

Certificate

Certified Passive House Component

For cool, temperate climates, valid until 31 December 2013

Category: **Heat recovery unit**
Manufacturer: **Stiebel Eltron GmbH u. Co. KG**
37603 Holzminden
Product name: **LWZ 270, LWZ 270 plus**

This certificate was awarded based on the following criteria:

Thermal comfort	$\theta_{\text{supply air}} \geq 16.5 \text{ }^\circ\text{C}$ at $\theta_{\text{outdoor air}} = -10 \text{ }^\circ\text{C}$
Effective heat recovery rate	$\eta_{\text{HR,eff}} \geq 75 \%$
Electric power consumption	$P_{\text{el}} \leq 0.45 \text{ Wh/m}^3$
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 pressure level $L_p \leq 35 \text{ dB(A)}$ based on a 4 m ² equivalent absorption area not met Here $L_p = 49.0 \text{ dB(A)}$ 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 $\theta_{\text{outdoor air}} = -15 \text{ }^\circ\text{C}$

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

Certified for air flow rates of

90-220 (305) m³/h

(with additional anti-freeze protection up to 305 m³/h)

$\eta_{\text{HR,eff}}$

83%

(86% bei 116 m³/h)

Electric power consumption

0.38 Wh/m³

(0.31 Wh/m³ bei 116 m³/h)



CERTIFIED COMPONENT

Passive House Institute

Appendix to the certificate Stiebel Eltron GmbH u. Co. KG, LWZ 270, LWZ 270 plus

Manufacturer: Stiebel Eltron GmbH u. Co. KG
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Passive House comfort criterion

A minimum supply air temperature of 16.5 °C is main tained 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:

$$\eta_{HR,eff} = 83 \%$$

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:

$$0.38 \text{ Wh/m}^3$$

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: 0.24 %

External leakage: 0.87 %

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 **90-220 (305) 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 3 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 **1 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

The sound pressure level in the installation room should be restricted to 35 dB(A) (with an equivalent room absorption area of 4 m²). Installation instructions must be provided which describe how the sound level can be kept below 25 dB(A) in living areas and below 30dB(A) in functional areas. The following sound levels have been determined at an air flow rate of **305 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)]
49.0	53.2	50.6	48.8	61.7

- The sound level of the device in an installation room with an equivalent room absorption area of 4m² 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:
 - ✓ A pre-heating coil with an output of 1000 W is pre-installed in the device. This output is insufficient for keeping the device frost-free up to a temperature of -15 °C with maximum air flow rates. In order to ensure frost-protection at an external temperature of -15 °C even with an air flow rate of 305 m³/h, a frost protection register with an output of at least 1400 W is required (mathematically determined). In order to operate the device with maximum air flow rates, the manufacturer recommends that either an external frost protection attachment (e.g. air subsoil heat exchanger) should be provided, or the device should be equipped with additional pre-heating coils and an extra circuit board (both are supplied as accessory parts for the device mrXbox90L from the manufacturer). The pre-set starting temperature of 0.5 °C is too high and should be reduced to -3 °C in the setup menu for specialists (the device settings were adjusted at the test facility so that frost protection becomes active only when an outdoor temperature of -3.5 °C is reached). The preheating coils should be protected against heat loss and should be insulated together with the external air ducts.
- Frostschutzschaltung für ein eventuell nachgeschaltetes hydraulisches Heizregister
 - ✓ To protect a downstream hydraulic heater in case of falling out of the exhaust air fan the device will be cut off. In this case, an error message is displayed.

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