = 0.9\%$$

Frost protection

down to +4°C

Total Primary Energy Demand (**)

51.3 kWh/(m²a)



CERTIFIED COMPONENT

Passive House Institute

Attachment to the Certificate(***)

Genvex Combi 185L

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Passive House Thermal Comfort Criterion: A minimum supply air temperature of 16,5°C is reached if the air first passes through earth tubes, i.e. the intake air of the ventilation system must have a temperature of at least +4°C.

Efficiency Criterion – heat: The heat recovery of the ventilation system incorporated in the unit demonstrates an efficiency of $\eta_{\text{eff}} = 76 \%$.

Efficiency Criterion – electricity: With a power consumption of 0.31 Wh/m³ at an air flow rate of 169 m³/h, the unit complies with the maximum consumption of 0,45 Wh/m³. The consumption of 5.5 W in standby-mode exceeds the target value of 1 W. When the unit is not in use it should be completely detached from the power supply in order to avoid unnecessary standby losses.

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

Control and calibration: The user can select one of three ventilation levels via the console, which are factory-set at 40% / 70% / 100% of the maximum air flow rate. These air flow rates can be adjusted separately when configuring or programming the unit.

Sound insulation: The acoustic pressure level was evaluated as 49 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 200 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 separate from the living area.

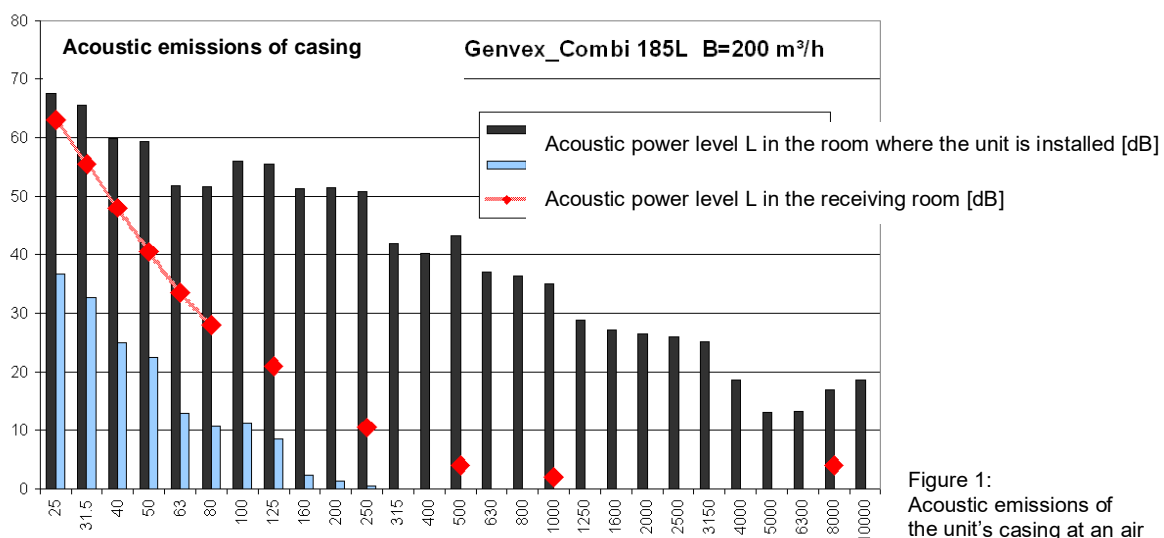


Figure 1:
 Acoustic emissions of the unit's casing at an air flow rate of 200 m³/h

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

Air pollution: 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. G4 filters are installed in both the intake and exhaust air streams within the unit. The manufacturer recommends the installation of a separate fine particle filter (F7) at the intake of the required earth-to-air heat exchanger. This configuration is in accordance with the recommendations for Passive Houses. An F7 and a G4 filter are installed respectively in the intake and exhaust air streams within the unit. This configuration is in accordance with the recommendations for Passive Houses.

Frost protection: The **anti-freeze protection** of this device is implemented externally. The manufacturer recommends the use of an external electric heater for frost protection. However, preheating the air electrically for the heat pump is not admissible, as this additional power consumption is not included in the heat pump's COP values as stated on the certificate. A **ground-coupled heat exchanger** must therefore be used, which preheats the intake air to at least 4 °C.

Assessment of the heat pump: The seasonal performance factor for the reference building is 1.8 under the testing conditions A (150 m³/h) and 1.9 under the testing conditions B (200 m³/h). The primary energy consumption for the reference building is 51.9 kWh/(m²a) (150 m³/h) and 51.3 (200 m³/h), respectively. This compact heat pump unit can be used in Passive Houses with an energy reference area of 128 m² to 205 m² or 128 m² to 220 m², respectively, based on a typical occupancy of 35 m²/person, an air flow rate of 30 m³/h/person and a heating load of 12 W/m². The unit was tested in combination with a specially selected **hot water storage**. If an other hot water storage is used the certified key values of the heat pump system especially the COP-values, the useful range of application and thus the seasonal performance factor (SPF) may differ significantly from the values denoted in the certification sheet.

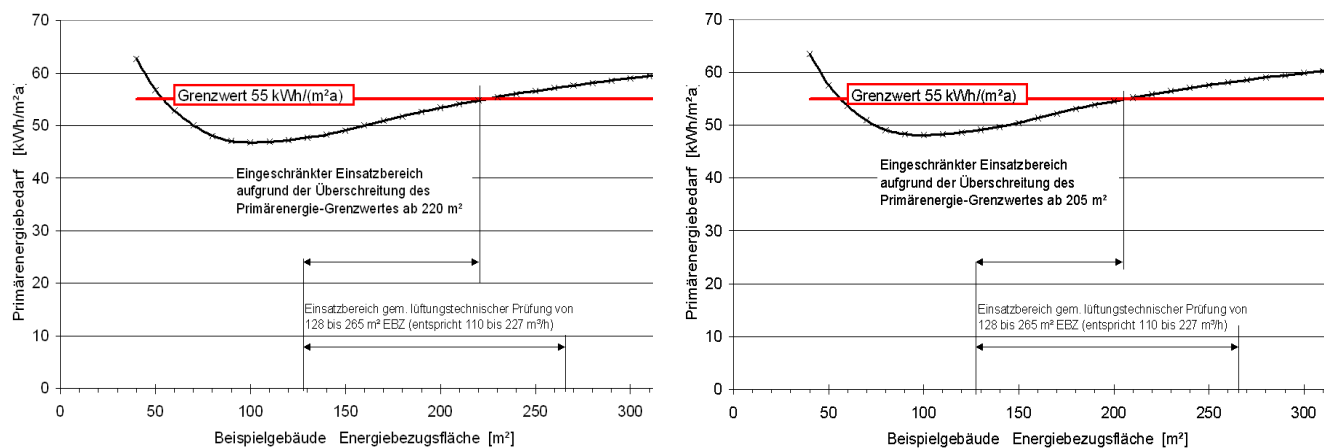


Figure 2: Application range of the unit Genvex 185L at a rated air flow rate of 150 m³/h and 200 m³/h.

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