CERTIFICATE

Certified Passive House Component

Valid until 31st December 2025

Passive House Institute
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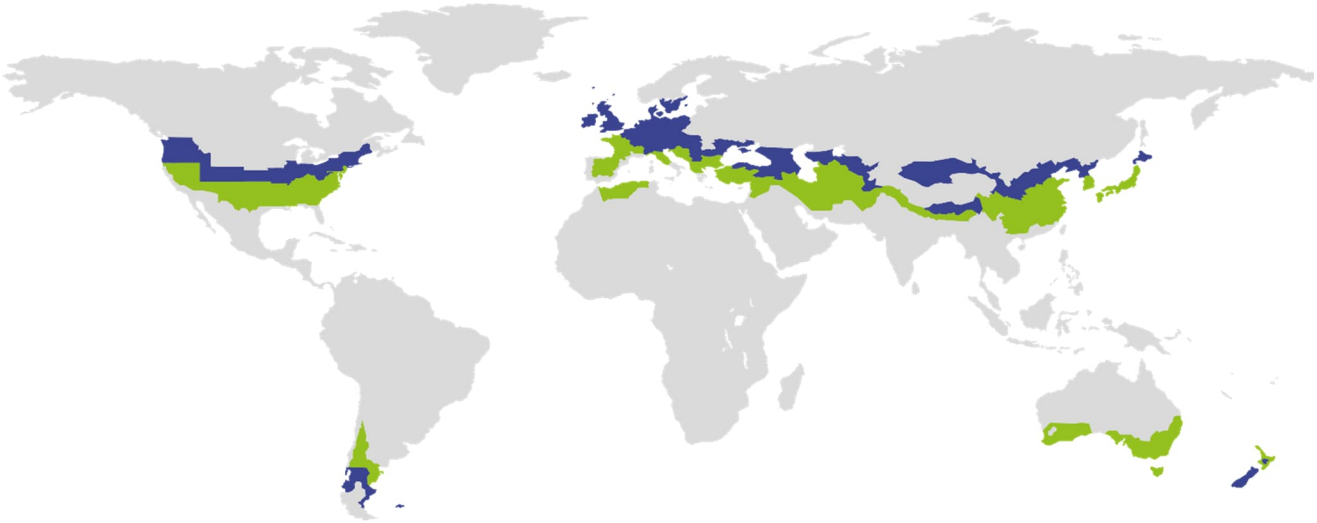

Category:	**Air handling unit with heat recovery**
Manufacturer:	**Nuaire**
	United Kingdom
Product name:	**Ventilation unit series**
	BPS T
Specification:	Airflow rate > 600 m³/h
Heat exchanger:	Regenerative

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 %
Comfort	Supply air temperature ≥ 16.5 °C at outdoor air temperature of -10 °C [3]		

Airflow range
2370-14400 m³/h at an external pressure of 308-388 Pa [1]
Heat recovery rate
η_{HR} ≥ 79 % [2]
Specific electric power
$P_{el,spec}$ ≤ 0.44 Wh/m³
Humidity recovery
η_x ≥ 37 %
Performance number
> 10

[1] The pressure drop of filters is covered in the listed external pressure. Additional components decrease the available pressure difference accordingly.

[2] For residential use a heat recovery rates of 82% and better can be applied.

[3] Installation of an additional post heater is necessary.

cool, temperate climate

CERTIFIED COMPONENT

Passive House Institute

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Component ID	Unit model	Airflow range Min m³/h	Airflow range Max m³/h	η_x [2] %	External pressure Pa	Actual available external pressure [1] Pa	Specific electric power %	η_{HR} %	$\eta_{HR,res.}$ [2] %	Performance number -
2290vl03	BPS T 12	2370	3960	37	308	255	0.42	83	86	10.3
2291vl03	BPS T 17	3000	5040	37	322	261	0.44	84	87	10.2
2219vl03	BPS T 22	3060	5500	37	328	275	0.44	84	87	10.5
2220vl03	BPS T 32	3540	9140	37	359	305	0.42	83	86	10.5
2221vl03	BPS T 42	7200	14400	37	388	340	0.30	79	82	13.4

Table 1: Certified values for each unit model.

1) Filter pressure losses have been deducted.
2) the energy saved by moisture recovery through evaporation from building components was taken into account as a bonus on the heat recovery rate. For use in residential buildings, the stated heat recovery rates can be applied.

Humidity recovery

Indoor air humidity can be increased by using systems with moisture recovery in cool, temperate climate, especially during winter. Exemplary measurements showed a moisture recovery of 37%.

Passive House comfort criterion

The device is not equipped with either a preheater coil or post heater. In order to maintain comfortable supply air temperatures at outdoor temperatures of -10°C, the installation of an additional post heater is required. Pre and Post heaters are available as standard ancillary items.

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.

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

With

η_{HR} Heat recovery rate 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)

- The heat recovery rates for each model of the unit are listed in Table 1.

In residential use, humidity recovery can have a positive effect on the heating demand by increasing the indoor air humidity. These higher humidity levels will reduce evaporation from building elements and furniture during the heating period and thus have a positive effect on the building's heating demand. In order to account for this effect, the heat recovery efficiency is increased by a certain percentage, depending on the achieved level of moisture recovery. ηHR,res (table 1) can therefore be applied for residential use.

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 m^3/h the applicable pressure differences vary with the nominal range of operation (as declared by the producer).

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.

- The airflow ranges and available external pressures for each model of the unit are listed in Table 1.

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 308-388 Pa.

- The specific electric powers for each model of the unit are listed in Table 1.

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.

- The performance numbers for each model of the unit are listed in Table 1.

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.

- These appliances meet 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). Availeable operation modes are explained in detail in the operation manual.

- Balancing of the airflow rates of the unit is possilbe.
- The standby power consumption of these devices makes 25 W.
- 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. The total acoustic power levels were determined by producer for each model of the units at an upper limit of the airflow range. The provided values have been verified by an exemplary measurement.

Unit model	Airflow range		Total acoustic power level				
				Duct			
	Min	Max	Casing	ODA	SUP	ETA	EHA
	m³/h	m³/h	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
Nuaire BPS T 12	2370	3960	52	56	72	56	72
Nuaire BPS T 17	3000	5040	55	59	75	58	74
Nuaire BPS T 22	3060	5500	60	67	79	65	78
Nuaire BPS T 32	3540	9140	55	60	74	59	74
Nuaire BPS T 42	7200	14400	62	65	81	64	81

Tabele 2: Acoustic power levels at an upper limit of the airflow range.

- 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
ISO ePM1 50%	ISO ePM10 60%

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

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 heating coil from freezing damage 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:
  - ✓ This series of ventilation units is equipped with rotor heat exchangers. There is no need for any additional frost protection strategy down to an outdoor air temperature of -15 °C.
- Frost protection of downstream hydraulic heater coils:
  - ✓ In order to protect a downstream hydraulic heater coil, the device switches off as soon as the supply air temperature reaches 5°C.

  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 avoided if the air duct is closed (by means of a shutoff damper).

Bypass of the heat recovery

The units are equipped with a 100% summer bypass facility (the bypass is achieved by stopping rotation of the thermal wheel). The effectiveness of bypass for night cooling of buildings has not been investigated within the scope of this testing.