CERTIFICATE

Certified Passive House Component

Component-ID 2041ch03 valid until 31st December 2025

Passive House Institute
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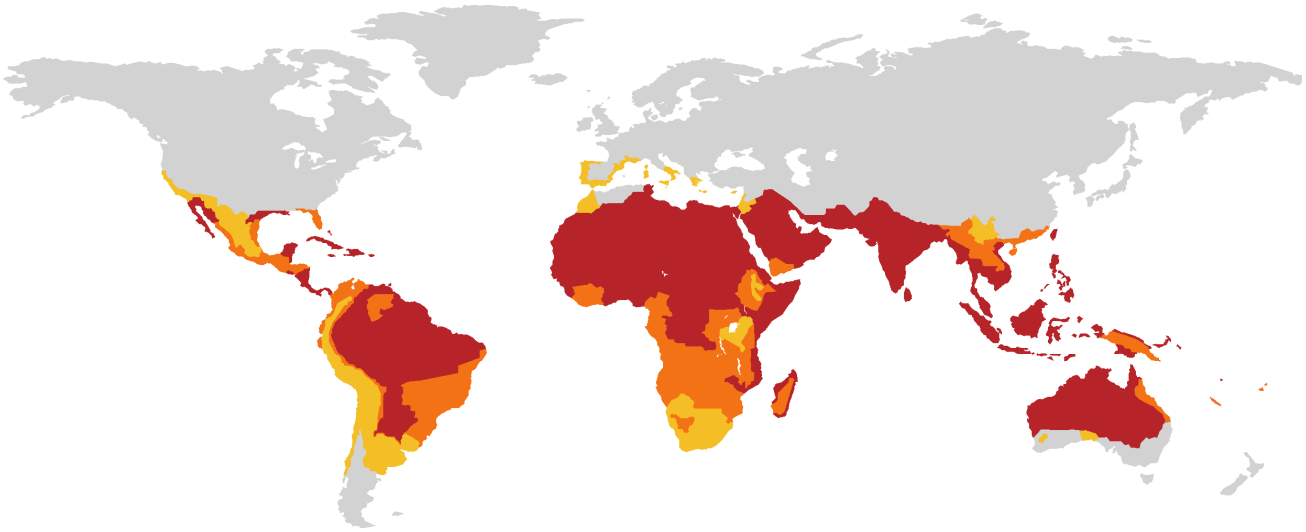

Category:	**Ventilation unit equipped with heat pump**
Manufacturer:	**Zehnder (China) Indoor Climate Co.,Ltd. China**
Product name:	**CHM 120**
Type of heat pump:	Air to air
Specification:	Airflow rate < 600 m³/h
Heat exchanger:	Recuperative with humidity recovery

This certificate was awarded based on the product meeting the following main criteria:

Ventilation

Cooling recovery	η_{HR}	≥	70 %
Specific electric power	$P_{el,spec}$	≤	0.45 Wh/m³
Leakage		<	3 %
Comfort	Supply air temperature ≥ 16.5 °C at outdoor air temperature of -10 °C		

Heat pump limit values for final energy consumption

Space cooling (dry climate)	11 kWh/(m²a)
Space cooling (humid climate)	13 kWh/(m²a)

Ventilation unit`s performance:

Airflow range
74-120 m³/h
Cooling recovery rate
$\eta_{HR,C}$ = 63 %
Specific electric power
$P_{el,spec}$ = 0.45 Wh/m³
Humidity recovery rate
η_x= 50%

Heat pump`s performance:

Cooling_DRY
7.3 kWh/(m²a)
Cooling_HUMID
10.7 kWh/(m²a)

very hot climate

CERTIFIED COMPONENT
Passive House Institute

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Part 1: Ventilation unit

Humidity recovery

In warm and humid climates, moisture recovery can significantly reduce the energy demand for active dehumidification and active cooling. In warm and humid or hot and humid climates therefore a humidity recovery of at least 60% is recommended together with active dehumidification. As an orientation, PHPP refers to moisture recovery if required.

Humidity recovery
η_x = 50%

Efficiency criterion (cooling recovery)

The cooling recovery rate is determined on the basis of laboratory measurements of the entire ventilation device with balanced mass flows on the outdoor air and exhaust air side according to following formula:

$$\eta_{HR,C} = \frac{(\theta_{ETA} - \theta_{EHA}) + \frac{P_{el}}{\dot{m} \cdot c_p}}{(\theta_{ETA} - \theta_{ODA})}$$

With

$\eta_{HR,C}$	Cooling recovery in %
θ_{ETA}	Extract air temperature in °C
θ_{EHA}	Exhaust air temperature in °C
θ_{ODA}	Outdoor air temperature in °C
P_{el}	Electric power in W
$\dot{m}$	Mass flow in kg/h
c_p	Specific heat capacity in Wh/(kg.K)

Cooling recovery
η_{HR} = 63 %

Efficiency criterion (electric power)

The overall electric power consumption of the device is measured at the test facility at an external pressure of 100 Pa (50 Pa, respectively, for the intake and outlet). This includes the general electric power consumption for operation and control.

Specific electric power
$P_{el,spec}$ = 0.45 Wh/m³

Leakage

Before starting the thermodynamic test, 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	External leakage
3.0 %	2.29 %

This ventilation unit meets the airtightness requirements.

Settings and airflow balance

It must be possible to adjust the balance of airflows at the unit itself (either between the exhaust and the outdoor airflows or between the supply and the extract airflows, if the unit is respectively placed inside or outside of the insulated thermal envelope of the building). Balancing of the airflow rates of the unit is possilbe.

- This unit is certified for airflow rates of **74-120** m^3/h.
- Balancing the air flow rates of the unit is possible.
  - ✓ The airflow volumes can be held steady automatically.
- The user should have at least following setting options:
  - ✓ Switching the system on and off.
  - ✓ Synchronized adjustment of the supply and extract airflows to basic ventilation (70-80%), standard ventilation (100%) and increased ventilation (130%) with a clear indication of the current setting.
  - ✓ Depending on the demand, the user can choose between several operating levels that can be set manually at the control unit of the operating element.
- The device has a standby power consumption of **7.0** W. The target value of 1 W was slightly exceeded. The device should be equipped with an additional external switch so that it can be disconnected from the mains, if required.
- After a power failure, the device will automatically resume operation.

Indoor air quality

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:

Outdoor air filter	Extract air filter
G4	G4

Supply air filter	Recirculation air filter
H11	G4

On the outdoor air / supply air side, a fine filter of efficiency ISO ePM1 50% (F7 according to EN 779) or better is recommended. For the exhaust air side, a filter with at least ISO Coarse 60% efficiency (G4 according to EN 779) is recommended. If no standard configuration, a filter with recommended efficiency is offered as optional equipment or accessories by the manufacturer.

Condensate drain

Under certain circumstances condensate may occur on the supply air side. A condensate drain on the supply air side is therefore recommended, especially if exhaust air temperatures < 25°C are to be expected during the cooling period. If no condensate occurs, the condensate drain must be tightly closed.

The tested unit provides a condensate connection on the supply air side. A suitable condensate drain is offered by the manufacturer as an accessory.

Bypass of the heat recovery

A summer bypass is part of the unit and can optionally be controlled automatically.
The effectiveness of the bypass for night cooling purpose of buildings was tested under following conditions:

- Exhaust air temperature 25 °C, outdoor air temperature 16 °C

The resulting temperature of supply air was 21 °C (increase of temperature of 5 K).

Part 2: Heat pump

Performance values of heat pump

Cooling

Temperature (°C)		Capacity (kW)			EER		
outside	room	On/OFF	ON/OFF Limit	Max	On/OFF	ON/OFF Limit	Max
35	25	0.61	1.10	3.45	2.24	3.51	2.88
30	25	0.63	1.14	3.58	2.56	4.01	3.29
25	25	0.64	1.16	3.64	2.87	4.50	3.69

The certified range for heat pump matches the certified range for ventilation unit. The following relation between air flow rate and floor area has been used for reference building: 35 m²/person, 30 m³/(h.person). Based on this relation, the heat pump is certified for floor area of 86-140 m². If the unit is to be used in flats with smaller floor area than that, this can result in worse performance (it very much depends on control/regulation system of the particular unit. The performance of control system was not evaluated during certification).

Air flow rate of recirculation air used during measurements in laboratory was in range of 150-550 m³/h

Dehumidification function

The certified unit is NOT controlled based on humidity.

Description of certification method

The seasonal performance of tested unit is evaluated by the Passive House Institute for representative climates (final energy consumption). This is based on the key characteristics determined for space heating, cooling and dehumidification operating modes at all test points specified in the testing regulations and stated in the certificate.

The Passive House Institute uses three reference climates, first for heating (cool,temperate), second for sensible cooling (hot and dry), and third for sensible cooling and dehumidification (hot and humid). This forms the basis for the calculation of the energy balance. Evaluation is based on final energy consumption. The limiting values for final energy consumption are 13 kWh/(m²y) for sensible/latent cooling (humid climate) and 9 kWh/(m²y) for heating. For cooling in dry climate, the limit for final energy is 11 kWh/(m²y).

Verification is based on a model Passive House with a heating demand of 15 kWh/(m²y), cooling demand for humid climate 23 kWh/(m²y) and cooling demand for dry climate 22 kWh/(m²y). All calculations are based on hourly method.