

CERTIFICATE

Certified Passive House Component

Valid until 31st December 2020

Passive House Institute
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Category: **Air handling unit with heat recovery**
Manufacturer: **Swegon Operations AB**
Sweden
Product name: **Ventilation unit series**
GOLD RX (Aluminium Rotor)

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}	\geq	75 %
Specific electric power	$P_{el,spec}$	\leq	0.45 Wh/m ³
Leakage		$<$	3 % ^{1) 2)}
Performance number		\geq	10
Comfort			Supply air temperature \geq 16.5 °C at outdoor air temperature of -10 °C

Airflow range
540-9000 m ³ /h at an external pressure of 222-359 Pa Requirements non-residential buildings (Therefore also applic- able for residential buildings)
Heat recovery rate
$\eta_{HR} \geq 84 \%$
Specific electric power
$P_{el,spec} 0.45 \text{ Wh/m}^3$ ³⁾

¹⁾ Carry-over from extract to supply air side.

²⁾ Due to heat exchanger condition the risk of carry-over from extract air to supply air side exists. In order to avoid carry over into the supply air side, pressure conditions in the device must be set as given by the manufacturer.

³⁾ At the lower airflow rate might be exceeded.



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Component ID	Unit model	Testing requirements	Airflow range		External pressure Pa	Specific electric power ¹⁾ Wh/m ³	Heat recovery rate %
			Min m ³ /h	Max m ³ /h			
0558vI03	04	Non-residential	540	1000	222	0.45	85
0559vI03	05	Non-residential	540	1000	222	0.45	85
0560vI03	07	Non-residential	540	1820	265	0.45	86
0561vI03	08	Non-residential	1080	1780	259	0.45	84
0562vI03	11	Non-residential	1080	2465	281	0.45	85
0563vI03	12	Non-residential	1800	2600	281	0.45	84
0564vI03	14	Non-residential	1800	4285	316	0.45	84
0565vI03	20	Non-residential	2520	4000	308	0.44	84
0566vI03	25	Non-residential	2520	5500	328	0.45	84
0567vI03	30	Non-residential	3600	4000	308	0.44	84
0568vI03	35	Non-residential	3600	7500	347	0.45	85
0569vI03	50	Non-residential	5400	9000	359	0.45	85

Table 1: Certified values for each unit model.

¹⁾ At the lower limit of the air flow range the nominal value of 0.45 Wh/m³ might be exceeded.

The efficiency values electric power consumption and heat recovery rate have been determined under standard external pressure differences as shown in the table. The project specific calculation with the manufacturer's software based on real project data (especially respecting the external pressure difference) could differ from the values given in the table 1.

Passivhaus-Behaglichkeitskriterium

Eine minimale Zulufttemperatur von 16,5 °C wird bei einer Außenlufttemperatur von ca. -10,0 °C unter Verwendung einer geeigneten Nachheizung eingehalten.

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.

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 $> 600 \text{ m}^3/\text{h}$ 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 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 222-359 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 kWh, 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). Available operation modes are explained in detail in the operation manual.

- Balancing of the airflow rates of the unit is possible.
 - ✓ The airflow volumes can be held steady automatically (by measurement of pressure differences at the fan inlet nozzle, only available if pressure gauges are installed and the control system is equipped with the additional mode).
- The standby power consumption of this device makes 32 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. The total acoustic power levels were determined by producer for each model of the units at an upper limit of the airflow range.

Unit model	Testing requirements	Airflow range		Total acoustic power level				
		Min	Max	Casing	Kanal			
		m ³ /h	m ³ /h		ODA	SUP	ETA	EHA
				dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
GL10	Non-residential	1700	2300	55	62	71	62	76
GL20	Non-residential	1400	2900	54	70	81	69	81
GL30	Non-residential	2300	3700	54	67	78	67	78
GL40	Non-residential	2600	6500	55	69	80	68	79
GL50	Non-residential	5900	6600	59	66	81	64	81
GL60	Non-residential	6490	9000	57	74	85	73	85
GL70	Non-residential	6450	9900	55	69	80	69	80

Table 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
F7	F5

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 ($-15\text{ }^{\circ}\text{C}$). 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 $-15\text{ }^{\circ}\text{C}$.

- Frost protection of 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 $5\text{ }^{\circ}\text{C}$.

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 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.