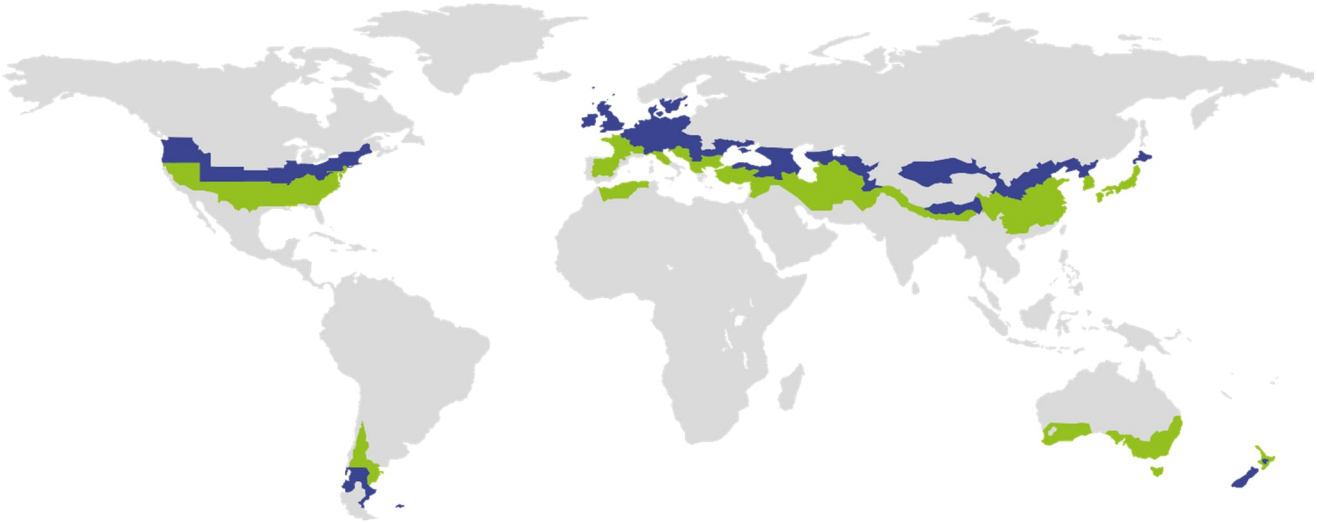
# CERTIFICATE

**Certified Passive House Component**

Valid until 31st December 2023

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 MPE Sorption** |

| | |
|---|---|
| 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 | $\eta_{HR}$ | ≥ | 75 % |
| Specific electric power | $P_{el,spec}$ | ≤ | 0.45 Wh/m³ |
| Leakage | | < | 3 % |
| Performance number | | ≥ | 10 |
| Comfort | Supply air temperature ≥ 16.5 °C at outdoor air temperature of -10 °C [2] | | |

| Airflow range |
|---|
| 500-14000 m³/h |
| at an external pressure of |
| 243-386 Pa [1] |
| Requirements non-residential buildings |
| **Heat recovery rate** |
| $\eta_{HR}$ ≥ 75 % |
| **Specific electric power** |
| $P_{el,spec}$ ≤ 0.45 Wh/m³ |
| **Humidity recovery** |
| $\eta_x$ ≥ 90 % |
| **Performance number** |
| > 8.5 [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 achieved.

cool, temperate 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 | Heat recovery rate % | Performance number - |
|---|---|---|---|---|---|---|---|---|---|---|
| 1952vl03 | GOLD 04 | Nichtwohnbau | 540 | 1500 | 93 | 247 | 197 | 0.45 | 75 | 8.6 |
| 1953vl03 | GOLD 05 | Nichtwohnbau | 540 | 1400 | 93 | 243 | 202 | 0.45 | 76 | 8.6 |
| 1954vl03 | GOLD 07 | Nichtwohnbau | 540 | 1970 | 93 | 265 | 221 | 0.42 | 77 | 9.4 |
| 1955vl03 | GOLD 08 | Nichtwohnbau | 720 | 2100 | 93 | 271 | 221 | 0.43 | 77 | 9.2 |
| 1956vl03 | GOLD 11 | Nichtwohnbau | 720 | 3000 | 93 | 290 | 236 | 0.44 | 77 | 9.0 |
| 1957vl03 | GOLD 12 | Nichtwohnbau | 900 | 3460 | 93 | 302 | 242 | 0.45 | 76 | 8.7 |
| 1958vl03 | GOLD 14 | Nichtwohnbau | 900 | 5000 | 93 | 322 | 269 | 0.44 | 76 | 8.9 |
| 1959vl03 | GOLD 20 | Nichtwohnbau | 1260 | 5330 | 93 | 328 | 272 | 0.45 | 75 | 8.5 |
| 1960vl03 | GOLD 25 | Nichtwohnbau | 1260 | 6580 | 93 | 343 | 299 | 0.44 | 78 | 9.2 |
| 1961vl03 | GOLD 30 | Nichtwohnbau | 2520 | 6500 | 93 | 338 | 295 | 0.45 | 76 | 8.6 |
| 1962vl03 | GOLD 35 | Nichtwohnbau | 2520 | 9170 | 93 | 365 | 317 | 0.45 | 77 | 8.9 |
| 1963vl03 | GOLD 40 | Nichtwohnbau | 5400 | 9000 | 93 | 359 | 312 | 0.45 | 77 | 8.8 |
| 1964vl03 | GOLD 50 | Nichtwohnbau | 5400 | 12000 | 93 | 376 | 330 | 0.45 | 77 | 8.7 |
| 1965vl03 | GOLD 70 | Nichtwohnbau | 7560 | 14000 | 93 | 386 | 346 | 0.45 | 78 | 8.9 |

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**

The moisture recovery rate is over 90%. The latent and sensible recovery efficiencies are not entirely independent of one another but regulation of the humidity recovery is to a limited extend possible without significant effect on the sensible recovery.

Moisture recovery during winter can be beneficial in cold and dry climates, but in applications with high and regular moisture loads, such as in residential buildings, humidity recovery at such a high level could be critical, as indoor moisture may not be removed. In general, the use of high humidity recovery systems must be checked on a project-specific basis depending on the climate, building airtightness and internal moisture sources, and under consideration of the respective benefits.

### 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

| | |
|---|---|
| $\eta_{HR}$ | Heat recovery rate in % |
| $\theta_{ETA}$ | Extract air temperature in °C |
| $\theta_{EHA}$ | Exhaust air temperature in °C |
| $\theta_{ODA}$ | 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 $m^3/h$ 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 243-386 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 kKh, 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). 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.

### 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 | 1500 | 52 | 60 | 74 |
| GOLD 05 | Non-residential | 540 | 1400 | 50 | 58 | 73 |
| GOLD 07 | Non-residential | 540 | 1970 | 55 | 63 | 77 |
| GOLD 08 | Non-residential | 720 | 2100 | 53 | 61 | 76 |
| GOLD 11 | Non-residential | 720 | 3000 | 57 | 66 | 79 |
| GOLD 12 | Non-residential | 900 | 3460 | 56 | 64 | 79 |
| GOLD 14 | Non-residential | 900 | 5000 | 62 | 70 | 84 |
| GOLD 20 | Non-residential | 1260 | 5330 | 57 | 65 | 79 |
| GOLD 25 | Non-residential | 1260 | 6580 | 60 | 69 | 82 |
| GOLD 30 | Non-residential | 2520 | 6500 | 58 | 66 | 80 |
| GOLD 35 | Non-residential | 2520 | 9170 | 62 | 70 | 83 |
| GOLD 40 | Non-residential | 5400 | 9000 | 60 | 68 | 83 |
| GOLD 50 | Non-residential | 5400 | 12000 | 62 | 70 | 83 |
| GOLD 70 | Non-residential | 7560 | 14000 | 62 | 70 | 83 |

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.

**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 °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 °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.