Certificate

Certified Passive House Component
For cool, temperate climates, valid until 31 December 2013

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
GERMANY

Category: **Heat recovery unit**

Manufacturer: **Zehnder Group Nederland B.V.**
8028 PM Zwolle, NETHERLANDS

Product name: **ComfoAir 160 ERV, ComfoD160 ERV, ComfoD150 ERV**

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 no Adjustment of air flow by means of moisture control required: yes
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 $L_p \leq 35$ dB(A) based on a 4 m² equivalent absorption area not met Here $L_p = 53.8$ dB(A) Unit must be installed in a separate building services room.
Indoor air quality	Outdoor air filter at least F7 Extract air filter at least G4
Frost protection	Frost protection for the heat exchanger with continuous fresh air supply down to $\theta_{Outdoor\ air} = -15$ °C

1) Only with additional heater coil in the supply air stream

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

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Certified for air flow rates of

73 – 115 m³/h

$\eta_{HR,eff}$

85 %

Average moisture recovery
η_X=0.64

Electric power consumption

0.33 Wh/m³

CERTIFIED COMPONENT
Passive House Institute

Certificate

Passivhaus Institut
Dr. Wolfgang Feist
Rheinstraße 44/46
D-64283 Darmstadt

valid until 31.12.2010

Component suitable for Passive Houses: **Heat recovery unit**
Manufacturer: **Zehnder Comfosystems**
Name of product: **ComfoAir 200**

The following criteria were checked for the award of this certificate:

The criteria are valid for the cool temperate climate.

1) **Passive House Thermal Comfort Criterion:**

A minimum supply air temperature of 16.5 °C is achieved at an ambient temperature of –10 °C.
Reasoning: In Passive Houses there is no need to install radiators on exterior walls. In order to avoid discomfort due to exposure to cold air, the supply air temperature must not sink below a minimum value.

2) **Efficiency Criterion (heat):**

The effective dry heat recovery rate, determined at an ambient air temperature between -15 and 10 °C, dry extraction air (21 °C) and with balanced mass flows, must be greater than
$\eta_{HR,t,eff} \geq 75\%$ **(in this case 92 %).**

3) **Efficiency Criterion (electricity):**

The unit's total specific electric power consumption for the operating levels applied in Passive Houses must not exceed 0,45 W/(m³/h), for the supply air delivered at design mass flow
(In this case 0,42 Wh/m³).

4) **Air-tightness and thermal insulation:**

The interior and exterior air leakage flow rates must not exceed 3 % of the nominal extraction air flow rate.
(Requirements and verification are described in the certificate's appendix.)

5) **Balancing and controllability:** (Requirements and verification are described in the certificate's appendix.)

6) **Sound insulation:** The installation in a separate room for building services is required for this unit.

The required sound pressure level of 35 dB(A) in the installation space with an equivalent absorption area of 4 m² is met, sound levels of < 25 dB(A) in living spaces and < 30 dB(A) in functional spaces are achieved with sound absorbers. (Requirements and verification are described in the certificate's appendix.)

7) **Room air hygiene:** **An outdoor air filter F7 is integrated in the unit.**

If the unit and all components are installed and operated according to the manufacturer's instructions, the unit will provide perfectly hygienic supply air. (Requirements and verification are described in the certificate's appendix.)

8) **Anti-freeze protection:** (Requirements and verification are described in the certificate's appendix.)

The certificate is to be used as follows:

COMPONENT suitable for PASSIVE HOUSES
Dr. Wolfgang Feist

Heat recovery unit:

Heat recovery rate (effective): 92 %

Electric efficiency: 0,42 Wh/m³

Certificate

valid until Dec 31th, 2010

Passivhaus Institut
Dr. Wolfgang Feist
Rheinstraße 44/46
D-64283 Darmstadt

PHI

Component suitable for Passive Houses: **Heat recovery unit**

Manufacturer: J.E. StorkAir (NL)

Name of product: **Zehnder ComfoAir 350**
(Zehnder Comfo D 350, G90-380, WHR 930)

The following criteria were checked for the award of this certificate:

1) **Passive House Thermal Comfort Criterion:**

A minimum supply air temperature of 16.5 °C is achieved at an ambient temperature of –10 °C.

Reasoning: In Passive Houses there is no need to install radiators on exterior walls. In order to avoid discomfort due to exposure to cold air, the supply air temperature must not sink below a minimum value.

2) **Efficiency Criterion (heat):**

The effective dry heat recovery rate, determined at an ambient air temperature between -15 and 10 °C, dry extraction air (21 °C) and with balanced mass flows, must be greater than

$\eta_{HR,t,eff} \geq 75\%$ (in this case: 84%).

3) **Efficiency Criterion (electricity):**

The unit's total specific electric power consumption for the operating levels applied in Passive Houses must not exceed **0,45 W/(m³/h),** for the supply air delivered at design mass flow
(**in this case: 0.29 W/(m³/h)**, under conditions described in the appendix).

4) **Airtightness and thermal insulation:**

The interior and exterior air leakage flow rates must not exceed 3 % of the nominal extraction air flow rate.
(Requirements and verification are described in the certificate's appendix.)

5) **Balancing and controllability:**

(Requirements and verification are described in the certificate's appendix.)

6) **Sound insulation:** The certificate is only valid with the restriction of installation in a separate room for building services.

The required sound pressure level of 35 dB(A) in the installation space with an equivalent absorption area of 4 m² is met, sound levels of < 25 dB(A) in living spaces and < 30 dB(A) in functional spaces are achieved with sound absorbers.
(Requirements and verification are described in the certificate's appendix.)

7) **Room air hygiene:**

If the unit and all components are installed and operated according to the manufacturer's instructions, the unit will provide perfectly hygienic supply air.
(Requirements and verification are described in the certificate's appendix.)

8) **Anti-freeze protection:** **(Requirements and verification are described in the certificate's appendix.)**

The certificate is to be used as follows:

COMPONENT suitable for PASSIVE HOUSES
Dr. Wolfgang Feist

Heat recovery:

Heat recovery rate (effective): 84 %

Electric efficiency: 0.29 Wh/m³

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Category: **Heat recovery unit**
Manufacturer: **Zehnder Group Nederland B.V.**
8028 PM Zwolle, NETHERLANDS
Product name: **ComfoAir 550 (WHR 960)**

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: no
Sound insulation	Sound pressure level $L_p \leq 35$ dB(A) based on a 4 m² equivalent absorption area not met Here $L_p = 48.1$ dB(A) Unit must be installed in a separate building services room.
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

Certified for air flow rates of

110 – 240
(308)[1)] m³/h

$\eta_{HR,eff}$

84%

Electric power consumption

0.31 Wh/m³

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

1) up to 308 m³/h just with additional external freezing protection

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Category: **Heat recovery unit**
Manufacturer: **Zehnder Group Nederland B.V.**
8028 PM Zwolle, NETHERLANDS
Product name: **ComfoAir XL 800**

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
Performance number	≥ 10
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	It is assumed that large ventilation units are installed in a separate building services room. Sound levels documented in the appendix of this certificate
Indoor air quality	Outdoor air filter F7 Extract air filter G4
Frostprotection	Frost protection required Different strategies mentioned in the appendix of this certificate

1) Available pressure difference with installed filter: 145 Pa.
Additional components (e.g. heater coil) decrease the available pressure difference accordingly.

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

Certified for air flow rates of 300 – 535 m³/h
At an external pressure of **155 Pa** [1)]
Requirements residential buildings

$\eta_{HR,eff}$ 80%

Electric power consumption 0.45 Wh/m³

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Category: **Heat recovery unit**
Manufacturer: **Zehnder Group Nederland B.V.**
8028 PM Zwolle, NETHERLANDS
Product name: **ComfoAir XL1500**

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
Performance number	≥ 10
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	It is assumed that large ventilation units are installed in a separate building services room. Sound levels documented in the appendix of this certificate
Indoor air quality	Outdoor air filter F7 Extract air filter G4
Frostprotection	Frost protection required Different strategies mentioned in the appendix of this certificate

1) Available pressure difference with installed filter: 175 Pa.
Additional components (e.g. heater coil) decrease the available pressure difference accordingly.

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

Certified for air flow rates of 500 – 1000 m³/h
At an external pressure of **187 Pa** [1)]
Requirements residential buildings

$\eta_{HR,eff}$ 80%

Electric power consumption 0.41 Wh/m³

Performance number 10.2

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Category: **Heat recovery unit**
Manufacturer: **Zehnder Group Nederland B.V.**
8028 PM Zwolle, NETHERLANDS
Product name: **ComfoAir XL 2200**

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
Performance number	≥ 10
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	It is assumed that large ventilation units are installed in a separate building services room. Sound levels documented in the appendix of this certificate
Indoor air quality	Outdoor air filter F7 Extract air filter G4
Frostprotection	Frost protection required Different strategies mentioned in the appendix of this certificate

1) Available pressure difference with installed filter: 169 Pa.
Additional components (e.g. heater coil) decrease the available pressure difference accordingly.

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

Certified for air flow rates of
750 – 1500 m³/h
At an external pressure of **212 Pa** [1)]
Requirements residential buildings

$\eta_{HR,eff}$ 80%

Electric power consumption
0.37 Wh/m³

Performance number
11.6

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Category: **Heat recovery unit**
Manufacturer: **Zehnder Group Nederland B.V.**
8028 PM Zwolle, NETHERLANDS
Product name: **ComfoAir XL 3300**

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
Performance number	≥ 10
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	It is assumed that large ventilation units are installed in a separate building services room. Sound levels documented in the appendix of this certificate
Indoor air quality	Outdoor air filter F7 Extract air filter G4
Frostprotection	Frost protection required Different strategies mentioned in the appendix of this certificate

1) Available pressure difference with installed filter: 199 Pa.
Additional components (e.g. heater coil) decrease the available pressure difference accordingly.

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

Certified for air flow rates of 1100 – 2200 m³/h
At an external pressure of 236 Pa [1)]
Requirements residential buildings

$\eta_{HR,eff}$ 85%

Electric power consumption 0.41 Wh/m³

Performance number 11

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Category: **Heat recovery unit**
Manufacturer: **Zehnder Group Nederland B.V.**
8028 PM Zwolle, NETHERLANDS
Product name: **ComfoAir XL 4400**

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
Performance number	≥ 10
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	It is assumed that large ventilation units are installed in a separate building services room. Sound levels documented in the appendix of this certificate
Indoor air quality	Outdoor air filter F7 Extract air filter G4
Frostprotection	Frost protection required Different strategies mentioned in the appendix of this certificate

1) Available pressure difference with installed filter: 250 Pa.
Additional components (e.g. heater coil) decrease the available pressure difference accordingly.

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

Certified for air flow rates of
1500 – 3200 m³/h
At an external pressure of **294 Pa** [1)]
Requirements non residential buildings
(Therewith device also applicable for residential building)

$\eta_{HR,eff}$
83% (3200 m³/h)
85% (2600 m³/h)
87% (2000 m³/h)

Electric power consumption
0.42 Wh/m³

Performance number
10.5

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Category: **Heat recovery unit**
Manufacturer: **Zehnder Group Nederland B.V.**
8028 PM Zwolle, NETHERLANDS
Product name: **ComfoAir XL 6000**

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
Performance number	≥ 10
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	It is assumed that large ventilation units are installed in a separate building services room. Sound levels documented in the appendix of this certificate
Indoor air quality	Outdoor air filter F7 Extract air filter G4
Frostprotection	Frost protection required Different strategies mentioned in the appendix of this certificate

1) Available pressure difference with installed filter: 243 Pa.
Additional components (e.g. heater coil) decrease the available pressure difference accordingly.

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

Certified for air flow rates of 2000 – 4000 m³/h
At an external pressure of **308 Pa** [1)]
Requirements non residential buildings
(Therewith device also applicable for residential building)

$\eta_{HR,eff}$ = 85 %

Electric power consumption 0.42 Wh/m³

Performance number 10.6

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