TECHNICAL SUBMITTAL SHEET

TS No:	**KH-TS-006**	Revision:	**0**
Date:	**08/05/2014**	Project No:	**KH0153**
To: Of:	**Andy Jarvis** **David Laing** **E3 Consulting Engineers** **Bennetts Associates**	Project:	**The Royal College of Ophthalmologists**
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		From:	**Gary Sumsion**
		Of:	**Knight Harwood**

Title:	**Air Handling Units**

Please find attached our AHU selection schedules and technical data including heat pump arrangement for the seminar room AHU for information and comments. As manufactured by Swegon.
Included attachments: - AHU Technical selection schedules
Basement/Seminar Room AHU Heat Pump Schedule

Date Response Required by:	**15/05/2014**

Comments:

Status:			
Date:	**Company:**	**Name:**	**Signature:**

TS-006-2014_04_15 AHU's Schedule.

Technical specification

ProUnit Version: 27 / 2014.4.9

Project Royal College of ophthalmologists AHU's & Heat Pump

Atmospheric pressure	101325	Pa
Air density	1.200	kg/m³

Sound power to duct, measured according to ISO 5136
Noise reduction for function section included to duct.
Sound power emitted to surroundings, measured according to ISO 3741
Components are arranged according to airflow direction

AHU 1
GOLD TOP
Manufactured by Swegon

Unit size	08	
Supply air flow	0.780	m³/s
Total pressure drop		
Outdoor air duct		Pa
Supply air duct	155	Pa
Extract air flow	0.780	m³/s
Total pressure drop		
Extract air duct	130	Pa
Exhaust air duct		Pa
Design outdoor temperature, summer	32.0	°C
Lowest design outdoor air temperature	-4.0	°C
Supply air temperature, summer	12.0	°C
Required supply air temperature, winter (ERS selected)	22.0	°C
Specific fan power efficiency rating, SFPv (clean filters)	2.15	kW/(m³/s)

With computer-based IQlogic control system
Painted panels with 50 mm fire retardant insulation

Electrical connections	1-phase, 3-wire, 230 V-10/+15%, 50 Hz, 16 A
alternative	3-phase, 5-wire, 400 V-10/+15%, 50 Hz, 10 A

Supply air

1 **Damper with actuator, TBSA-2-000-040-1-1**
Motor with spring return action
Tightness class 3 to EN 1751

Total pressure drop	11	Pa

1 **Air handling system, GOLD, GOLD08ERXTOP**

Accessories

1 Hand terminal GOLD ver E, TBLZ-1-71-1
1 Baseframe
1 Air quality sensor, duct, ELQZ-2-504-2

1 **Pleated filter**

Filter class F7
880x440x130)

Recommended design pressure drop		197	Pa
Initial pressure drop		150	Pa
Final pressure drop		244	Pa

1 **Rotary heat exchanger**

Rotary heat exchanger of type RECOnomic
Hygroscopically treated aluminium
Speed controlled

Total pressure drop, supply air		199	Pa
Total pressure drop, extract air		199	Pa
Extra pressure drop in extract air side (damper) to ensure the right flow direction		122	Pa
Purging flow including leakage		0.049	m³/s
Temperature efficiency of supply air	(82.0% at the same airflow)	82.0	%
Annual energy efficiency ratio, dry conditions.		99.5	%
Humidity efficiency, supply air, winter		80.0	%
Humidity efficiency, supply air, summer		74.5	%

Supply air side, winter	In	Out	
Air temperature	-4.0	17.4	°C
Relative humidity	100.0	31.1	%
Capacity		22.8	kW

Extract air side, winter	In	Out	
Air temperature	22.0	0.6	°C
Relative humidity	25.0	75.3	%

Supply air side, summer	In	Out	
Air temperature	32.0	25.4	°C
Relative humidity	45.0	51.0	%

Extract air side, summer	In	Out	
Air temperature	24.0	30.6	°C
Relative humidity	50.0	45.0	%

1 **Fan section**

Fan of type GOLD Wing+
Direct drive with rotation controlled EC motor
Standard connection, internal
Rubber anti-vibration mountings

Supply air flow		0.780	m³/s
LOT without flow reduction		16.6	°C
Flow reduction at the lowest design outdoor temp.		100	%
Total pressure drop, duct		155.0	Pa
Total pressure rise (dry conditions)	(Clean filter: 624 Pa)	671	Pa
Temperature rise caused by the fan		1.0	
Speed	(Min 400, Max 2780, Clean filter 2365 r/m)	2420	r/m
Electric power to motor(s)	(Clean filter: 0.83 kW)	0.91	kW
Rated motor power		1.15	kW
Motor option		1	
Motor code		DOMEL 747.3.392	
Number of fans/motors in the air stream		1	
Total efficiency (fan inside the unit)		58.0	%
Maximum motor efficiency	(incl. motor control 88.5%)	93.5	%

Sound power level

Frequency band	**Hz**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**		**All**	
To supply air duct		80	78	75	73	74	72	66	62	dB	78	dB(A)
To outdoor air duct		79	76	71	71	63	65	62	63	dB	73	dB(A)

To surroundings	74	67	55	57	46	44	39	39	dB	57	dB(A)
To surroundings incl. exh. air	75	68	56	58	47	45	40	40	dB	58	dB(A)

1 **Cooling coil, water, TBKA-5-000-050-2**

1 Valve kit heating/cooling, TBVL-3-160-2
Incl. actuator, freeze guard sensor, connection cable and valve (kvs = 16.00)

Version		2	
No.of tube rows		6	
No.of circuits		22	
Connection number		20 ext.	
Fin spacing		2.5	mm
Pressure drop, dry		109	Pa
Pressure drop, wet		121	Pa
Air velocity		2.4	m/s
Air temperature	26.4	12.0	℃
Relative humidity	48.0	95.0	%
Sensible coil capacity		13.60	kW
Required total coil capacity		18.80	kW
Excess capacity of the coil		-34	%
Amount of drained water		0.1182	l/min
Liquid temperature	8.0	12.0	℃
Flow of liquid		1.120	l/s
Liquid pressure drop		23.5	kPa
Liquid volume of the coil		8.1	l
Nom. pipe connection size, valve		32	ext.
Liquid pressure drop, open valve		6	kPa

1 **Heating (heat pump) coil**

1 Air temperature	14	24	℃
Liquid temperature	45	40	℃

Extract air

(Air handling system, GOLD)

1 **Pleated filter**
Filter class F7
880x440x130)

Recommended design pressure drop	142	Pa
Initial pressure drop	108	Pa
Final pressure drop	176	Pa

(Rotary heat exchanger)
Accessories and technical data, see supply air

1 **Fan section**
Fan of type GOLD Wing+
Direct drive with rotation controlled EC motor
Standard connection, internal
Rubber anti-vibration mountings

Extract air flow		0.780	m³/s
Total pressure drop, duct		130.0	Pa
Total pressure rise (dry conditions)	(Clean filter: 570 Pa)	604	Pa
Temperature rise caused by the fan		0.9	
Speed	(Min 400, Max 2780, Clean filter 2399 r/m)	2439	r/m
Electric power to motor(s)	(Clean filter: 0.85 kW)	0.92	kW
Rated motor power		1.15	kW
Motor option		1	
Motor code		DOMEL 747.3.392	

	Number of fans/motors in the air stream										1	
	Total efficiency (fan inside the unit)										54.5	%
	Maximum motor efficiency						(incl. motor control 88.5%)				93.5	%
	Sound power level											
	Frequency band	**Hz**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**All**	
	To extract air duct		74	71	66	66	58	60	57	58 dB	68	dB(A)
	To exhaust air duct		80	76	73	73	74	72	68	65 dB	78	dB(A)
	To surroundings		69	62	50	52	41	39	34	34 dB	52	dB(A)

1 **Damper with actuator, TBSA-2-000-040-1-1**

	Motor with spring return action		
	Tightness class 3 to EN 1751		
	Total pressure drop	11	Pa

Project: **Royal College of ophthalmologists AHU's & Heat Pump**

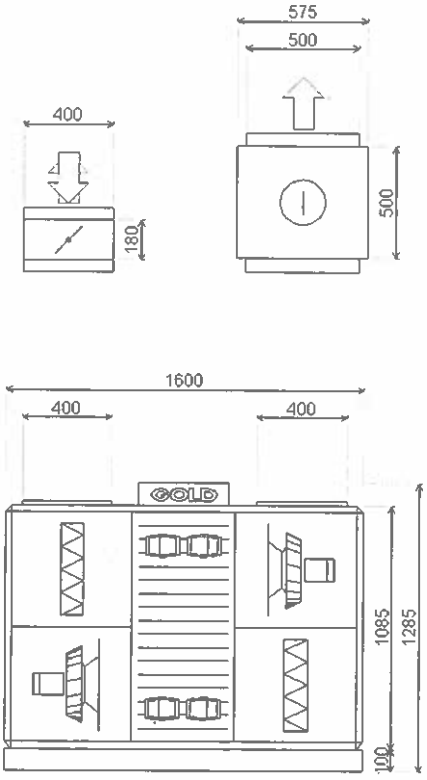
Inspection side

Unit: **AHU 1**

Size:	08
Total weight:	380 kg
Width, nominal:	995 mm
Max:	995 mm

Connection size:	Diameter
Outdoor air	Ø 400
Supply air	Ø 400
Extract air	Ø 400
Exhaust air	Ø 400
Damper with actuator	Ø 400
Damper with actuator	Ø 400
Cooling coil, water	Ø 500

Pipe connection:	Conn.nr	Drain.conn.
Cooling coil, water	20	



Project: **Royal College of ophthalmologists AHU's & Heat Pump**

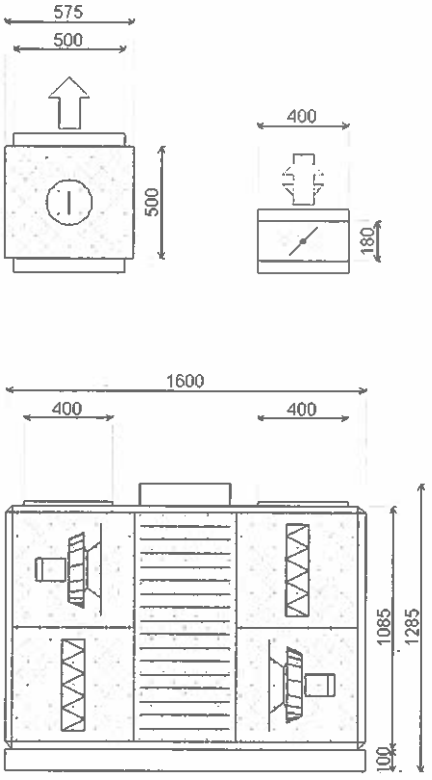
Rear side

Unit: **AHU 1**

Size:	08
Total weight:	380 kg
Width, nominal:	995 mm
Max:	995 mm

Connection size:	Diameter
Outdoor air	Ø 400
Supply air	Ø 400
Extract air	Ø 400
Exhaust air	Ø 400
Damper with actuator	Ø 400
Damper with actuator	Ø 400
Cooling coil, water	Ø 500

Pipe connection:	Conn.nr	Drain.conn.
Cooling coil, water	20	



Project: **Royal College of ophthalmologists AHU's & Heat Pump**

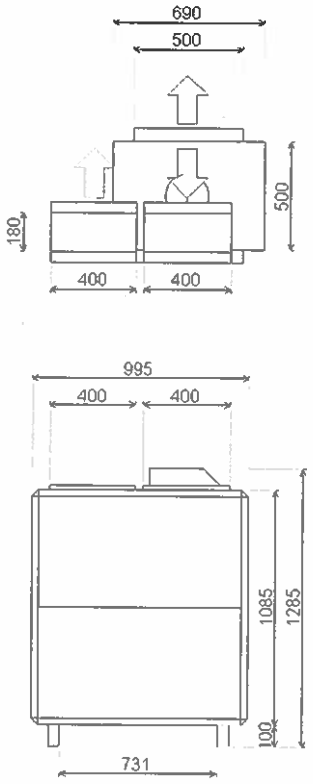
Left-hand

Unit: **AHU 1**

Size:	08
Total weight:	380 kg
Width, nominal:	995 mm
Max:	995 mm

Connection size:	Diameter
Outdoor air	Ø 400
Supply air	Ø 400
Extract air	Ø 400
Exhaust air	Ø 400
Damper with actuator	Ø 400
Damper with actuator	Ø 400
Cooling coil, water	Ø 500

Pipe connection:	Conn.nr	Drain.conn.
Cooling coil, water	20	



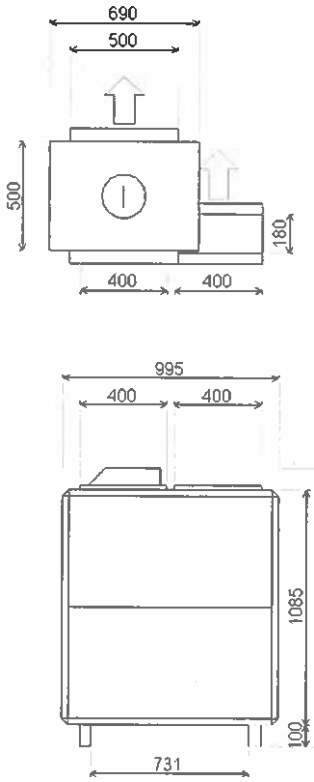
Project: **Royal College of ophthalmologists AHU's & Heat Pump**
Right-hand

Unit: **AHU 1**

Size:	08
Total weight:	380 kg
Width, nominal:	995 mm
Max:	995 mm

Connection size:	Diameter
Outdoor air	Ø 400
Supply air	Ø 400
Extract air	Ø 400
Exhaust air	Ø 400
Damper with actuator	Ø 400
Damper with actuator	Ø 400
Cooling coil, water	Ø 500

Pipe connection:	Conn.nr	Drain.conn.
Cooling coil, water	20	



Project: **Royal College of ophthalmologists AHU's & Heat Pump**

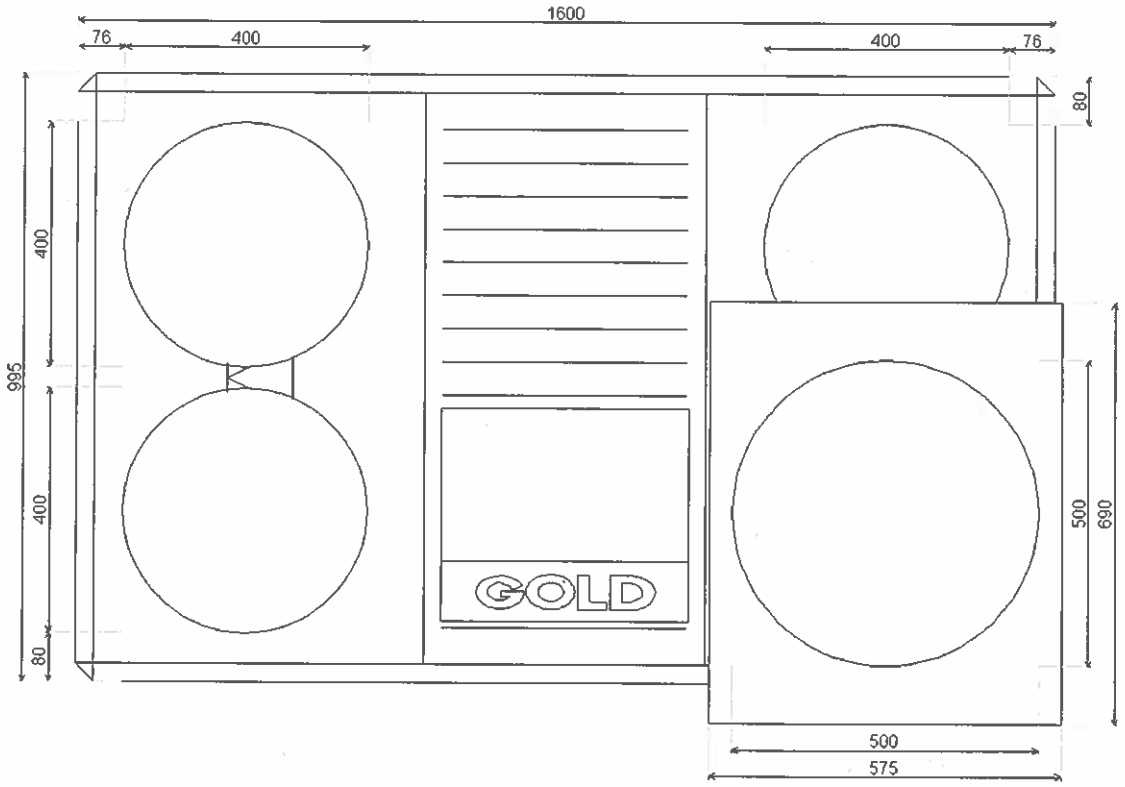
Above

Unit: **AHU 1**

Size:	08
Total weight:	380 kg
Width, nominal:	995 mm
Max:	995 mm

Connection size:	Diameter
Outdoor air	Ø 400
Supply air	Ø 400
Extract air	Ø 400
Exhaust air	Ø 400
Damper with actuator	Ø 400
Damper with actuator	Ø 400
Cooling coil, water	Ø 500

Pipe connection:	Conn.nr	Drain.conn.
Cooling coil, water	20	



Project: **Royal College of ophthalmologists AHU's & Heat Pump**

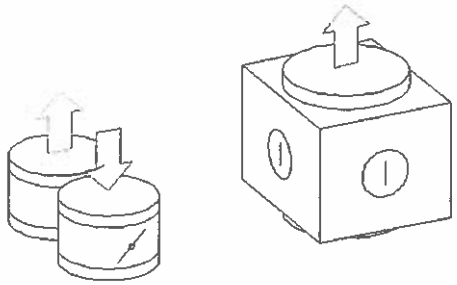
Above left

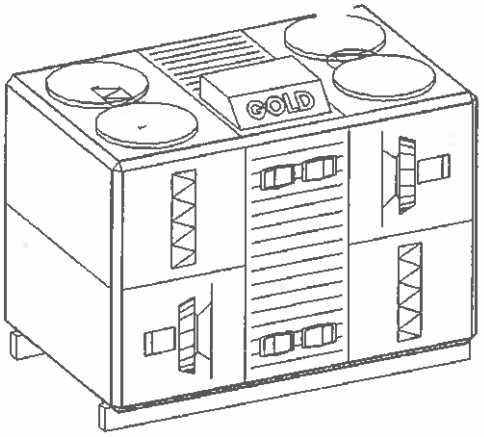
Unit: AHU 1

Size:	08
Total weight:	380 kg
Width, nominal:	995 mm
Max:	995 mm

Connection size:	Diameter
Outdoor air	Ø 400
Supply air	Ø 400
Extract air	Ø 400
Exhaust air	Ø 400
Damper with actuator	Ø 400
Damper with actuator	Ø 400
Cooling coil, water	Ø 500

Pipe connection:	Conn.nr	Drain.conn.
Cooling coil, water	20	





Project: **Royal College of ophthalmologists AHU's & Heat Pump**

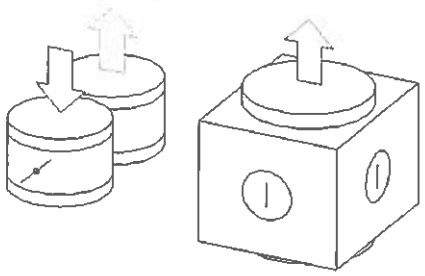
Above right

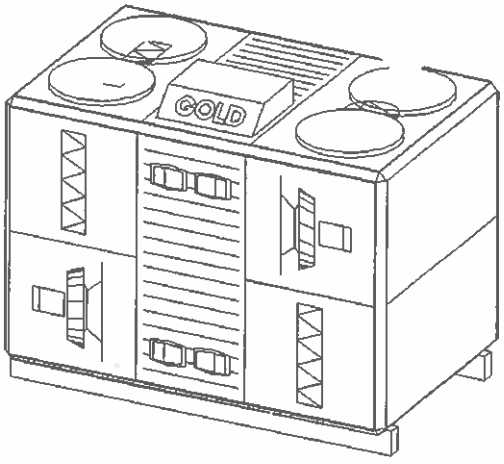
Unit: **AHU 1**

Size:	08
Total weight:	380 kg
Width, nominal:	995 mm
Max:	995 mm

Connection size:	Diameter
Outdoor air	Ø 400
Supply air	Ø 400
Extract air	Ø 400
Exhaust air	Ø 400
Damper with actuator	Ø 400
Damper with actuator	Ø 400
Cooling coil, water	Ø 500

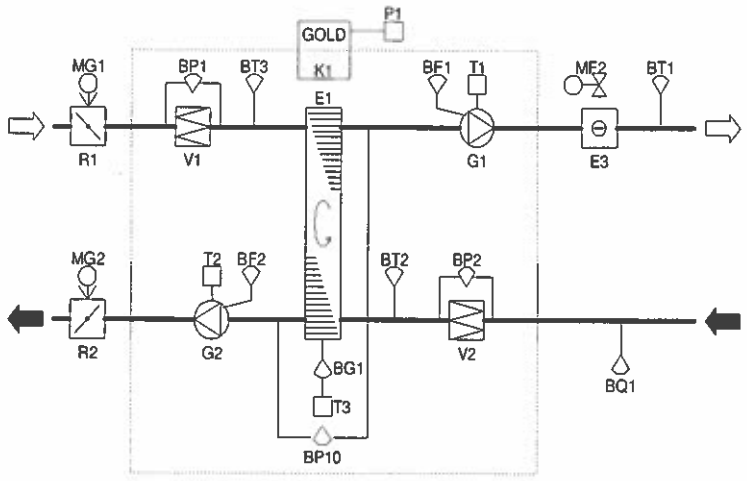
Pipe connection:	Conn.nr	Drain.conn.
Cooling coil, water	20	





Item: Royal College of ophthalmologists AHU's & Heat Pump
GOLD Air handling unit: AHU 1

Function summary
Air Handling System GOLD RX with rotory heat exchangerRECOnomic, Supply- and Extract Air fan Wing including completely inigrated control system IQlogic.
The desired settings can be entered in the hand-held micro terminal, where current in-service readings are also shown.
Controls
Time switch, low-high
Sequential start-up
Damper with motor, outdoor air duct, spring return
Damper with motor, exhaust air duct,spring return
Demand-controlled flow, supply air
Air quality sensor, extract air
Constant air flow regulation, extract air
Density-corrected air flow
Extract air temp.-related supply air temp.-regulation (ERS regulation)
Heating sequence
- Rotary heat exchanger
Cooling sequence:
- Stepless Cooling control
Cooling coil, water
Functions
Cooling recovery, rotary heat exchanger
Air purging function
Carry-over control, rotary heat exchanger
Zero point calibration
Alarm monitoring
Filter monitoring
Rotation sensor, rotary heat exchanger
Temperature monitoring
Service period
Logging function
Recirculation section
Wifi connection to WLAN



GOLD	Air handlings system	BF2	Airflow pressure sensor
G1	Supply fan, Wing	BP1	Filter pressure sensor
G2	Extract fan, Wing	BP2	Filter pressure sensor
V1	Supply air filter	BP10	Flow calibration sensor
V2	Extract air filter	BG1	Rotation monitor sensor
E1	Rotary heat exchanger, RECOnomic	R1	Outdoor air damper
P1	Hand terminal	R2	Exhaust air damper
T1	Motor control	MG1	Damper actuator, spring return
T2	Motor control	MG2	Damper actuator, spring return
T3	Heat exchanger control	BQ1	Air quality sensor
BT1	Temperature sensor, duct	E3	Cooling coil, water
BT2	Temperature sensor, duct	MF2	Valve actuator
BT3	Temperature sensor, duct	K1	Control box IQlogic
BF1	Airflow pressure sensor		

Item: Royal College of ophthalmologists AHU's & Heat Pump
GOLD Air handling unit: AHU 1

Description of the functions

Controls
GOLD is controlled via Hand Termonal P1 which is a capacitive 7" touch screen with an intuitive user interface and information help texts.
Settings and readings for included components in GOLD are presented in a flow chart on the screen.
All settings and readings are expressed in real values, such as temperatures in °C; airflows optional in m3/s, m3/h or l/s and pressure in Pascal.
GOLD controls low-high as set times in time channel
When starting the GOLD, extract fan G2 is started and heat exchanger E1 is forced to max. recovery
Then, as a preset delay, the supply fan G1 starts.
Supply fan G1 and extract fan G2 are inter locked
Damper actuator MG1 closes the outdoor air damper R1 when GOLD stops, and if power fails.
Damper actuator MG2 closes the exhaust air damper R2 when GOLD stops, and if power fails.

Demand-controlled flow, supply air
Air quality sensor BQ1 keeps the set air quality by increasing and decreasing the air flow.
Flow pressure sensor BF1 keeps the constant calculated supply air flow via motor controller T1.
The required setting for low and high speed and the min/max limits of the air flow are set via the hand terminal P1.

Constant air flow regulation, extract air
Flow pressure sensor BF2 keeps the constant extract air flow via motor controller T2.
Required flow for low and high extract air fan operation mode is set via hand terminal P1.
The air flow is density corrected and compensated automatically for the airs increased density at low outdoor temperatures

Exhaust air temp.- related supply air temp. regulation (ERS regulation1)
The temp. on the supply air is regulated to follow the extract air temp. at a set curve
Three factors are affected by the setting in the hand terminal P1
1. Set point in °C (starting from extract air temp).
2. Temp limit above the set point in fixed steps.
3. Temp difference under set point in °C.
Temperature sensor BT1 keeps the supply air temperature constant according to the following control sequence.
Via hand terminal P1 the required temp set value is set.
Control sequence if heating is required:
- Heat exchanger E1 is started via heat exchanger controller T3, which on an increased heating load steplessly and linearly regulates the heat recovery efficiency of the heat exchanger to max.

Control sequence if cooling is required:
- Valve actuator MF2 opens the valve for the chilled water to cooling coil E3.

Cooling recovery, rotary heat exchanger
Heat exchanger E1 operates at max rpm when temp. sensor BT2 senses a lower temp than temp. sensor BT3.

Air purging function
Heat excanger E1 starts at regular intervals for purging the rotor during longer periods of inactivity.

Carry-over control
The heat exchanger's max. rotation speed is calculated with respect to the airflow so that a correct purging function can be performed even at low airflows.
Pressure sensor BP10 measures the leakage- and purging flow over the heat exchanger and corrects the Extract Air fan flow measurement for a correct flow description.

Zero point calibration
The zero point value is checked on all connected pressure sensors. If the value doesn't tally, a new calibration is made.
The function is automatically switched in each time the fans have been stopped for more than 3 minutes.

Alarm monitoring
The alarm can be seen in clear text on the hand terminal P1, where even re-setting of the alarm is done.
Alarm priority A or B can be chosen for all alarms. The alarm's function, if it is to stop the GOLD or not, is chosen individually for each alarm. Safety alarms always stop the GOLD.

Filter monitoring
Pressure sensor BP1 continually measures the pressure drop across filter V1.
Pressure sensor BP2 continually measures the pressure drop across filter V2.
The alarm limit is calculated continuously and is changed automatically dependent on the actual flow. When the set alarm value is reached the alarm is activated. The alarm limit for each filter is set in the hand terminal P1.

Rotation sensor, rotary heat exchanger
Rotation sensor BG1 monitors continuously the heat exchanger E1. On an inadvertent stop, the heat exchanger initiates an alarm and stops the GOLD at low out door temp.

Temperature monitoring
Temperatures on temp. sensors BT1 and BT2/BM2 are monitored continuously. Alarm is given if the temp. goes below set limits. The required Alarm values are set in Hand Terminal P1
The alarm is delayed 20 minutes.

Service period
When the set service time is reached an alarm is given. After the service the next service period is set via hand terminal P1.

Reading
Actual working value is shown in the hand terminal P1.
Temperatures
- Temperature readings on all connected temperature sensores.
- Set and actual set value.

Supply- and extract fan:
- Flow / pressure
- Set and actual set value.
- Working level
- Output
- Power.
- SFPv-value.

Filter
- Calculated and set alarm limit.

Rotory heat exchanger:
- Calculated efficiency

Control sequence:
- All activated and connected control sequences.
- All conected valve actuators are equiped with valve response that indicates the valve position and gives an alarm at differing valve position.

Input and output connections:
- Current status.

Operating periods:
- Supply and extract air fans.
- Heat exchanger.
- Cooling.

Alarms:
GOLD is controlled and monitored by web reader. Control system IQlogic includes a web server where

a dynamic flow chart, operation- and function page is available. Alarms are forwarded via built-in email function.
- Current alarm without time delay.
All other settings are also shown in the hand terminal.

Manual test
Provision is available for testing and checking internal components in GOLD unit. Fans, heat exchanger, inputs and outputs and the connected accessories can be tested individually.

Logging function
Via styr systemets multi-media card the parameter values are logged and saved for the systems log function.
On a specific log page in the Hand Terminal one or several parameters can be chosen, to be read in a diagram with a time axis and a size axis. The parameters can be read in real time or as a loged value.

WiFi
Control unit K1 is equiped with an anteni for connection to WLAN and direct connection to Portable Computers or Smart phone. Where the same functionality and visualisation is given as in the Hand Terminal P1

Item: Royal College of ophthalmologists AHU's & Heat Pump
GOLD Air handling unit: AHU 1

Demarcation list

VC	Ventilation contracter	D	Delivery
PC	Pipe work contracter	A	Assembly
CM	Control and supervision	C	Connection
EC	Electrical contracter	F	Accountability for operation
CC	Cooling contracter	I	Inspection of the installation

Designation	Product	VC	PC	CM	EC	CC	Comments
GOLD	Air handlings system	DAF			C		Power supply carried out by EC.
G1	Supply fan, Wing	DCAF					Mounted and electrically connected in the GOLD.
G2	Extract fan, Wing	DCAF					Mounted and electrically connected in the GOLD.
V1	Supply air filter	DAF					Mounted in the GOLD
V2	Extract air filter	DAF					Mounted in the GOLD
E1	Rotary heat exchanger, RECOnomic	DAF					Mounted in the GOLD
P1	Hand terminal	DCAF					Mounted control cable with quick-fit connector to the GOLD.
T1	Motor control	DCAF					Mounted and electrically connected in the GOLD.
T2	Motor control	DCAF					Mounted and electrically connected in the GOLD.
T3	Heat exchanger control	DCAF					Mounted and electrically connected in the GOLD.
BT1	Temperature sensor, duct	DCAF					Mounted control cable with quick-fit connector to the GOLD.
BT2	Temperature sensor, duct	DCAF					Mounted and electrically connected in the GOLD.
BT3	Temperature sensor, duct	DCAF					Mounted and electrically connected in the GOLD.
BF1	Airflow pressure sensor	DCAF					Mounted and electrically connected in the GOLD.
BF2	Airflow pressure sensor	DCAF					Mounted and electrically connected in the GOLD.
BP1	Filter pressure sensor	DCAF					Mounted and electrically connected in the GOLD.
BP2	Filter pressure sensor	DCAF					Mounted and electrically connected in the GOLD.
BG1	Rotation monitor sensor	DCAF					Mounted and electrically connected in the GOLD.
R1	Outdoor air damper	DAF					
R2	Exhaust air damper	DAF					
MG1	Damper actuator, spring return	DAF			C		
MG2	Damper actuator, spring return	DAF			C		
BQ1	Air quality sensor	DF			AC		
E3	Cooling coil, water	DAF	C				
MF2	Valve actuator	DF			AC		
	Valve	DF	A				
BP10	Flow calibration sensor	DCAF					Mounted and electrically connected in the GOLD.

Technical specification

ProUnit Version: 27 / 2014.4.9

Project Royal College of ophthalmologists AHU's & Heat Pump

Atmospheric pressure	101325	Pa
Air density	1.200	kg/m³

Sound power to duct, measured according to ISO 5136
Noise reduction for function section included to duct.
Sound power emitted to surroundings, measured according to ISO 3741
Components are arranged according to airflow direction

AHU 2
GOLD RX
Manufactured by Swegon

Unit size	12	
Supply air flow	0.930	m³/s
Total pressure drop		
Outdoor air duct		Pa
Supply air duct	250	Pa
Extract air flow	0.930	m³/s
Total pressure drop		
Extract air duct	250	Pa
Exhaust air duct		Pa
Design outdoor temperature, summer	32.0	°C
Lowest design outdoor air temperature	-4.0	°C
Supply air temperature, summer	23.5	°C
Required supply air temperature, winter (ERS selected)	22.0	°C
Specific fan power efficiency rating, SFPv (clean filters)	1.72	kW/(m³/s)

With computer-based IQlogic control system
Painted panels with 50 mm fire retardant insulation
Electrical connections 3-phase, 5-wire, 400 V-10/+15%, 50 Hz, 10 A

Supply air

1 **Air intake section for outdoor installation, TBTF-2-12-3-1-1**
With damper

Pressure drop, connection	17	Pa

1 **Air handling system, GOLD, GOLD-12-E-RX**

Accessories

1 Roof for outdoor installation, TBTB-3-12-RX
1 AHU Exhaust air cowl for outdoor installation, TBTA-2-12-2

Pressure drop	13	Pa

1 Hand terminal GOLD ver E, TBLZ-1-71-1

1 **Filter**

Filter class F7
2x(490x592x370-8)

Recommended design pressure drop	105	Pa
Initial pressure drop	61	Pa
Final pressure drop	149	Pa

1 **Rotary heat exchanger**

Rotary heat exchanger of type RECOnomic
Standard aluminium
Speed controlled

Total pressure drop, supply air	150	Pa
Total pressure drop, extract air	150	Pa
Extra pressure drop in extract air side (damper) to ensure the right flow direction	0	Pa
Purging flow including leakage	0.086	m³/s
Temperature efficiency of supply air (84.0% at the same airflow)	84.0	%
Annual energy efficiency ratio, dry conditions.	99.0	%
Humidity efficiency, supply air, winter	12.0	%
Humidity efficiency, supply air, summer	0.0	%

Supply air side, winter	In	Out	
Air temperature	-4.0	17.0	°C
Relative humidity	100.0	23.7	%
Capacity		24.1	kW

Extract air side, winter	In	Out	
Air temperature	21.0	-0.0	°C
Relative humidity	25.0	98.2	%

Supply air side, summer	In	Out	
Air temperature	32.0	22.8	°C
Relative humidity	45.0	77.3	%

Extract air side, summer	In	Out	
Air temperature	21.0	30.2	°C
Relative humidity	50.0	28.9	%

1 **Fan section**

Fan of type GOLD Wing+
Direct drive with rotation controlled EC motor
Standard connection, internal
Rubber anti-vibration mountings

Supply air flow	0.930	m³/s
LOT without flow reduction	21.3	°C
Flow reduction at the lowest design outdoor temp.	100	%
Total pressure drop, duct	250.0	Pa
Total pressure rise (dry conditions) (Clean filter: 499 Pa)	543	Pa
Temperature rise caused by the fan	0.7	
Speed (Min 300, Max 2250, Clean filter 1684 r/m)	1738	r/m
Electric power to motor(s) (Clean filter: 0.75 kW)	0.83	kW
Rated motor power	1.60	kW
Motor option	1	
Motor code	DOMEL 748.3.292	
Number of fans/motors in the air stream	1	
Total efficiency (fan inside the unit)	61.0	%
Maximum motor efficiency (incl. motor control 91.5%)	94.0	%

Sound power level

Frequency band	**Hz**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**		**All**	
To supply air duct		79	74	74	72	73	73	68	65	dB	78	dB(A)
To outdoor air duct		74	71	68	58	49	47	42	43	dB	62	dB(A)
To surroundings		68	60	51	51	40	40	34	34	dB	52	dB(A)

To surroundings incl. exh. air	72	64	55	55	44	44	38	38	dB	56	dB(A)

1 **End section, supply air**
Total pressure drop 21 Pa

Extract air

1 **End section, extract air**
Total pressure drop 21 Pa

(Air handling system, GOLD)

1 **Filter**
Filter class F7
2x(490x592x370-8)
Recommended design pressure drop 107 Pa
Initial pressure drop 61 Pa
Final pressure drop 153 Pa

(Rotary heat exchanger)
Accessories and technical data, see supply air

1 **Fan section**
Fan of type GOLD Wing+
Direct drive with rotation controlled EC motor
Standard connection, internal
Rubber anti-vibration mountings

Extract air flow		0.930	m³/s
Total pressure drop, duct		250.0	Pa
Total pressure rise (dry conditions)	(Clean filter: 522 Pa)	568	Pa
Temperature rise caused by the fan		0.8	
Speed	(Min 300, Max 2250, Clean filter 1760 r/m)	1813	r/m
Electric power to motor(s)	(Clean filter: 0.85 kW)	0.93	kW
Rated motor power		1.60	kW
Motor option		1	
Motor code	DOMEL 748.3.292		
Number of fans/motors in the air stream		1	
Total efficiency (fan inside the unit)		62.0	%
Maximum motor efficiency	(incl. motor control 91.5%)	94.0	%

Sound power level

Frequency band	**Hz**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**		**All**	
To extract air duct		75	72	69	59	50	48	43	44	dB	63	dB(A)
To exhaust air duct		80	75	75	73	74	74	69	66	dB	79	dB(A)
To surroundings		69	61	52	52	41	41	35	35	dB	53	dB(A)

1 **End section, exhaust air**
Total pressure drop 21 Pa

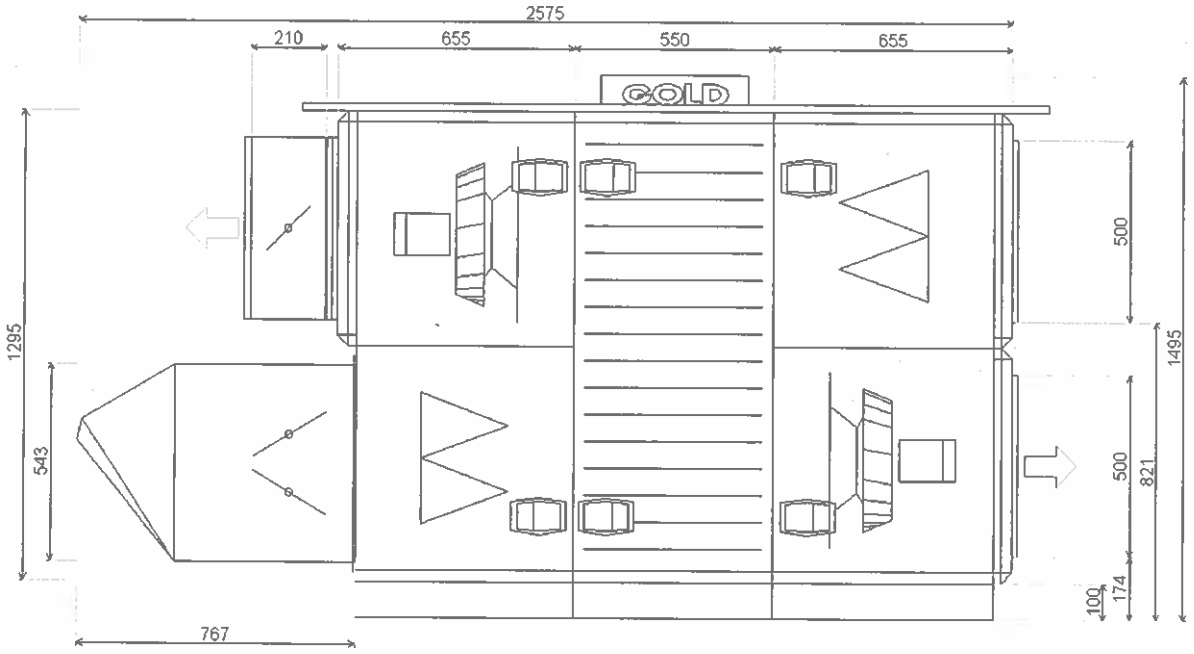
1 **Damper with actuator, TBSA-2-000-050-1-1**
Motor with spring return action
Tightness class 3 to EN 1751
1 Weather protection for damper actuator, TBLZ-1-45
Total pressure drop 6 Pa

Project: **Royal College of ophthalmologists AHU's & Heat Pump**
Inspection side

Unit: **AHU 2**

Size:	12
Total weight:	567 kg
Width, nominal:	1199 mm
Max:	1199 mm

Connection size:	Diameter
Damper with actuator	Ø 500
End section, supply air	Ø 500
End section, extract air	Ø 500
End section, exhaust air	Ø 500



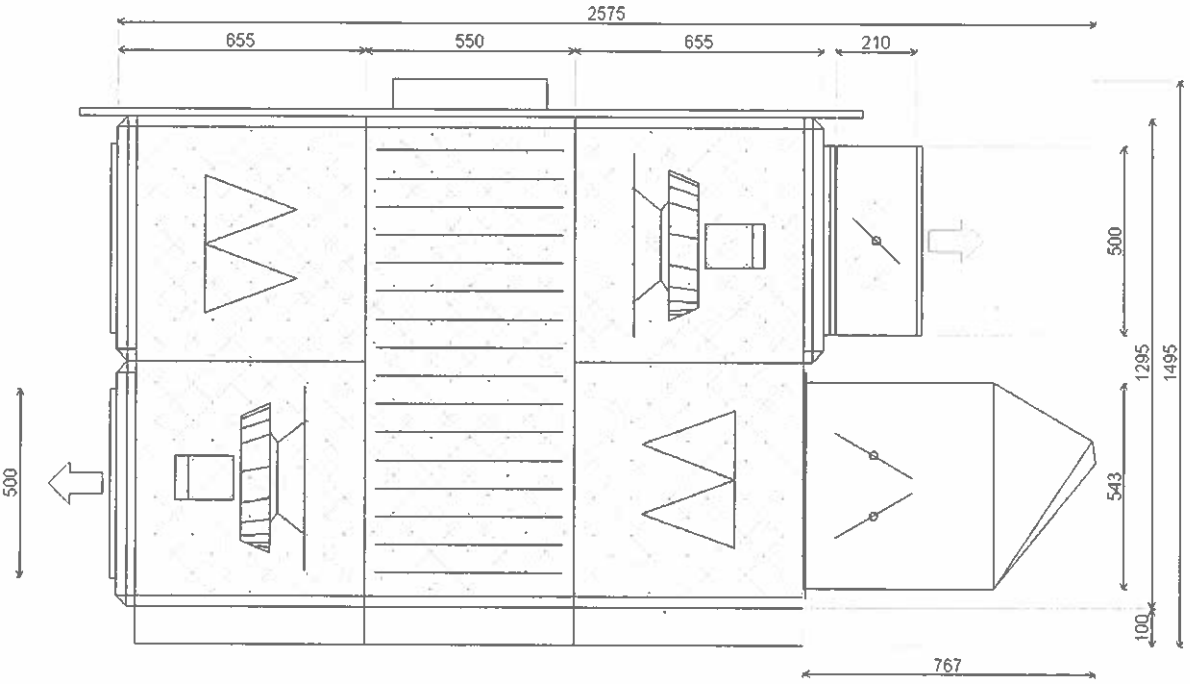
Project: **Royal College of ophthalmologists AHU's & Heat Pump**

Rear side

Unit: **AHU 2**

Size:	12
Total weight:	567 kg
Width, nominal:	1199 mm
Max:	1199 mm

Connection size:	Diameter
Damper with actuator	Ø 500
End section, supply air	Ø 500
End section, extract air	Ø 500
End section, exhaust air	Ø 500



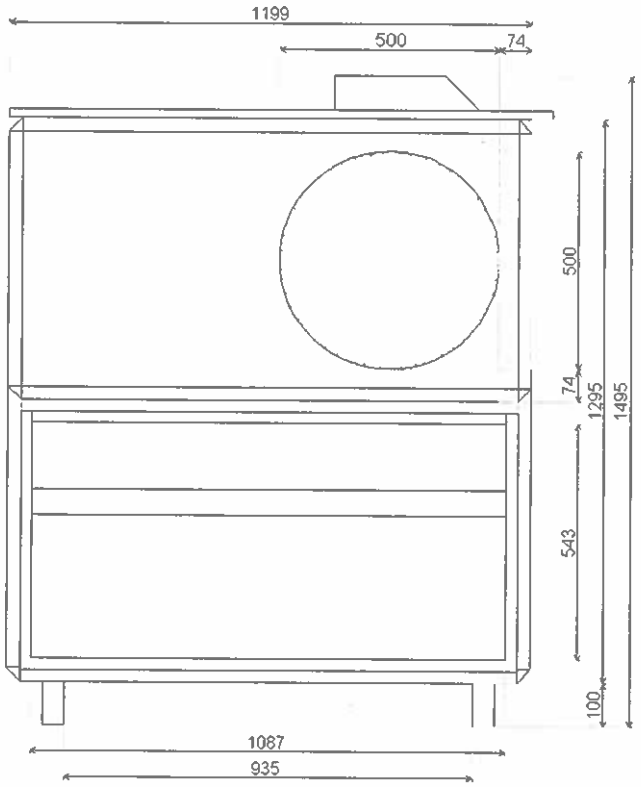
Project: **Royal College of ophthalmologists AHU's & Heat Pump**

Left-hand

Unit: **AHU 2**

Size:	12
Total weight:	567 kg
Width, nominal:	1199 mm
Max:	1199 mm

Connection size:	Diameter
Damper with actuator	Ø 500
End section, supply air	Ø 500
End section, extract air	Ø 500
End section, exhaust air	Ø 500

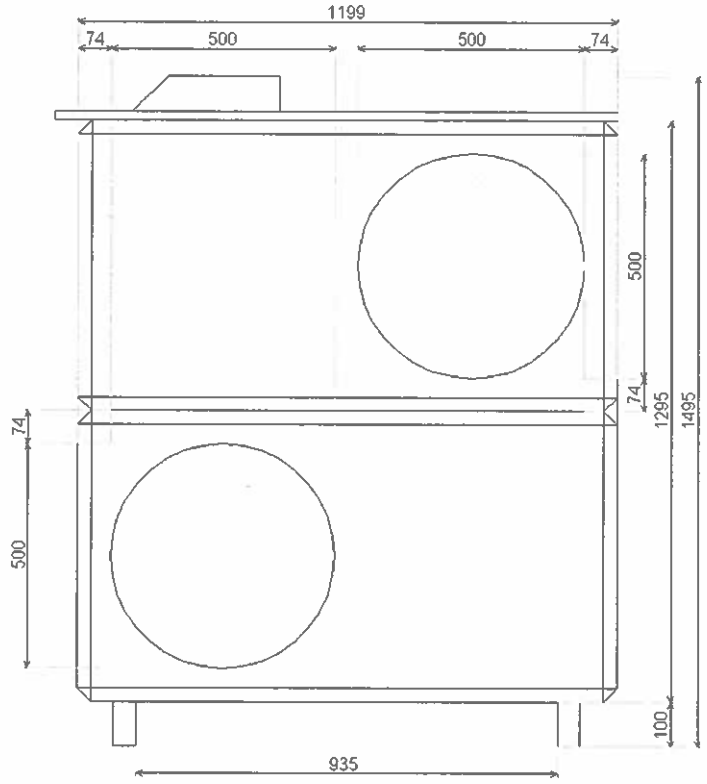


Project: **Royal College of ophthalmologists AHU's & Heat Pump**
Right-hand

Unit: **AHU 2**

Size:	12
Total weight:	567 kg
Width, nominal:	1199 mm
Max:	1199 mm

Connection size:	Diameter
Damper with actuator	Ø 500
End section, supply air	Ø 500
End section, extract air	Ø 500
End section, exhaust air	Ø 500

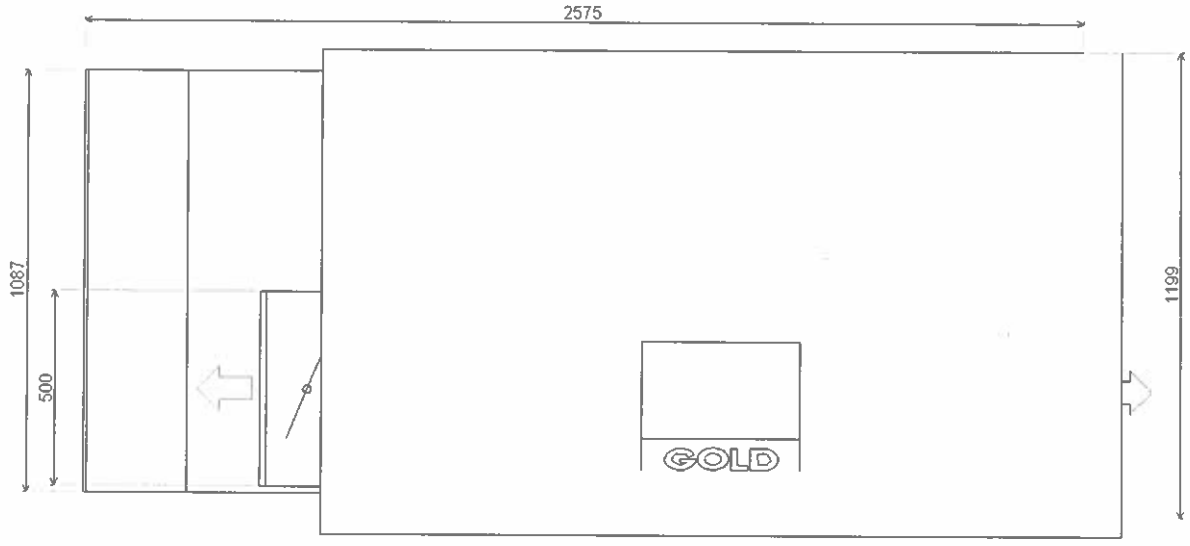


Project: **Royal College of ophthalmologists AHU's & Heat Pump**
Above

Unit: **AHU 2**

Size:	12
Total weight:	567 kg
Width, nominal:	1199 mm
Max:	1199 mm

Connection size:	Diameter
Damper with actuator	Ø 500
End section, supply air	Ø 500
End section, extract air	Ø 500
End section, exhaust air	Ø 500

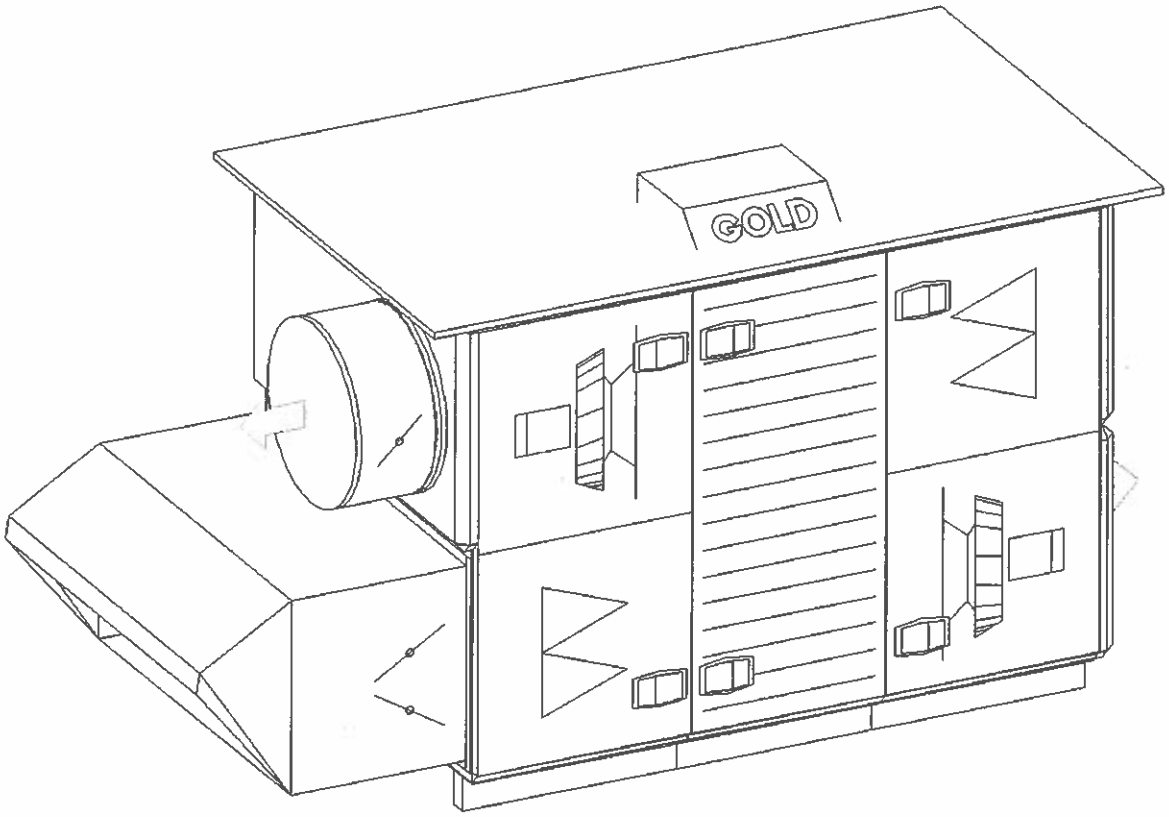


Project: **Royal College of ophthalmologists AHU's & Heat Pump**
Above left

Unit: **AHU 2**

Size:	12
Total weight:	567 kg
Width, nominal:	1199 mm
Max:	1199 mm

Connection size:	Diameter
Damper with actuator	Ø 500
End section, supply air	Ø 500
End section, extract air	Ø 500
End section, exhaust air	Ø 500



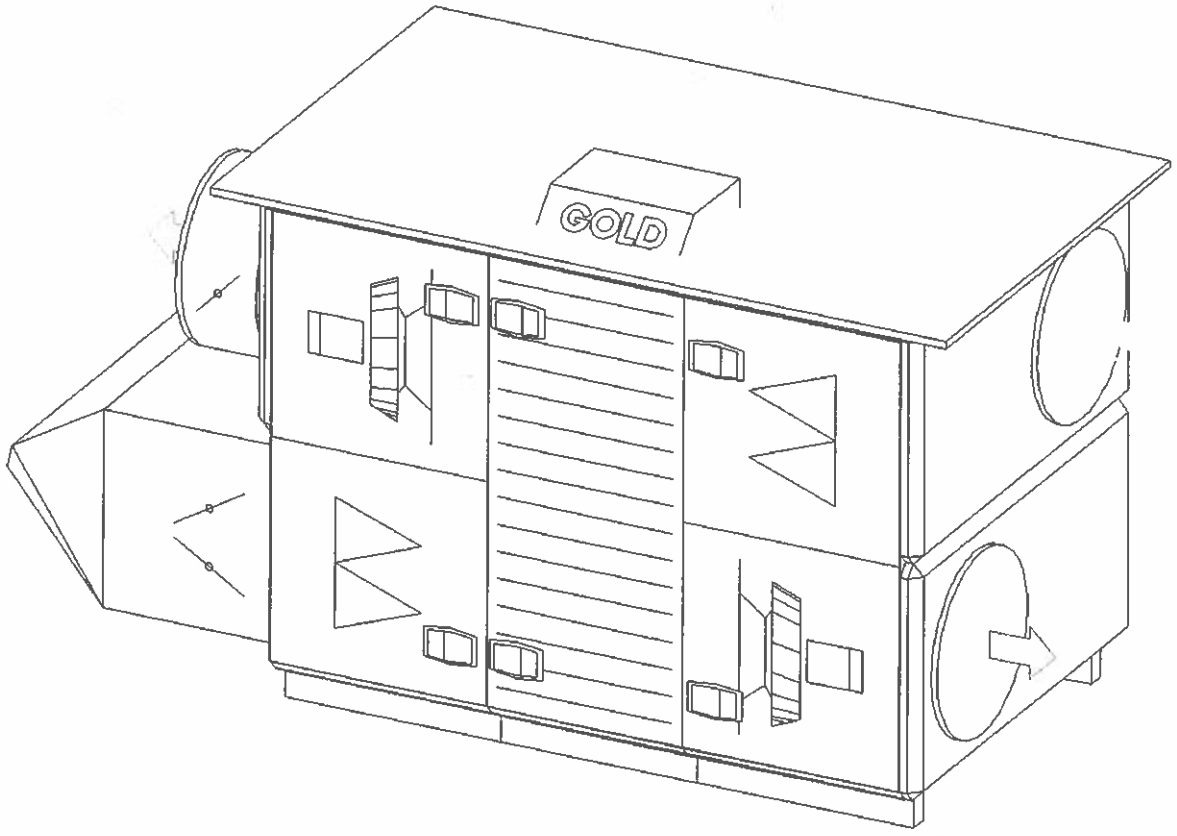
Project: **Royal College of ophthalmologists AHU's & Heat Pump**

Above right

Unit: **AHU 2**

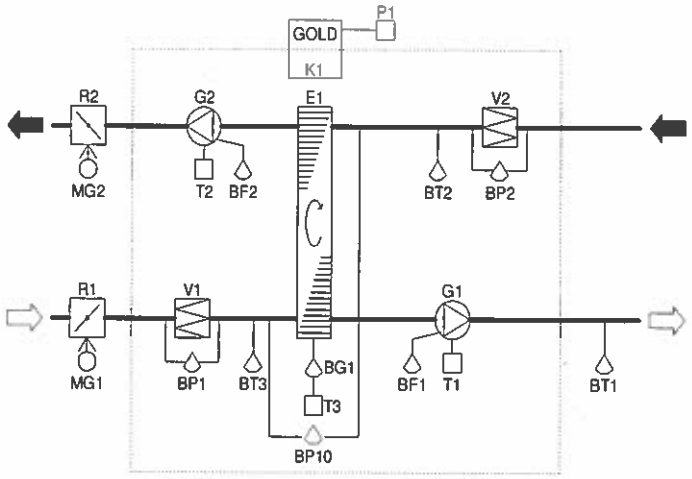
Size:	12
Total weight:	567 kg
Width, nominal:	1199 mm
Max:	1199 mm

Connection size:	Diameter
Damper with actuator	Ø 500
End section, supply air	Ø 500
End section, extract air	Ø 500
End section, exhaust air	Ø 500



Item: Royal College of ophthalmologists AHU's & Heat Pump
GOLD Air handling unit: AHU 2

Function summary
Air Handling System GOLD RX with rotory heat exchangerRECOnomic, Supply- and Extract Air fan Wing including completely inigrated control system IQlogic.
The desired settings can be entered in the hand-held micro terminal, where current in-service readings are also shown.
Controls
Time switch, low-high
Sequential start-up
Damper with actuator outdoor air, modulating
Damper with motor, exhaust air duct,spring return
Constant air flow regulation, supply air
Constant air flow regulation, extract air
Density-corrected air flow
Extract air temp.-related supply air temp.-regulation (ERS regulation)
Heating sequence
- Rotary heat exchanger
Functions
Cooling recovery, rotary heat exchanger
Air purging function
Carry-over control, rotary heat exchanger
Zero point calibration
Alarm monitoring
Filter monitoring
Rotation sensor, rotary heat exchanger
Temperature monitoring
Service period
Logging function
Recirculation section
Wifi connection to WLAN



GOLD	Air handlings system	BT3	Temperature sensor, duct
G1	Supply fan, Wing	BF1	Airflow pressure sensor
G2	Extract fan, Wing	BF2	Airflow pressure sensor
V1	Supply air filter	BP1	Filter pressure sensor
V2	Extract air filter	BP2	Filter pressure sensor
E1	Rotary heat exchanger, RECOnomic	BP10	Flow calibration sensor
P1	Hand terminal	BG1	Rotation monitor sensor
T1	Motor control	R1	Outdoor air damper
T2	Motor control	R2	Exhaust air damper
T3	Heat exchanger control	MG1	Damper with actuator, modulating, spring return
BT1	Temperature sensor, duct	MG2	Damper actuator, spring return
BT2	Temperature sensor, duct	K1	Control box IQlogic

Item: Royal College of ophthalmologists AHU's & Heat Pump
GOLD Air handling unit: AHU 2

Description of the functions

Controls
GOLD is controlled via Hand Termonal P1 which is a capacitive 7" touch screen with an intuitive user interface and information help texts.
Settings and readings for included components in GOLD are presented in a flow chart on the screen.
All settings and readings are expressed in real values, such as temperatures in °C; airflows optional in m3/s, m3/h or l/s and pressure in Pascal.
GOLD controls low-high as set times in time channel
When starting the GOLD, extract fan G2 is started and heat exchanger E1 is forced to max. recovery
Then, as a preset delay, the supply fan G1 starts.
Supply fan G1 and extract fan G2 are inter locked
Damper actuator MG2 closes the exhaust air damper R2 when GOLD stops, and if power fails.

Constant air flow regulation, supply air
Flow pressure sensor BF1 keeps the constant supply air flow via motor controller T1.
Via the hand terminal P1 the required flow for low- and high speed for supply air is set.

Constant air flow regulation, extract air
Flow pressure sensor BF2 keeps the constant extract air flow via motor controller T2.
Required flow for low and high extract air fan operation mode is set via hand terminal P1.
The air flow is density corrected and compensated automatically for the airs increased density at low outdoor temperatures

Exhaust air temp.- related supply air temp. regulation (ERS regulation1)
The temp. on the supply air is regulated to follow the extract air temp. at a set curve
Three factors are affected by the setting in the hand terminal P1
1. Set point in °C (starting from extract air temp).
2. Temp limit above the set point in fixed steps.
3. Temp difference under set point in °C.
Temperature sensor BT1 keeps the supply air temperature constant according to the following control sequence.
Via hand terminal P1 the required temp set value is set.
Control sequence if heating is required:
- Heat exchanger E1 is started via heat exchanger controller T3, which on an increased heating load steplessly and linearly regulates the heat recovery efficiency of the heat exchanger to max.

Cooling recovery, rotary heat exchanger
Heat exchanger E1 operates at max rpm when temp. sensor BT2 senses a lower temp than temp. sensor BT3.

Air purging function
Heat excanger E1 starts at regular intervals for purging the rotor during longer periods of inactivity.

Carry-over control
The heat exchanger's max. rotation speed is calculated with respect to the airflow so that a correct purging function can be performed even at low airflows.
Pressure sensor BP10 measures the leakage- and purging flow over the heat exchanger and corrects the Extract Air fan flow measurement for a correct flow description.

Zero point calibration
The zero point value is checked on all connected pressure sensors. If the value doesn't tally, a new calibration is made.
The function is automatically switched in each time the fans have been stopped for more than 3 minutes.

Alarm monitoring
The alarm can be seen in clear text on the hand terminal P1, where even re-setting of the alarm is done.
Alarm priority A or B can be chosen for all alarms. The alarm's function, if it is to stop the GOLD or not, is chosen individually for each alarm. Safety alarms always stop the GOLD.

Filter monitoring
Pressure sensor BP1 continually measures the pressure drop across filter V1.
Pressure sensor BP2 continually measures the pressure drop across filter V2.
The alarm limit is calculated continuously and is changed automatically dependent on the actual flow. When the set alarm value is reached the alarm is activated. The alarm limit for each filter is set in the hand terminal P1.

Rotation sensor, rotary heat exchanger
Rotation sensor BG1 monitors continuously the heat exchanger E1. On an inadvertent stop, the heat exchanger initiates an alarm and stops the GOLD at low out door temp.

Temperature monitoring
Temperatures on temp. sensors BT1 and BT2/BM2 are monitored continuously. Alarm is given if the temp. goes below set limits. The required Alarm values are set in Hand Terminal P1
The alarm is delayed 20 minutes.

Service period
When the set service time is reached an alarm is given. After the service the next service period is set via hand terminal P1.

Reading
Actual working value is shown in the hand terminal P1.
Temperatures
- Temperature readings on all connected temperature sensores.
- Set and actual set value.
Supply- and extract fan:
- Flow / pressure
- Set and actual set value.
- Working level
- Output
- Power.
- SFPv-value.
Filter
- Calculated and set alarm limit.
Rotory heat exchanger:
- Calculated efficiency
Control sequence:
- All activated and connected control sequences.
- All conected valve actuators are equiped with valve response that indicates the valve position and gives an alarm at differing valve position.
Input and output connections:
- Current status.
Operating periods:
- Supply and extract air fans.
- Heat exchanger.
Alarms:
GOLD is controlled and monitored by web reader. Control system IQlogic includes a web server where a dynamic flow chart, operation- and function page is available. Alarms are forwarded via built-in email function.
- Current alarm without time delay.
All other settings are also shown in the hand terminal.

Manual test
Provision is available for testing and checking internal components in GOLD unit. Fans, heat

exchanger, inputs and outputs and the connected accessories can be tested individually.

Logging function
Via styr systemets multi-media card the parameter values are logged and saved for the systems log function.
On a specific log page in the Hand Terminal one or several parameters can be chosen, to be read in a diagram with a time axis and a size axis. The parameters can be read in real time or as a loged value.

WiFi
Control unit K1 is equiped with an anteni for connection to WLAN and direct connection to Portable Computers or Smart phone. Where the same functionality and visualisation is given as in the Hand Terminal P1

Item: Royal College of ophthalmologists AHU's & Heat Pump
GOLD Air handling unit: AHU 2

Demarcation list

VC	Ventilation contracter	D	Delivery
PC	Pipe work contracter	A	Assembly
CM	Control and supervision	C	Connection
EC	Electrical contracter	F	Accountability for operation
CC	Cooling contracter	I	Inspection of the installation

Designation	Product	VC	PC	CM	EC	CC	Comments
GOLD	Air handlings system	DAF			C		Power supply carried out by EC.
G1	Supply fan, Wing	DCAF					Mounted and electrically connected in the GOLD.
G2	Extract fan, Wing	DCAF					Mounted and electrically connected in the GOLD.
V1	Supply air filter	DAF					Mounted in the GOLD
V2	Extract air filter	DAF					Mounted in the GOLD
E1	Rotary heat exchanger, RECOnomic	DAF					Mounted in the GOLD
P1	Hand terminal	DCAF					Mounted control cable with quick-fit connector to the GOLD.
T1	Motor control	DCAF					Mounted and electrically connected in the GOLD.
T2	Motor control	DCAF					Mounted and electrically connected in the GOLD.
T3	Heat exchanger control	DCAF					Mounted and electrically connected in the GOLD.
BT1	Temperature sensor, duct	DCAF					Mounted control cable with quick-fit connector to the GOLD.
BT2	Temperature sensor, duct	DCAF					Mounted and electrically connected in the GOLD.
BT3	Temperature sensor, duct	DCAF					Mounted and electrically connected in the GOLD.
BF1	Airflow pressure sensor	DCAF					Mounted and electrically connected in the GOLD.
BF2	Airflow pressure sensor	DCAF					Mounted and electrically connected in the GOLD.
BP1	Filter pressure sensor	DCAF					Mounted and electrically connected in the GOLD.
BP2	Filter pressure sensor	DCAF					Mounted and electrically connected in the GOLD.
BG1	Rotation monitor sensor	DCAF					Mounted and electrically connected in the GOLD.
R1	Outdoor air damper	DAF					
R2	Exhaust air damper	DAF					
MG1	Damper actuator, modulating, spring return				DAF	C	
MG2	Damper actuator, spring return	DAF			C		
BP10	Flow calibration sensor	DCAF					Mounted and electrically connected in the GOLD.

TS-006-2014_04_15 BASEMENT AHU HEAT PUMP SCHEDULE

TECHNICAL DATA EN 14511

Swegon

Unit

Model	MAROON 2 MT 25/LN/ST 1PS
Refrigerant	R410A

Cooling

Cooling capacity	22.23	kW
Total power input	6.31	kW
EER (2)	3.52	

Heating

Heating capacity	17.79	kW
Total power input	7.02	kW
COP TOTAL (2)	2.53	

Compressors

Type	Scroll	
Quantity	1.00	n°
Refrigerant circuits	1.00	n°
Capacity steps	1.00	%
Total oil charge	2.51	kg
Total refrigerant charge	9.10	kg

Evaporator (Summer)

Carrier fluid	ETH. GLYCOL 25%	
Inlet water temperature	12	°C
Outlet water temperature	8	°C
Type	Plates evaporator	
Quantity	1.00	n°
Water flow rate	5121	l/h
Hydraulic circuit pressure drop	62	kPa
Water content	1.12	l

Condenser (Winter)

Carrier fluid	ETH. GLYCOL 25%	
Inlet water temperature	40	°C
Outlet water temperature	45	°C
Type		
Quantity	1.00	n°
Water flow rate	3430	l/h
Hydraulic circuit pressure drop	23	kPa

Fans

Type	Axial	
Ambient air temperature (Summer)	32	°C
Ambient air temperature (Winter)	-4	°C
Relative humidity	99	%
Total air flow rate	14000	m³/h
Standard available static pressure		Pa
Quantity	2.00	n°
Fan motor rated power	0.30	kW
Fan motor rated current	1.70	A

Nominal electrical data

Max. absorbed power (1)	10.20	kW
Max. absorbed current - FLA	22.20	A
Max. starting current (4)	101.20	A
Electric power supply		V/Ph/Hz
Control circuits power supply		V/Ph/Hz

Dimensions

Length	1105	mm
Height	1850	mm
Depth	505	mm
Weight in operation		kg

Sound spectrum

Frequency	63	125	250	500	1000	2000	4000	8000	Total
[Hz]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB(A)]
Lw	76.0	74.0	74.0	71.0	62.0	60.0	55.0	46.0	71.0
Lp	45.0	43.0	43.0	40.0	31.0	29.0	24.0	15.0	40.0

Lw: sound power levels in free field conditions calculated according to ISO 3744
Lp: sound pressure values measured at 10 meters distance from the unit in free field and at nominal working conditions, in compliance with ISO 3744
(1) Electric power that must be available from the mains for the unit operation.
(2) This value derives from effective absorbed power.
(4) With standard start-up

The weight is a preliminary estimate related to the basic unit, without accessories

Hydraulic module

Pumps number	1	n°
Pump type	Standard	
Carrier fluid	ETH. GLYCOL 25%	
Water flow rate	5121	l/h
Pump rated power	0.62	kW
Pump rated current	2.77	A
Available pressure	72.9	kPa
Max. allowable hydraulic circuit pressure	600	kPa
Storage tank capacity	130	l