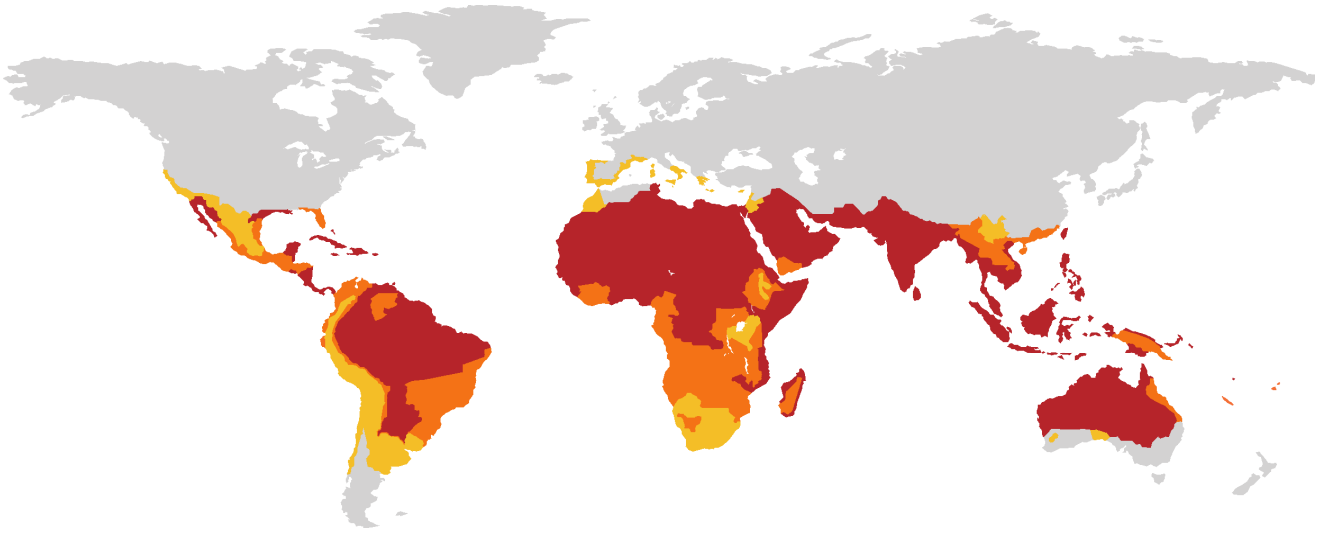
CERTIFICATE

Certified Passive House Component

Valid until 31st December 2025

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
Germany



Category:	**Air handling unit with heat recovery**
Manufacturer:	**Swegon Operations AB**
	Sweden
Product name:	**Ventilation unit series**
	GOLD F RX STE Sorption

Specification:	Airflow rate > 600 m³/h
Heat exchanger:	Regenerative

This certificate was awarded based on the product meeting the following main criteria

Cooling recovery	$\eta_{HR,C}$	≥	70 %
Specific electric power	$P_{el,spec}$	≤	0.45 Wh/m³
Leakage		<	3 %

Airflow range

500-10000 m³/h

at an external pressure of

238-365 Pa [1)]

Requirements non-residential buildings

Cooling recovery

$\eta_{HR,C} \geq 70$ %

Specific electric power

$P_{el,spec} \leq 0.45$ Wh/m³

Humidity recovery

$\eta_x \geq 90$ %

[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.

very hot climate

CERTIFIED COMPONENT

Passive House Institute

Swegon Operations AB
Frejgatan 14, 535 30 Kvänum, Sweden
☎ +46 512 32 200 | ✉ - | http://www.swegon.com |

Component ID	Unit model	Testing requirements	Airflow range Min m³/h	Airflow range Max m³/h	Humidity-recovery [2] %	External pressure Pa	Actual available external pressure [1] Pa	Specific electric power Wh/m³	Cooling recovery %
1966vl05	GOLD 04	Non-res.	540	1270	92	238	196	0,45	70
1967vl05	GOLD 05	Non-res.	540	1100	92	228	192	0,43	71
1968vl05	GOLD 07	Non-res.	540	1770	92	259	221	0,41	71
1969vl05	GOLD 08	Non-res.	1080	1900	92	265	223	0,45	71
1970vl05	GOLD 11	Non-res.	1080	2670	92	286	236	0,41	74
1971vl05	GOLD 12	Non-res.	1800	2930	92	290	237	0,45	72
1972vl05	GOLD 14	Non-res.	1800	4500	92	316	266	0,41	73
1973vl05	GOLD 20	Non-res.	2520	4290	92	316	267	0,42	73
1974vl05	GOLD 25	Non-res.	2520	5730	92	333	295	0,41	72
1975vl05	GOLD 30	Non-res.	3600	4660	92	322	292	0,42	73
1976vl05	GOLD 35	Non-res.	3600	8000	92	351	310	0,41	73
1977vl05	GOLD 50	Non-res.	5400	10000	92	365	327	0,42	73
1978vl05	GOLD 70	Non-res.	8280	10000	92	365	337	0,42	75

Table 1: Certified values for each unit model.

[1] Pressure drop of filters were taken into account.

[2] High humidity recovery rates require careful design

Humidity recovery

In warm and humid climates, moisture recovery can significantly reduce the energy demand for active dehumidification and active cooling. In warm and humid or hot and humid climates therefore a humidity recovery of at least 60% is recommended together with active dehumidification. As an orientation, PHPP refers to moisture recovery if required.

Efficiency criterion (cooling recovery)

The cooling recovery rate is determined on the basis of laboratory measurements of the entire ventilation device with balanced mass flows on the outdoor air and exhaust air side according to following formula:

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

With

$\eta_{HR,C}$ Cooling recovery 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 cooling 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 m^3/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 238-365 Pa.

- The specific electric powers 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 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.

www.passivehouse.com

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		
				Casing	Duct	
		Min	Max		ETA	SUP
		m³/h	m³/h	dB(A)	dB(A)	dB(A)
GOLD 04	Non-residential	540	1270	50	58	73
GOLD 05	Non-residential	540	1100	49	57	73
GOLD 07	Non-residential	540	1770	53	62	75
GOLD 08	Non-residential	1080	1900	52	60	75
GOLD 11	Non-residential	1080	2670	56	64	78
GOLD 12	Non-residential	1800	2930	55	63	79
GOLD 14	Non-residential	1800	4500	59	68	82
GOLD 20	Non-residential	2520	4290	56	65	79
GOLD 25	Non-residential	2520	5730	58	68	81
GOLD 30	Non-residential	3600	4660	57	66	80
GOLD 35	Non-residential	3600	8000	60	69	82
GOLD 50	Non-residential	5400	10000	60	69	82
GOLD 70	Non-residential	8280	10000	60	68	82

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

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.

Bypass of the heat recovery

The heat recovery is regulated by stepless control of the rotation speed of the heat exchanger. The effectiveness of the bypass for night cooling purpose of buildings was tested at rotor stop under following conditions:

- Exhaust air temperature 25 °C, outdoor air temperature 16 °C

The temperature increase of the supply air compared to the outdoor air was < 2 K.