Certificate

Certified Passive House Component
For cool, temperate climates, valid until 31 December 2018

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
GERMANY

Category: **Heat recovery unit**
Manufacturer: **FläktGroup Deutschland GmbH**
44625 Herne, GERMANY
Product name: **Ventilation units serie**
COM4plus CL10–CL70

This certificate was awarded based on the following criteria:

Thermal comfort	$\theta_{supply\ air} \geq 16.5$ °C [2] 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	Interior and 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 [3]
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 at least F7 Extract air filter at least M5
Frost protection	Frost protection is not needed. See an appendix of this certificate.

Certified for air flow rates of 1400-9900 m³/h at an external pressure of 274-364 Pa [1]

Requirements non-residential buildings

(thereby suitable also for application in residential building)

$\eta_{HR,eff} \geq 78$ %

Electric power consumption ≤ 0.45 Wh/m³ [4]

Performance number ≥ 9 [5]

1) Available external pressure without installed filters. Additional components (e.g. heating coils) decrease the available pressure difference accordingly.
2) Installation of an additional post heater is necessary.
3) Only with optional pressure measuring device.
4) At the lower airflow rate can be overstepped.
5) The recommended value was not achieved.

Further information can be found in the appendix of this certificate.

CERTIFIED COMPONENT
Passive House Institute

www.passivehouse.com

Appendix of the certificate

FläktGroup Deutschland GmbH, Ventilation units serie COM4plus CL10–CL70

Manufacturer FläktGroup Deutschland GmbH
Südstraße 48, 44625 Herne, GERMANY
Tel: +49 (0)2325 - 468 00
E-Mail: sales.de@flaktgroup.com, www.dencohappel.com

Certificate ID	Model	Testing requirements	Air flow range		External pressure	Available external pressure[1)]	**Elektro-efficiency**	**HR_{Rate}**	**Performance number**
			Min	Max					
			m³/h	m³/h	Pa	Pa	**Wh/m³**	**%**	-
0998vl03	CL10	Non-residential	1700	2300	274	224	**0,44**	**79**	**9,3**
0999vl03	CL20	Non-residential	1400	2900	288	238	**0,45**	**80**	**9,1**
1000vl03	CL30	Non-residential	2300	3700	304	272	**0,45**	**82**	**9,2**
1001vl03	CL40	Non-residential	2600	6500	338	296	**0,45**	**78**	**9,0**
1002vl03	CL50	Non-residential	5900	6600	339	304	**0,45**	**80**	**9,2**
1003vl03	CL60	Non-residential	6490	9000	359	310	**0,45**	**80**	**9,1**
1004vl03	CL70	Non-residential	6450	9900	364	328	**0,45**	**81**	**9,3**

Table 1: Certified parameters of ventilation units. 1) Excluding pressure drops of filters

Passive House comfort criterion

A minimum supply air temperature of 16.5 °C is maintained at an outdoor air temperature of -10 °C by using of a suitable post-heating element.

Effective heat recovery rate

The effective dry heat recovery rate is determined at the test facility using balanced mass flows on the outdoor air and extract air side and partly determined through a design software. This software was verified on the base of laboratory measured data for two selected units in advance. The boundary conditions for the calculation were taken from the documents relating to the testing procedure. The rotor heat exchanger is equipped with a purge sector (2x 5°).

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

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

$$\dot{Q}_{Vent,dry} = \dot{V}.(100\% - \eta_{HR}).0{,}34.\Delta\theta$$

In case of condensation the heat recovery rate is usually higher. This case is intentionally not considered here. The heat recovery rates for each model of the units are listed in Table 1.

Appendix of the certificate

FläktGroup Deutschland GmbH, Ventilation units serie COM4plus CL10–CL70

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 that of the clean filter.

The air flow ranges and available external pressures for each model of the units are listed in Table 1.

Efficiency criterion (power consumption)

The overall electrical power consumptions of the devices including controllers were determined as per requirements at a corresponding external pressure differences for each model of the unit.

Based on the calculated values 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 corresponding air flow range was determined.

The overall electric power consumptions at the corresponding external pressure differences as well as the performance numbers for each model of the units are listed in Table 1.

Airtightness and insulation

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 air flows must not exceed 3 % of the average air flow of the device's operating range.

These appliances meet the airtightness requirements.

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 these units is possible:
  - ✓ Automatically (by measuring of pressure differences at the fan's injections)
  - ✓ Manually (by the service technician)
- The standby consumption of this ventilation appliance of 32 W is regarded as high. In order to avoid unnecessary standby losses, a manual switch for complete disconnection of the unit from the power supply should be installed.
- After a power failure, the device automatically continues to operate in the mode that was set before the power failure.

Appendix of the certificate

FläktGroup Deutschland GmbH, Ventilation units serie COM4plus CL10–CL70

Acoustic 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 air flow range.

The results can be found in Table 2.

Model	Testing requirements	Air flow range		Total acoustic power level				
		Min	Max	Casing	ODA	SUP	ETA	EHA
		m³/h	m³/h	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
CL10	Nichtwohnbau	1700	2300	55	62	71	62	76
CL20	Nichtwohnbau	1400	2900	51	70	81	69	81
CL30	Nichtwohnbau	2300	3700	51	67	78	67	78
CL40	Nichtwohnbau	2600	6500	55	69	80	68	79
CL50	Nichtwohnbau	5900	6600	59	66	81	64	81
CL60	Nichtwohnbau	6490	9000	57	74	85	73	85
CL70	Nichtwohnbau	6450	9900	55	69	80	69	80

Table 2: Acoustic emissions at the upper limit of the air flow 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

This device is equipped with following filter qualities:

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

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.

Appendix of the certificate

FläktGroup Deutschland GmbH, Ventilation units serie COM4plus CL10–CL70

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 circuit for 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 circuit for downstream hydraulic heater coils
  - ✓ As default, this series of ventilation units is not equipped with frost protection for downstream hydraulic heater coils. In order to achieve this function, the unit has to be additionally equipped with a thermostat in a supply air stream which ensures that both fans are switched off in case the outdoor temperature drops below 5 °C.

  It should be noted that cold air can also lead to freezing 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 of the heat recovery

The heat recovery can be interrupted by suspending the rotation of the heat exchanger.

Abbreviations

- ODA = Outdoor air
- EHA = Exhaust air
- SUP = Supply air
- ETA = Extract air