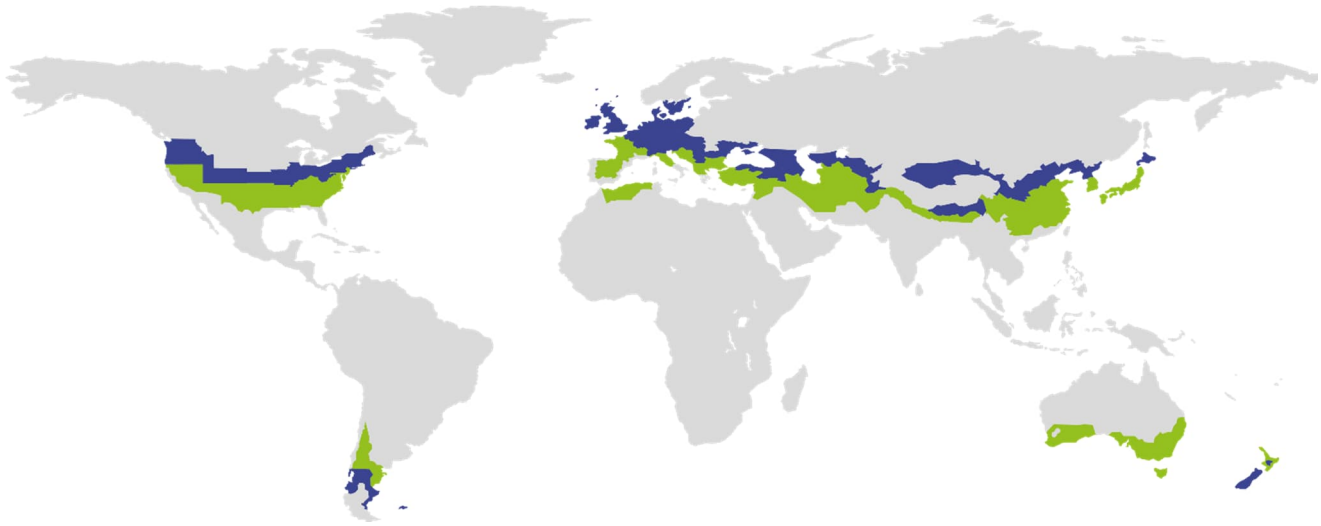
CERTIFICATE

Certified Passive House Component

Component-ID 2040ch03 valid until 31st December 2025

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
Germany



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 unit

Heat recovery rate	η_{HR}	≥	75 %
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 heating	9 kWh/(m²a)

Ventilation unit`s performance:

Airflow range
74-120 m³/h
Heat recovery rate
η_{HR} = 79 %
Specific electric power
$P_{el,spec}$ = 0.45 Wh/m³
Humidity recovery rate
η_x = 53 %

Heat pump`s performance:

Heating
7.82 kWh/(m²a)

cool, temperate climate

CERTIFIED COMPONENT
Passive House Institute

Zehnder (China) Indoor Climate Co.,Ltd.
Beijing One Plaza F18, Zhongshan Street 59, Tongzhou District, 101100 Beijing, China
☎ +861061562288 | ✉ guo@zehnder.com.cn | http://www.zehnder.com.cn |

Part 1: Ventilation unit

Passive House comfort criterion

A minimum supply air temperature of 16.5 °C is maintained at an outdoor air temperature of -10 °C.

Efficiency criterion (heat recovery rate)

The effective dry 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.

$$\eta HR,eff = \frac{(\vartheta_{ETA} - \vartheta_{EHA}) + \frac{P_{el}}{m.c_p}}{(\vartheta_{ETA} - \vartheta_{ODA})}$$

The (dry) ventilation heating load (the house is the system boundary) can be calculated using ηHR,eff based on the formula $\dot{V}_{supply\_air}$ * (1- ηHR,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 values in bracket are values for summer performance.

Heat recovery rate
79 %

Efficiency criterion (moisture recovery rate)

Moisture recovery rate
53 %

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:

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 air flow balance

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 **74-120** m³/h
- Balancing the air flow rates of the unit is possible
  - ✓ The air flow rates are hold steady automatically
- 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 several 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 **7.0** W and therefore does not comply with the target value of 1 W. The device must be equipped with an additional external switch to separate the device from the electric circuit if required.
- After a power failure the device automatically continues to operate in the mode that was set before the power failure.

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:

Outdoor air filter	Extract air filter
G4	G4

Supply air filter	Recirculation air filter
H11	G4

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

Filter replacement is recommended after an interval of 6 months. However, depending on environment in where the unit will operate, more often changes can be required.

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:
  - ✓ The frost protection of heat recovery unit is done by use of resistance direct electricity heater (rated power **1000 W**).
- Frost protection circuit for downstream hydraulic heater coils:
  - ✓ The unit is equipped with heat pump technology, which ensures the frost protection of heater coils.

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).

Bypass function

The unit is equipped with bypass of passive recovery core. The effectiveness of the bypass for night cooling purposes 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).

Performance number

Based on the measured values for the calculation of heat recovery efficiency and power consumption and on the climatic data of central Europe (Gt: 84 kKh, heating time: 5400 h/a), an average performance number at the airflow range was determined.

Performance number
0.59

Part 2: Heat pump

Performance values of heat pump

Heating

Temperature (°C)		Capacity (kW)			COP		
outside	room	On/OFF	ON/OFF Limit	Max	On/OFF	ON/OFF Limit	Max
-7	20	0.30	1.08	3.91	1.16	2.93	2.57
7	20	0.28	1.00	3.59	1.39	3.51	3.08
2	20	0.25	0.91	3.29	1.16	2.94	2.58

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 m^2/person, 30 m^3/(h.person). Based on this relation, the heat pump is certified for floor area of 86-140 m^2. 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 m^3/h.

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/(m^2y) for sensible/latent cooling (humid climate) and 9 kWh/(m^2y) for heating. For cooling in dry climate, the limit for final energy is 11 kWh/(m^2y).

Verification is based on a model Passive House with a heating demand of 15 kWh/(m^2y), cooling demand for humid climate 23 kWh/(m^2y) and cooling demand for dry climate 22 kWh/(m^2y). All calculations are based on hourly method.