Certificate

Certified Passive House Component
For cool, temperate climates, valid until 31 December 2015

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
GERMANY

Category: **Heat recovery unit**

Manufacturer: **Ensto Enervent Oy**
06150 PORVOO, FINLAND

Product name: **LTR-2 eco EC (DP), LTR-2 eco ECE (DP)**

This certificate was awarded based on the following criteria:

Thermal comfort	$\theta_{supply\ air} \geq 16.5$ °C [1)] 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
Moisture recovery	Moisture recovery rate < 0.6 yes Adjustment of air flow by means of moisture control required: no
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: no
Sound insulation	Sound level $L_w \leq 35$ dB(A) not met Here $L_w = 59.3$ dB(A) Unit must be installed in a separate building services room.
Indoor air quality	Outdoor air filter F7 Extract air filter G4
Frost protection	Frost protection for the heat exchanger with continuous fresh air supply down to $\theta_{outdoor\ air} = -15$ °C

1) Met with supply air heater
2) Regenerative heat recovery – applicability to be checked

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

Certified for air flow rates of

118-166 m³/h

$\eta_{HR,eff}$

80%

Average moisture recovery η_X=0.56

Electric power consumption

0.44 Wh/m³

CERTIFIED COMPONENT
Passive House Institute

Appendix to the certificate Ensto Enervent Oy, LTR-2 eco EC (DP), LTR-2 eco ECE (DP)

Manufacturer: Ensto Enervent Oy
Kipinätie 1, 06150 PORVOO, FINLAND
Tel: +358(0)20 528 800
E-Mail: enervent@enervent.fi, www.enervent.fi

Moisture recovery

By means of moisture recovery the indoor air humidity can be higher than without moisture recovery. Especially during the winter months that could lead to reduced heating demand caused by less evaporation of water from construction components and furniture. This energy relevant influence is considered, depending on the moisture recovery rate, with a bonus on the heat recovery rate of the ventilation device.

- Adjustment of air flow by means of moisture control:
  - This ventilation device has got a moisture recovery rate < 0.6. An airflow control by means of moisture recovery is not required.
- Application of moisture recovery:
  - In cool temperate climates, heat exchanger with moisture recovery in general should only be used if the internal moisture load of the building is low compared to normal utilization (e.g. residential building with occupancy rate (far) below average).
  - If planning the application of moisture recovery in building with average occupancy rate, the energy balance of the building is to be calculated with an increased air flow rate according to following formula.

$$\dot{V}_{eff} = \dot{V}_{hyg} \cdot \frac{0{,}4}{1-\eta_x}$$

  - In cool climates the outdoor air in winter is very dry; moisture recovery could ensure comfortable room air conditions and is applicable also at normal utilization.

Passive House comfort criterion

A minimum supply air temperature of 16.5 °C is not maintained at an outdoor air temperature of -10 °C. The installation of a heater coil for supply air heating is required. For this purpose the manufacturer provides adequate measures:

- the unit LTR-2 eco ECE (DP) with integrated electrical supply air heater with 400 Watt heating power
- another adequate dimensioned external supply air heater

Appendix to the certificate Ensto Enervent Oy, LTR-2 eco EC (DP), LTR-2 eco ECE (DP)

Efficiency criterion (heat recovery rate)

The effective heat recovery rate is measured at the test facility using balanced mass flows on the outdoor air/extract air side. The boundary conditions for the measurement should be taken from the documents relating to the testing procedure.

$$\eta_{HR,eff} = \frac{(\vartheta_{ETA} - \vartheta_{EHA}) + \frac{P_{el}}{\dot{m} \cdot c_p}}{(\vartheta_{ETA} - \vartheta_{ODA})} + 0{,}08 \cdot \eta_x$$

Please Note:

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).

For this device:

$\eta_{HR,eff}$ = 80 %

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 (50 Pa for each of the pressure/ intake sides).

For this device: **0.44 Wh/m³**

Air tightness and insulation

Before starting the thermodynamic test, the air tightness test with respect to external leakages was carried out for under pressure as well as for over pressure. The air tightness measurement with respect to internal leakages was conducted according to the tracer gas method based on EN 13141-7. 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 result was obtained as followed:

Internal leakage: 2.2 %

External leakage: 0.6 %

This ventilation unit meets the air tightness requirements, however PHI recommends better values for internal leakages (values < 0.5% are achievable under consideration of fan position and the use of a correct dimensioned purging chamber).

Appendix to the certificate Ensto Enervent Oy, LTR-2 eco EC (DP), LTR-2 eco ECE (DP)

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 **118-166 m³/h**
- Balancing the air flow rates of the unit is possible
- 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 4 operating levels.
- The device being tested here has a standby power consumption of 2.3 W and therefore does not comply with the target value of 1 W. The unit needs to be equipped with an additional On/Off switch.
- After a power failure, this appliance automatically returns into its last operation mode once the power supply is back.

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 30dB(A) in functional areas. The following sound power levels have been determined at an air flow rate of **160 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)]
59.3	52.9	63.5	51.9	62.3

- The sound 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.

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). The unit is equipped with following filter qualities by default:

- ✓ Outdoor Air filter F7
- ✓ Extract Air filter G4

If the device is not operated during summer, the filter should be replaced before the next operation.

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:
  - ✓ Down to an outdoor air temperature of -15°C there is no need for an active frost protection strategy. It is assumed that the appliance is applicable in cool climates (outdoor air temperatures < -15°C) with only a small energy demand for frost protection.
- Frost protection circuit for downstream hydraulic heater coils:
  - ✓ This function is not intended by the unit. The frost protection circuit there for needs to be assured by means of an external thermostat in the supply air duct.

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