CERTIFICATE- preliminary

Certified Passive House Component

Component-ID 1985vl03 valid until 31st December 2024

Passive House Institute
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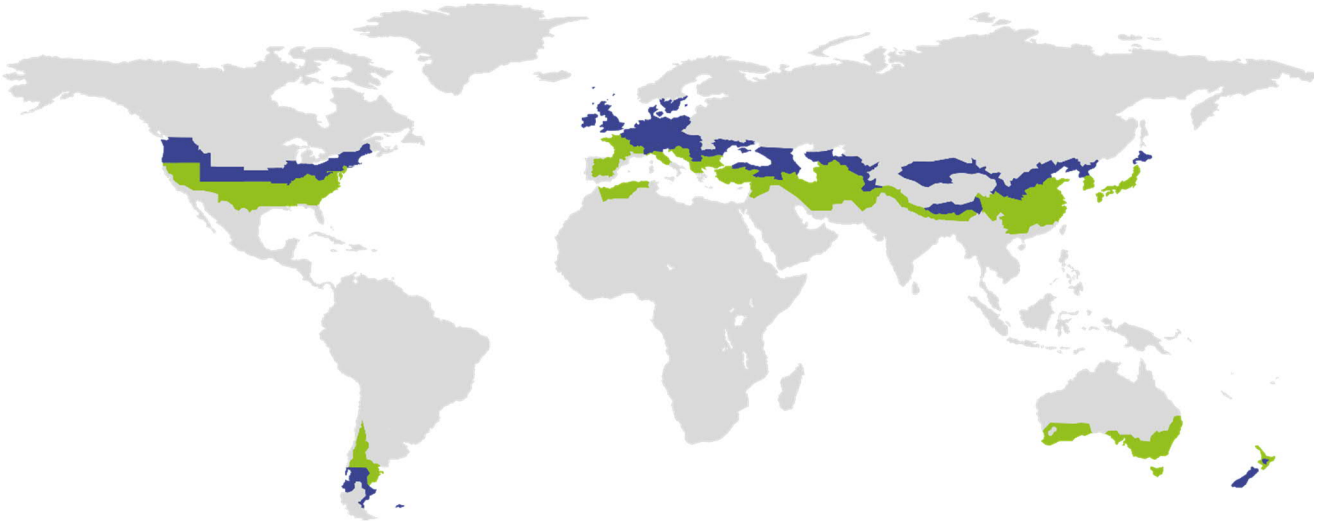

Category:	**Air handling unit with heat recovery**
Manufacturer:	**Nuaire**
	England
Product name:	**XPC55**
Specification:	Airflow rate > 600 m³/h
Heat exchanger:	Recuperative

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

Heat recovery rate	η_{HR}	≥	75 %
Specific electric power	$P_{el,spec}$	≤	0.45 Wh/m³
Leakage		<	3 %
Performance number		≥	10
Comfort	Supply air temperature ≥ 16.5 °C at outdoor air temperature of -10 °C		

Airflow range
590-1377 m³/h
at an external pressure of
250 Pa [1)]
Requirements non-residential buildings (Therefore also applicable for residential buildings)
Heat recovery rate
η_{HR} = 85 %
Specific electric power
$P_{el,spec}$ = 0.43 Wh/m³
Performance number
10.1 [2)]

[1)] The real available external pressure with installed filters makes **248 Pa**. Additional components decrease the available pressure difference accordingly.

[2)] At a minimum airflow a performance number of 9.6 is achieved.

cool, temperate climate

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Passive House comfort criterion

At an outdoor air temperature of -10 °C a minimal supply air temperature of 16.5 °C is maintained at the upper airflow rate. At middle and lower airflow rates the comfort criterion might not be met. Therefore for operation at middle and lower airflow rates the installation of a supply air heater coil is recommended.

Efficiency criterion (heat recovery rate)

The effective heat recovery rate is measured at a test facility using balanced mass flows of the outdoor and exhaust air. The boundary conditions for the measurement are documented in the testing procedure.

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

With

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

Heat recovery rate
η_{HR} = 85 %

Airflow range and external pressure difference

The operational range of the device results from the efficiency criterion (see below). As per the certification criteria for ventilation units > 600 m³/h the applicable pressure differences vary with the nominal range of operation (as declared by the producer) and the application (residential or non-residential building).

The external pressure difference includes all pressure losses of the ventilation system caused by components apart from the tested unit (consisting of casing, heat exchanger and fans). If filters are installed inside of the unit, their pressure losses are to be reduced accordingly. The average filter pressure drop of an operational filter is assumed to be 30 % higher than that of the clean filter.

- According to the certification requirements for non-residential buildings the airflow range achieves **590-1377 m³/h** at an external pressure difference of **250 Pa**. The available pressure difference with installed filters, internal electrical preheater and shut-off dampers is about **248 Pa**.

Efficiency criterion (electric power)

The overall electrical power consumption of the device including controllers was measured at the test facility as per the requirements for non-residential buildings at an external pressure difference of 250 Pa.

Specific electric power
$P_{el,spec}$ = 0.43 Wh/m³

- The overall electrical power consumption of the device at an external pressure difference of 298 Pa does not exceed 0.45 Wh/m³ at the middle and upper airflow rate. At minimum flow the nominal value of 0.45 Wh/m³ is slightly exceeded.

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
10.1

- At minimum flow a performance number of only 9.6 is achieved.

Leakage

The airtightness of the unit is tested for under pressure and over pressure before the thermodynamic test is conducted. As per the certification criteria the leakage airflows must not exceed 3 % of the average airflow of the device's operating range.

Internal leakage	External leakage
1.93 %	2.44 %

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). Availeable operation modes are explained in detail in the operation manual.

- Balancing of the airflow rates of the unit is possilbe.
  - ✓ The factory fitted control includes variable speed control for the supply and extract fans, with independent minimum, maximum and offset adjustment for accurate commissioning.
- The standby power consumption of this device makes 22.0 W. The target value of 1 W was 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.

Acoustical testing

A ventilation unit > 600 m³/h is assumed to be operated in an installation room, for which sound limits are defined in the applicable regulations. For this device, the following sound level values have been derived from the measurements at an airflow rate 1417 m³/h:

Casing	Duct			
	Outdoor	Supply	Extract	Exhaust
63.7 dB(A)	63.9 dB(A)	74.3 dB(A)	63.9 dB(A)	74.6 dB(A)

- For complying with the required sound level in the supply air and extract air rooms, dimensioning of a suitable silencer is required for the specific project on the basis of the measured sound level.

Indoor air quality

Instructions for changing of the air filters are documented in the operation manual. This device is equipped with following filter qualities:

Outdoor air filter	Extract air filter
F7	G4

If the device is not operated during summer, the filter should be replaced before the next operation. The producer of the device has to ensure that based on the latest findings, room air hygiene can be maintained by means of integrated or obligatory components.

For the operation of ventilation systems a strategy for avoiding permanent moisture penetration of the outdoor air filter needs to be considered. The strategies are mentioned in the full report and can be implemented through installation of either an additional component of the ventilation device or on the ventilation site system.

Frost protection

Appropriate measures should be taken to prevent the heat exchanger and optional downstream hydraulic heater coil from getting damaged by frost during extreme winter temperatures (−15 °C). It must be ensured that the unit's ventilation performance is not affected during frost protection cycles.

- Frost protection of the heat exchanger:
  - ✓ Frost protection is provided according to the client`s specification. LPHW and Electric frost coils are available as ancillaries, typically fitted with independent thermostatically controlled activation.
  - ✓ Should the internal temperature of the unit fall below a value defined in the commissioning variables, the control will override all heating/cooling logic to open the LPHW or CW control valves, if fitted. The supply fan will also stop and the appropriate frost protection software module will enter an alarm state.
- Frost protection of downstream hydraulic heater coils:

  Where product variants include LPHW or CW coils, the supplied unit control will first trigger ancilliary frost protection systems (if fitted), monitor, and only shut down the appliance if +5 deg C conditions are not met.

  The appliance tested did not include this functionality.

  It should be noted that, due to free circulation, cold air can also lead to freezing – even when the fans are stationary. This can only be ruled out if the air duct is closed (by means of a shut-off flap).

  LPHW=Low pressure hot water CW= Chilled water

Bypass of the heat recovery

The heat recovery can also be controlled by the shutting-off of the heat exchanger.

The effectiveness of this appliance's shutoff for night-cooling of buildings has not been tested within the scope of this testing.

According to information provided by producer, the default control of the bypass is based on supply air temperature. The heat exchange bypass damper/rotor operates by calculating the supply air temperature based on the return air temperature, the outside air temperature and the heat exchanger efficiency.