Certificate

Certified Passive House Component

For cool, temperate climates, valid until 31 December 2018

Passive House Institute
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GERMANY

Category: **Heat recovery unit**

Manufacturer: **Menerga GmbH**
45472 Mülheim an der Ruhr, GERMANY

Product name: **Adconair 76 03 01 – 76 37 01**

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	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 M5
Frost protection	Frost protection required, see appendix of this certificate

1) Available pressure difference with installed filters.
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 1000-15000 m³/h
At an external pressure of **265 - 390 Pa** [1)]
Requirements non residential buildings

(Therewith device also applicable for residential building)

$\eta_{HR,eff}$ ≥ 88%

Electric power consumption ≤ 0.45 Wh/m³

Performance number ≥ 10

CERTIFIED COMPONENT
Passive House Institute

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Appendix of the certificate Menerga GmbH, Adconair 76 03 01 – 76 37 01

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Certificate ID	Type designation	Testing requirement	Operational range		External pressure	**Available external pressure[1)]**	**Electrical efficiency**	**HR**	**Performance number**
			min	max					
			m³/h	m³/h	Pa	Pa	Wh/m³	%	-
0845vl03	760301	Non-residential	1000	2000	265	228	0,45	88	10
0846vl03	760501	Non-residential	1200	2800	286	250	0,44	89	10
0847vl03	760601	Non-residential	1000	3000	290	255	0,45	91	10
0502vl03	761001	Non-residential	1500	4500	316	281	0,42	93	11
0848vl03	761301	Non-residential	2000	6000	333	299	0,43	91	11
0849vl03	761601	Non-residential	3000	7000	343	312	0,43	91	11
0850vl03	761901	Non-residential	3200	8800	359	326	0,43	94	11
0851vl03	762501	Non-residential	6000	10000	365	337	0,44	94	11
0852vl03	762901	Non-residential	8500	11500	376	349	0,45	94	11
0853vl03	763701	Non-residential	8000	15000	390	363	0,45	94	11

Table 1: Results of the certified devices 1) less assumed filter pressure drops

Passive House comfort criterion
A minimum supply air temperature of 16.5 °C at an external air temperature of -10 °C can only be maintained if an adequate frost protection system with pre or post heating coils is installed. The controller comes with corresponding algorithms.

Effective heat recovery rate

The effective dry heat recovery efficiency is measured at the test facility with balanced mass flows on the external air/extract air side. The boundary conditions for the measurement are defined in the testing procedure.

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

The (dry) ventilation heating load (building is the system boundary: Plus Infiltration) can be calculated:

$$Q_{Lüftung,trocken} = \left(100\,\% - \eta_{WRG,teff}\right) \cdot 0{,}34\,\Delta\vartheta$$

In case of condensation the heat recovery rate usually is higher. For the thermodynamic testing air conditions are chosen which exclude condensation. The heat recovery rates of the tested devices are shown in Table 1.

Air flow 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 of the clean filter.

The device was tested as per the requirements for non-residential buildings. The external pressures and the operational ranges are shown in Table 1.

Efficiency criterion (power consumption)

The overall electrical power consumption of the device including controllers was tested as per the requirements of non-residential buildings at an external pressure difference of 265 - 390 Pa. The measurements lead to average values of:

- ✓ **≤ 0.45 Wh/m³**

Based on the measured values for the determination of the heat recovery rate, the power consumption and the climatic data of middle Europe (Gt: 84 kKh, heating time: 5400 h/a), the average performance number for the range of operation was determined:

- ✓ **Performance number: ≥ 10**

Airtightness and insulation

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

Following leakage rates were measured:

Internal leakage: 2.3%

External leakage: < 1%

The airtightness requirements are fulfilled.

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Balancing and adjustability

The ventilation unit must provide the opportunity to adjust the balance between the exhaust and outdoor air flow (unit located inside of the thermal envelope) or the extract and supply air flow (unit located outside of the thermal envelope). Possible operation modes are explained in detail in the operation manual.

- Balancing the air flow rates of the unit:
  - ✓ automatic (measurement of pressure differences at fan injection nozzle)
  - ✓ manually (by the installer)
- The standby consumption of this ventilation appliance (only controller is active) is 45 W.
- After a power failure the device automatically resets into its last operation mode.

Sound Protection

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 manufacturer's design software provides the following sound levels that have been verified on different devices by an independent test laboratory:

Certificate ID	Type designation	Testing requirement	Operational range		Sound power level				
			min	max	Device	ODA	SUP	ETA	EHA
			m³/h	m³/h	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
0845vl03	760301	Non-residential	1000	2000	57	64	78	72	69
0846vl03	760501	Non-residential	1200	2800	55	62	78	72	66
0847vl03	760601	Non-residential	1000	3000	56	62	78	72	67
0502vl03	761001	Non-residential	1500	4500	61	69	82	77	72
0848vl03	761301	Non-residential	2000	6000	61	68	81	76	73
0849vl03	761601	Non-residential	3000	7000	57	70	85	80	73
0850vl03	761901	Non-residential	3200	8800	62	70	81	76	74
0851vl03	762501	Non-residential	6000	10000	63	70	84	79	75
0852vl03	762901	Non-residential	8500	11500	65	70	87	82	77
0853vl03	763701	Non-residential	8000	15000	65	71	86	81	78

Table 2: Sound power levels at maximum fresh air flow rate

Indoor air quality

Informations about the filter exchange are given in the manual. The device is equipped with following filters:

- ✓ Outdoor Air filter F7
- ✓ Extract Air filter M5

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

For the operation of the ventilation system a strategy must be provided avoiding permanent moisture penetration of the outdoor air filter. As one possible strategy the recirculation of supply air into the outdoor air should be mentioned. Further strategies are mentioned in the certification report.

Frost protection

Appropriate measures must be provided in order to avoid icing inside the heat exchanger and freezing of the hydraulic post-heater coil during winter at extreme temperatures (-15 °C). The actual function of the ventilation device must not be impaired by the regular operation of the frost protection system. A sufficient air supply must be provided with balanced air flows. Infiltration due to excess extract air would cause an unacceptable heat load. For the frost protection of the hydraulic post-heater coil the failure of a pre-heater coil or the exhaust air fan needs to be considered.

- Frost protection of the heat exchanger
  - ✓ The device series Adconair 76 comes standard with an appropriate defrost function for the heat exchanger. If a temperature of <0 °C is measured in the exhaust air area of the heat exchanger and if the extract air temperature drops below the dew point, a periodic defrost interval is driven by partially opening the HR bypass damper. Higher heating requirements of the heater must possibly be considered when designing the heating supply in order to meet the comfort criterion.

  It should be noted that free circulation of cold air can cause freezing if fans stand still. Hence air ducts should closed with shut-off flaps.

Bypass of heat recovery

The heat recovery system is equipped as standard with HR bypass dampers in both air ways. If both HR bypass dampers are fully open, no heat recovery takes place. Hence the device series is suitable for concepts with free cooling and free night cooling. The effectiveness of free cooling was not analysed within the scope of the tests.

Abbreviations: ODA = Outdoor air, EHA = Exhaust air, SUP = Supply air, ETA = Extract air