# Energy efficient ventilation with integrated heatpump.

## GOLD RX/HC

Packaged ventilation,
heating and cooling

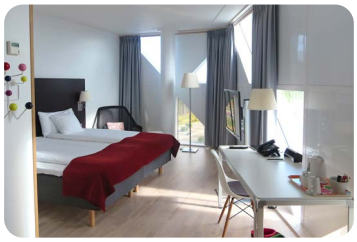
Swegon

# GOLD RX/HC -
# Ventilation, heating and cooling in a single package

The  GOLD RX/HC is a ventilation unit with energy recovery and an integrated reversible heat pump to provide an energy efficient and comfortable indoor climate.

The heating and cooling is built in to the unit and integrated in the controls in a smart solution that fully utilises the passive energy recovery.

You save time on site because there are fewer pieces of equipment to be installed, no pipe work and fewer connections.



The GOLD RX/HC needs only electrical power to run the compressor circuit and the fans. Quick and simple!

Your risk is reduced with a single supplier responsibility.

The GOLD RX/HC can be installed indoors or outdoors, with one point access for servicing all of these functions including the controls.

An energy efficient defrosting function is important with this type of product and the GOLD RX/HC has been developed for the European and Nordic areas with three alternative defrost systems; which have been fully tested in our laboratory.

The GOLD range of units have Eurovent certified performance, and are tested in the factory and are CE marked.

## Energy Efficient ventilation, heating and cooling

The GOLD RX/HC features our highly efficient rotary heat exchanger; which provides most of the heating throughout the year.

Because the heatpump coils are placed on either side of the rotor, it is possible to maximise the recovery of both heating and  cooling energy.

The rotor is treated with a sorption coating that efficiently transfers moisture.

That means that in the summer it recovers both sensible and latent cooling so that the electrical energy required for cooling is minimised.

During the winter the rotor and heatpump are operated in sequence to recover even more heat from the exhaust air and transfer it to the supply air.

The GOLD RX/HC also has an exceptionally wide working range, and continues to generate heating even at an outdoor temperature as low as -25°C. and cooling when the outdoor temperature is 35C.

The compressor in the GOLD RX/HC is speed controlled and managed by the unique GOLD IQlogic control system to give stepless control of the supply temperature

## Complete DX heatpump system

The RX/HC has a complete DX system. The reversible DX coils, speed controlled compressor, electronic expansion valves, four way valve, refrigerant and all control and safety equipment are included and installed within the unit.

The GOLD RX/HC can be used in both CAV and VAV systems.

## One point of access

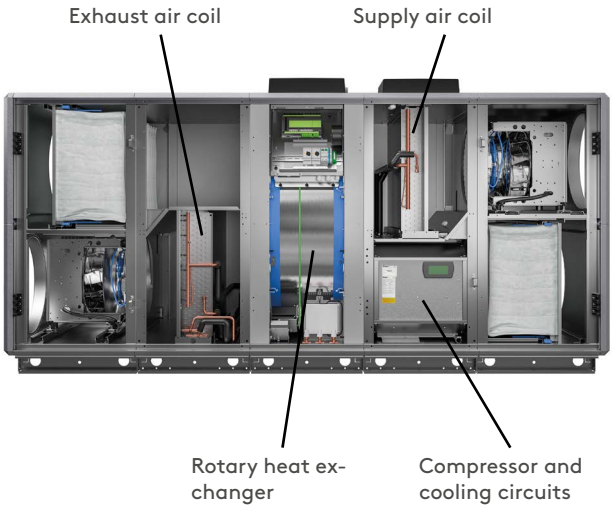
All settings are made in the GOLD IQlogic hand held terminal; which with its easy to use interface is easy to use.

Refrigerant measuring nipples and sight glasses are easily accessible and measurements can be made during operation.

## Placement of coils

The power needed to drive the rotary heat exchanger is relatively small and the energy recovered very large so it makes sense to utilise the rotor as much as possible and ensure that the compressor operation does not in any way reduce the performance of the rotor. This demands that the coils of the heat pump circuit are correctly placed on either side of the rotor as shown to the right. As a result, the Total COP and EER are high at about 30  and 11 respectively.

The large filter and coil area keeps the air pressure drop and energy consumption low.



# Mechanical Design

RX/HC consists of three sections. One with the sorption rotor, one for the exhaust air coil and one for the supply air coil, compressor and control panel.

The RX/HC section can be delivered in a split version on request to facilitate transport and installation.

RX/HC are designed and tested for ambient temperatures from -40°C to +40°C. The heat pump function withstands temperatures from -25°C to +35°C.

# Control and Regulation

Heating/cooling controls are housed in a separate electrical cabinet inside the unit and are operated using the GOLD air handling unit's IQNavigator handheld terminal.

The refrigerant circuit in all sizes contains a speed controlled scroll compressor with a high efficiency permanent magnet motor and DC inverter that regulates the output.

In sizes 040- 080 the circuit also has an on/off compressor of the same type that is operated in sequence with the speed controlled compressor.

# High Seasonal Energy Performance

The GOLD RX/HC has a very good part load performance which is important because of the seasonal load variation. Not only does it offer a good peak performance but the performance is even better during the rest of the year.

This means that the total energy consumed for heating and cooling is minimised.

# Compliant

The GOLD RX/HC is compliant with all relevant Regulations and standards and is CE marked.

Full details are available on request.

# Refrigerant

The refrigerant circuit is correctly filled with R410a refrigerant in the factory. This refrigerant is subject to the requirements of Regulation No 517/2014 on fluorinated greenhouse gases.

The volume of refrigerant for each size is tabulated in the Performance Data, see next page.

R410a has no known influence on the ozone layer and no known future restrictions are anticipated.

R410a has a GWP of 2088

Installation checks, obligation to report and periodic leakage tracing may be required in some cases by local supervisory authorities.

# Defrost alternatives

Through extensive testing in our climate laboratory we have been able to rigorously test the heating function in different winter conditions so you can rest assured that the GOLD RX/HC unit will work perfectly throughout the winter.

Three different defrost options are available depending on climate and comfort needs.

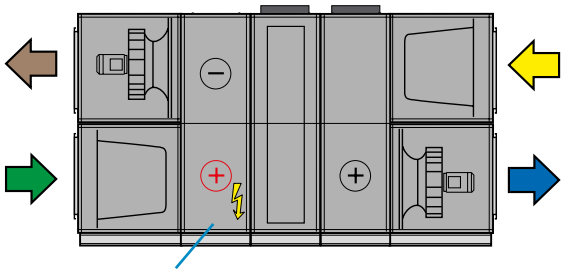
Our selection program AHU Design provides support in making the right selection. The options are described below and on the next page.

## Reversing the refrigerant circuit

When the build-up of frost in the exhaust coil reaches a limit the system reverses the heatpump circuit so that the exhaust coil is warmed up so that the frost is melted. During this short period of time the supply air will be cooled. This method is normally sufficient for climates with a design winter temperature down to –5°C

## Reversing the refrigerant circuit + Electric air heater

Where the reversing method is not sufficient, an optional electric air heater, placed in front of the rotating heat exchanger, is used to supplement the heat by warming the rotary heat exchanger and thereby the exhaust air. This reduces the defrosting time and is recommended for use in areas where the outdoor design temperature is lower than -5°C and down to –10°C.

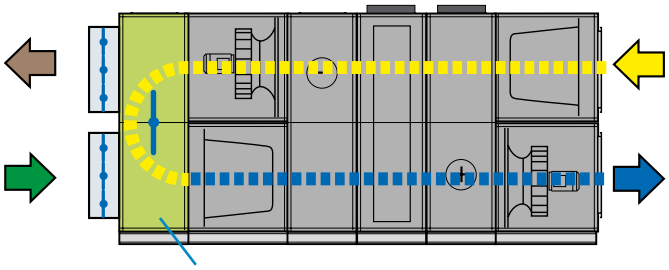


Electrical air heater placed in RX/HC (accessory)

## Reversing the refrigerant circuit + Air recirculation section

As an alternative to the electric heater , an air recirculation section is placed on the air handling unit's outdoor air/exhaust side, see the illustration to the right.

When defrosting, the air recirculation damper opens fully and the outdoor air/exhaust air damper closes fully. The warm extract air is recirculated. The temperature across the exhaust coil increases. This method can be used where outdoor temperatures are as low as -25°C.



Air recirculation section RX/HC (accessory)

Outdoor air Supply air Extract air Exhaust air

# GOLD RX/HC Performance data

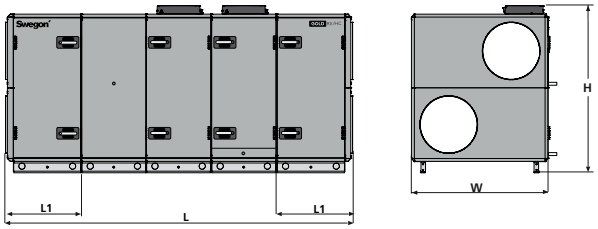
The GOLD RX/HC is available in GOLD sizes 011 to 080 with a total cooling capacity up to 140 kW.

As a guide, basic data is tabulated below but to get exact performance data our selection program AHU Design should be used.

In addition to performance data, the program can calculate annual energy consumption.

| Size | Airflow at SFPv 1.8 ($m^3/s$) | Min. airflow ($m^3/s$)[1] | Cooling cap. (kW)[2] | Heating cap. (kW)[3] | Refrigerant (kg) | Rec. fuse (A) | EER[2] | COP[3] | EER total | COP total | Max. cooling cap. (kW)[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 011 | 0.89 | 0.45 | 14.8/8.2 | 44.0/4.1 | 6 | 16 | 4.7 | 3.5 | 12.4 | 40.6 | 50,5 |
| 012 | 0.97 | 0.50 | 15.9/8.9 | 47.4/4.8 | 8 | 25 | 4.6 | 3.5 | 12.4 | 37.9 | 50,5 |
| 014 | 1.48 | 0.75 | 24.2/13.6 | 72.0/7.9 | 8 | 25 | 5.3 | 3.6 | 14.1 | 37.0 | 68,2 |
| 020 | 1.53 | 0.75 | 25.0/14.1 | 74.1/8.4 | 10 | 25 | 4.4 | 3.4 | 11.8 | 33.0 | 68,2 |
| 025 | 2.07 | 0.95 | 33.7/19.1 | 100.1/11.5 | 10 | 25 | 4.4 | 3.4 | 11.7 | 33.0 | 88,9 |
| 030 | 2.10 | 0.95 | 34.1/19.4 | 101.4/11.8 | 13 | 32 | 4.9 | 3.4 | 12.8 | 32.3 | 88,9 |
| 035 | 3.12 | 1.50 | 51.2/28.5 | 152.0/16.4 | 15 | 50 | 4.5 | 3.2 | 12.7 | 32.9 | 141,2 |
| 040 | 3.30 | 1.10 | 53.8/30.3 | 159.7/18.3 | 17.5 | 50 | 4.9 | 3.3 | 13.5 | 32.6 | 141,2 |
| 050 | 4.22 | 1.40 | 68.8/38.9 | 204.4/23.2 | 17.5 | 63 | 4.3 | 3.1 | 11.5 | 33.4 | 183,1 |
| 060 | 4.25 | 1.50 | 69.3/39.2 | 205.7/23.5 | 20 | 63 | 3.9 | 3.0 | 10.5 | 29.0 | 183,1 |
| 070 | 5.51 | 2.00 | 90.5/50.5 | 268.8/28.7 | 25 | 63 | 4.0 | 2.9 | 10.8 | 30.0 | 251,1 |
| 080 | 5.52 | 2.10 | 90.6/50.6 | 269.2/28.8 | 30 | 80 | 4.0 | 2.9 | 10.8 | 29.9 | 262,0 |

[1] Minimum air flow with compressor running.
[2] For an outdoor temperature of 26°C, 50% RH, extract air temperature of 22°C, supply air temperature 16°C. Cooling capacity: rotating heat exchange / coil HC.
[3] For an outdoor temperature of -20°C, 95% RH, extract air temperature of 22°C, supply air temperature 20°C. Heating capacity: rotating heat exchange / coil HC.
[4] For an outdoor temperature of 34°C 50% RH, extract air temperature of 22°C, supply air temperature 16°C. Max. cooling output: rotary heat exchanger and HC coil at max. air flow.



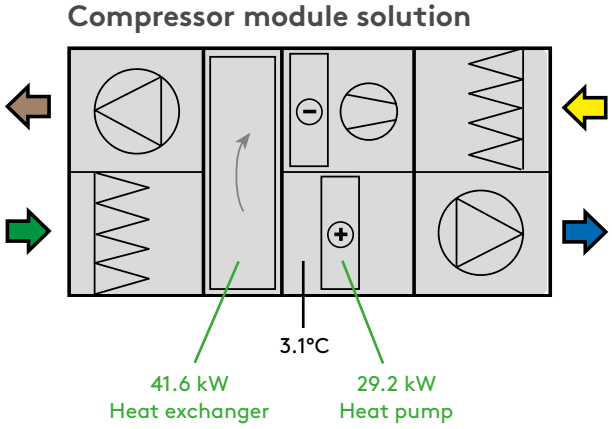

| GOLD RX/HC | L | | L1 | | W | H | ⌀ | Max. | |
|---|---|---|---|---|---|---|---|---|---|
| | mm | kg | mm | kg | mm | mm | mm | m³/s | m³/h |
| 011 | 2989 | 737-835 | 647 | 135-175 | 1199 | 1471 | 500 | 1.10 | 3960 |
| 012 | 2989 | 765-868 | 647 | 146-189 | 1199 | 1471 | 500 | 1.40 | 5040 |
| 014 | 3210 | 934-1062 | 758 | 190-244 | 1400 | 1727 | 1000x400 | 1.65 | 5940 |
| 020 | 3210 | 964-1112 | 758 | 200-264 | 1400 | 1727 | 1000x400 | 2.10 | 7560 |
| 025 | 3391 | 1238-1426 | 848 | 249-333 | 1600 | 1911 | 1200x500 | 2.50 | 9000 |
| 030 | 3391 | 1300-1460 | 848 | 275-345 | 1600 | 1911 | 1200x500 | 3.20 | 11520 |
| 035 | 3772 | 1664-1894 | 1039 | 377-482 | 1990 | 2259 | 1400x600 | 3.90 | 14040 |
| 040 | 3772 | 1740-1970 | 1039 | 390-495 | 1990 | 2259 | 1400x600 | 3.90 | 14040 |
| 050 | 3892 | 2138-2396 | 1039 | 444-563 | 2318 | 2388 | 1600x800 | 5.00 | 18000 |
| 060 | 3892 | 2322-2580 | 1039 | 511-630 | 2318 | 2388 | 1600x800 | 6.50 | 23400 |
| 070 | 4362 | 3322-3592 | 1274 | 786-911 | 2637 | 2740 | 1800x1000 | 7.50 | 27000 |
| 080 | 4362 | 3426-3840 | 1274 | 813-1010 | 2637 | 2740 | 1800x1000 | 9.50 | 34200 |

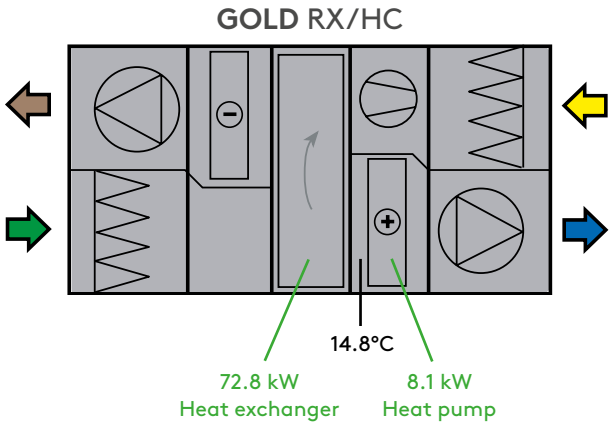
# Heat exchanger before heat pump

Energy recovery via a rotary heat exchanger is significantly more efficient than "making" heating and cooling by means of a heat pump. This means that it is especially important in the case of an air handling unit with a built-in heat pump how its two coils are positioned in relation to the heat exchanger. By positioning the coils on either side of the heat exchanger, the GOLD RX/HC can recover both cooling and heating energy efficiently, and the heat exchanger can be used as the primary, and then let the heat pump supplement the system as and when needed. This is how we optimise the energy efficiency of the solution.

In other solutions offered on the market, with the heat pump's coils assembled in a compressor module on one side of the heat exchanger, the heat pump has to work harder and the heat exchanger is not worked to the full. This type of solution also requires oversizing of the cooling/heating capacity, and does not permit cooling energy to be recovered. A simple sample calculation demonstrates the difference:

Sample calculation for heating operation:
Outdoor temperature -20°C.
Supply air temperature +20°C.
Extract air temperature, +22°C




This shows that compressor module solutions largely have to heat the supply air via the heat pump. In the GOLD RX/HC, however, the rotary heat exchanger meets a higher proportion of the power requirement by recovering heating energy from the extract air, which is basically cost-free electrical energy. The heat pump can then top up the remaining proportion of the heating requirement.

# AHU Design

## Detailed technical data from our selection program

Our Eurovent certified selection program AHU Design provides all of the data you need in your project design work.

The program accurately calculates heating and cooling capacity as well as the electrical power required to operate the unit.

The basic data used has been measured in our modern purpose built climate chamber for each unit size.

Complex algorithms are used to calculate heating, cooling and electrical energy hour by hour for a complete year using local climate data.

# Defrost function

In heating mode the heatpump reduces the temperature of the extract air to recover the heat. The extract air is cooled below freezing and  moisture reaching the coil in the air will freeze.

The GOLD RX/HC has the advantage of the sorption rotary heat exchanger that recovers moisture from the extract air. This means that the air reaching the coil is drier and that reduces frosting.

It is necessary to remove the frost to prevent an increase in pressure drop and reduction of the performance.

Defrosting is automatic, adaptive and is controlled via a pressure sensor.

During defrosting the refrigerant circuit is reversed to heat the exhaust air coil, which together with the heat in the extract air melts the frost in the coil.

The exhaust coil has a sub cooling circuit; which delays the build-up of frost; which means longer time between defrost sequences.

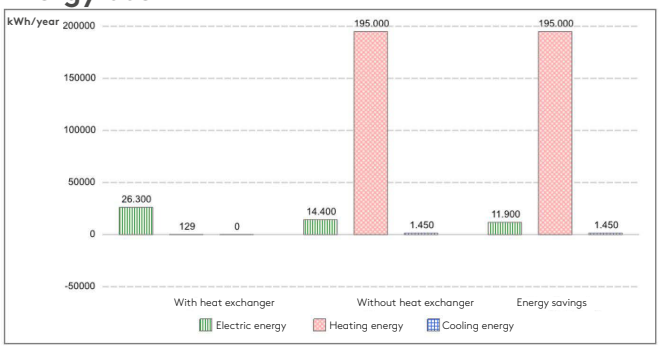
This means the supply air will be cooled but the defrosting is quick and effective and the supply air is only cold for a short period of time.

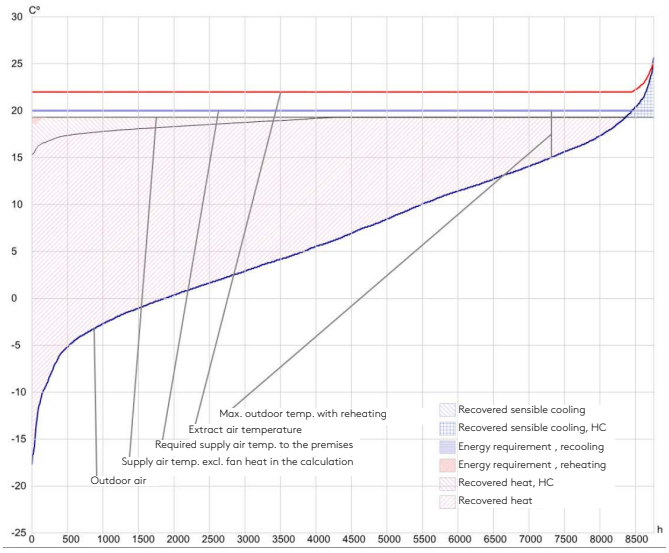
The length of time for defrosting and the lowest temperature reached depends on several parameters but is typically 3-5 minutes and  not lower than 10°C.

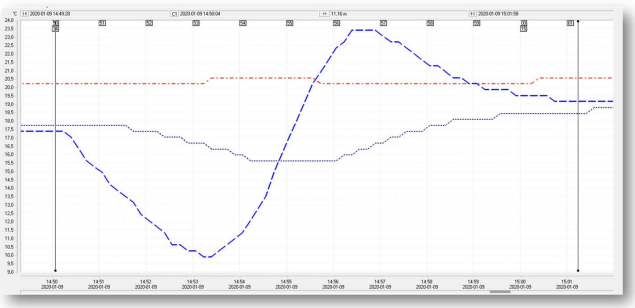
The effect on the comfort in the room is minimal. Full scale testing has shown that during defrosting the supply air temperature at the inlet to the supply air device is normally some 5°C higher than the defrosting temperature after the fan. In the occupied zone the temperature remains quite stable with less than 1 degree fall.

The loss of heating capacity is easily and quickly compensated for by heat sources in the room.

### Energy use



A typical defrosting showing the  dip in temperature  of the supply air.

Feel good **inside**

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