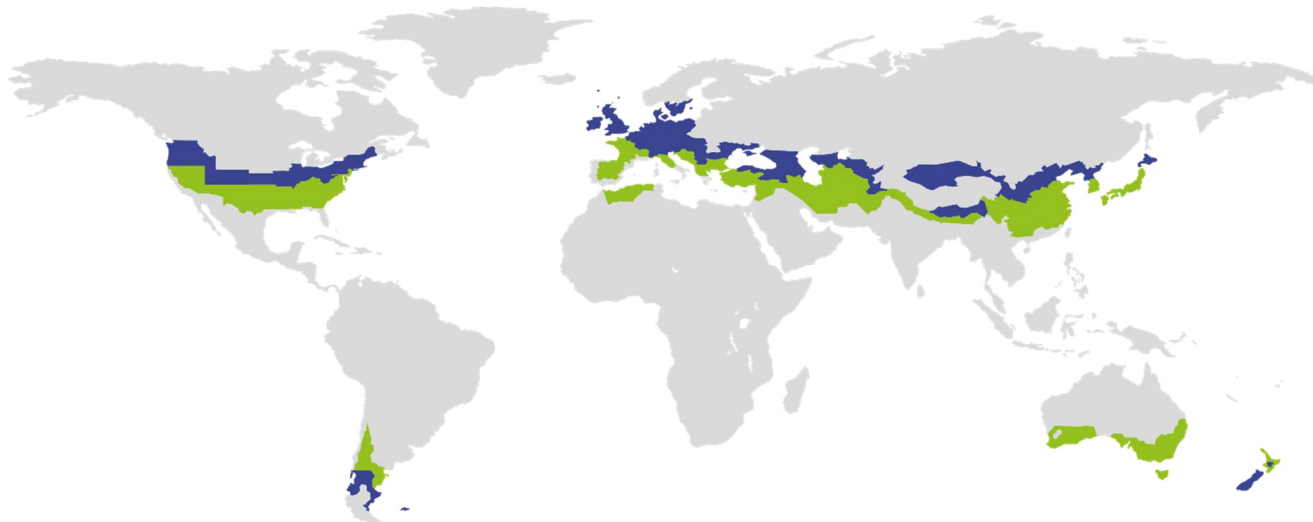


CERTIFICATE

Certified Passive House Component

Valid until 31st December 2023

Passive House Institute
Dr. Wolfgang Feist
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Germany



Category: **Air handling unit with heat recovery**
Manufacturer: **Swegon Operations AB**
Sweden
Product name: **Ventilation unit series**
GOLD F RX STE Aluminium
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 %
Performance number		\geq	10
Comfort			Supply air temperature \geq 16.5 °C at outdoor air temperature of -10 °C ²⁾

Airflow range
540-11000 m ³ /h at an external pressure of 238-371 Pa ¹⁾ Requirements non-residential buildings (Therefore also applic- able for residential buildings)
Heat recovery rate
$\eta_{HR} \geq 83 \%$
Specific electric power
$P_{el,spec} \leq 0.45 \text{ Wh/m}^3$
Performance number
> 9 ³⁾

¹⁾ The pressure drop of filters is covered in the listed external pressure. Additional components (e.g. heating coil) decrease the available external pressure accordingly.

²⁾ Installation of an additional post heater is necessary.

³⁾ The recommended value of 10.0 was not reached for all device sizes.

cool, temperate climate



**CERTIFIED
COMPONENT**

Passive House Institute

Component ID	Unit model	Testing requirements	Airflow range		External pressure Pa	Actual available external pressure ¹⁾ Pa	Specific electric power Wh/m ³	Heat recovery rate %	Performance number -
			Min m ³ /h	Max m ³ /h					
2008vl03	GOLD 04	Non-residential	540	1300	238	194	0.45	83	9.4
2009vl03	GOLD 05	Non-residential	540	1180	233	194	0.44	83	9.8
2010vl03	GOLD 07	Non-residential	540	1800	259	220	0.41	84	10.6
2011vl03	GOLD 08	Non-residential	1080	2000	265	221	0.45	83	9.4
2012vl03	GOLD 11	Non-residential	1080	2740	286	235	0.45	84	9.5
2013vl03	GOLD 12	Non-residential	1800	3000	290	236	0.45	83	9.4
2014vl03	GOLD 14	Non-residential	1800	4510	322	272	0.45	83	9.4
2015vl03	GOLD 20	Non-residential	2520	4500	316	266	0.44	83	9.7
2016vl03	GOLD 25	Non-residential	2520	5910	333	294	0.42	83	10.1
2017vl03	GOLD 30	Non-residential	3600	5000	322	290	0.43	84	10.0
2018vl03	GOLD 35	Non-residential	3600	8330	355	312	0.43	84	10.1
2019vl03	GOLD 40	Non-residential	5400	6500	338	305	0.45	85	9.8
2020vl03	GOLD 50	Non-residential	5400	10000	365	314	0.42	84	10.2
2021vl03	GOLD 70	Non-residential	8280	11000	371	340	0.44	85	9.8

Table 1: Certified values for each unit model. ¹⁾ Pressure drop of filters were taken into account.

Passive House comfort criterion

A supply air temperature of 16.5 °C is maintained at an outdoor air temperature of about -10.0 °C by use of a suitable post-heating element.

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 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 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 238-371 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 using the fan inlet pressure based standard flow control function provided in the control)
- The standby power consumption of these devices makes 15 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.

Unit model	Testing requirements	Airflow range		Total acoustic power level		
		Min	Max	Casing dB(A)	Duct	
		m ³ /h	m ³ /h		ETA dB(A)	SUP dB(A)
GOLD 04	Non-residential	540	1300	50	58	73
GOLD 05	Non-residential	540	1180	49	57	73
GOLD 07	Non-residential	540	1800	53	62	75
GOLD 08	Non-residential	1080	2000	52	60	75
GOLD 11	Non-residential	1080	2740	56	64	78
GOLD 12	Non-residential	1800	3000	55	63	79
GOLD 14	Non-residential	1800	4510	59	68	82
GOLD 20	Non-residential	2520	4500	56	65	79
GOLD 25	Non-residential	2520	5910	58	68	81
GOLD 30	Non-residential	3600	5000	57	66	80
GOLD 35	Non-residential	3600	8330	60	69	82
GOLD 40	Non-residential	5400	6500	59	66	80
GOLD 50	Non-residential	5400	10000	60	69	82
GOLD 70	Non-residential	8280	11000	60	68	82

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

This unit is to be equipped with the following filter qualities:

Outdoor air filter	Extract air filter
ISO ePM1 50% (F7)	ISO Coarse 60% (G4)

On the outdoor air side, the filter efficiency of ISO ePM1 50% (F7 according to EN 779) or better is recommended. For the extract air side, a filter efficiency of at least ISO Coarse 60% (G4 according to EN 779) is recommended. If not in standard configuration, the recommended filter is available as an accessory part.

For the operation of ventilation systems a strategy for avoiding permanent moisture penetration of the outdoor air filter needs to be considered. The strategies 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 ($-15\text{ }^{\circ}\text{C}$). 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 supplied with a frost protection function as standard. For this purpose, a temperature sensor must be installed on the supply air side, which is available as a standard unit accessory.

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 heat recovery is regulated by stepless control of the rotation speed of the heat exchanger.