PARASOL VAV

Installation – Commissioning – Maintenance

20160301
Art. 942428032

Parasol VAV system design, recommended arrangement of modules

Master and slave modules

The base modules are called slave modules and a base module with control equipment is called a Master.

A Master can control a maximum of 7 slave modules.

The control equipment is supplied in factory-mounted condition or can be ordered separately for upgrading a slave module to Master.

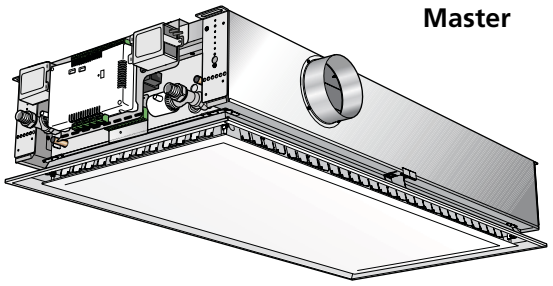
The slave modules receive control voltage from the Master for regulating air dampers and valve actuators.

Pressure measurements and calculations required for regulating the airflow in the room take place in the Master.

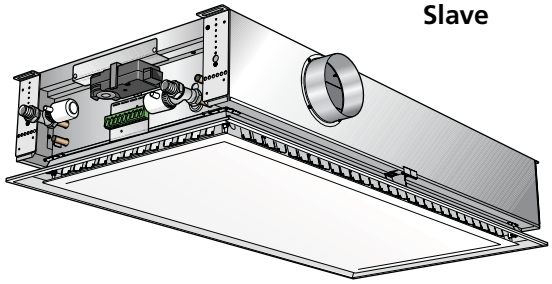
The Master presupposes that all the modules in the room act in exactly the same way and have exactly the same C-factor, commissioning pressure and accordingly also the same airflow.

In order for the Parasol VAV system to operate in the best way, the following is recommended:

- Constant pressurisation in the zone
- Symmetric arrangement of the modules (so that the commissioning pressure will be as equal as possible in every module)
- The modules in the room should all be the same size
- All the modules should have the same nozzle configuration (C-factor)



Master



Slave

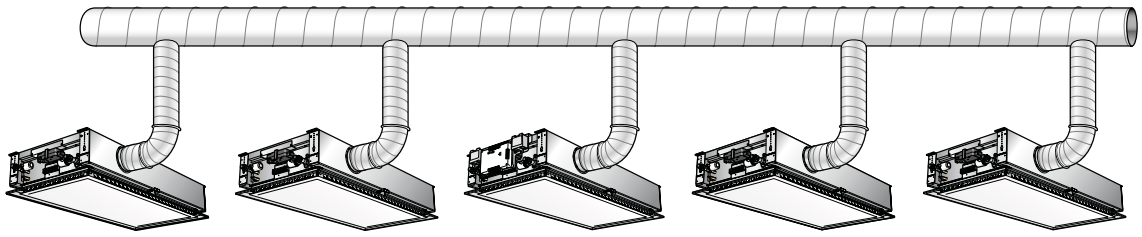
Recommended arrangement

If the modules in the room have different commissioning pressures, it is advisable to locate the Master where the commissioning pressure is somewhere halfway between the lowest and the highest commissioning pressure in the room; see Example 1.

The Master registers and adjusts the airflow. When the commissioning pressure differs substantially between the modules, it is important to consider the location of the Master in order to obtain an airflow in the room that is as correct as possible.

Swegon

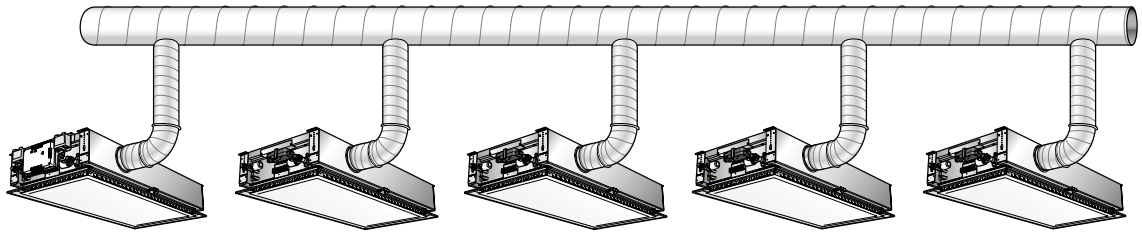
Example 1
In this example, we want 175 l/s (630 m³/h) in the room when there is max. occupancy. The Master is located between the lowest and highest commissioning pressure in the room.



Module number	Model	Nozzle configuration	Pressure	The module's airflow	
			Pa	l/s	m³/h
1, Slave	Parasol VAV 1200 HF	H-H-H-H	80 Pa	37.4	134,6
2, Slave	Parasol VAV 1200 HF	H-H-H-H	75 Pa	36.2	130,3
3, Master	Parasol VAV 1200 HF	H-H-H-H	70 Pa	35.0	126
4, Slave	Parasol VAV 1200 HF	H-H-H-H	65 Pa	33.7	121,3
5, Slave	Parasol VAV 1200 HF	H-H-H-H	60 Pa	32.4	116,6
				Sum: 174.7 l/s	628,9 m³/h

The sum of the actual airflow will thus be 174.7 l/s (628,9 m³/h)which means that the difference between the required airflow and the actual airflow will be minimal.

Example 2
Example 2 shows the same system and commissioning pressure in the modules in the room but now the Master is installed at a different location, consequently the difference between the required airflow and the actual airflow is greater, compared with Example 1.



In this example, we want 175 l/s (630 m3/h)in the room when there is max. occupancy. The Master is located by the highest commissioning pressure in the room.

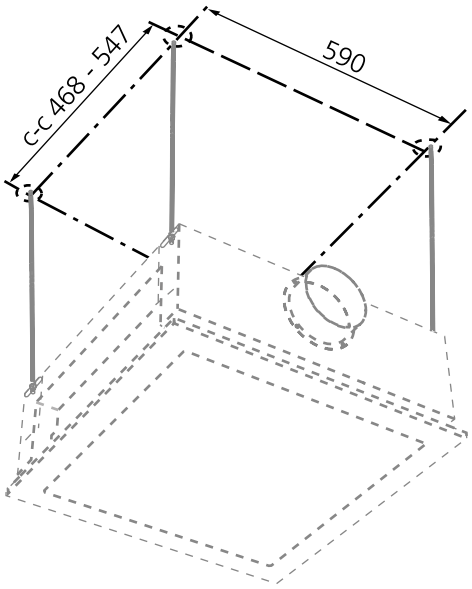
Module number	Model	Nozzle configuration	Pressure	The module's airflow	
				l/s	m³/h
1, Master	Parasol VAV 1200 HF	H-H-H-H	80 Pa	35.0	126
2, Slave	Parasol VAV 1200 HF	H-H-H-H	75 Pa	33.9	122
3, Slave	Parasol VAV 1200 HF	H-H-H-H	70 Pa	32.7	117,7
4, Slave	Parasol VAV 1200 HF	H-H-H-H	65 Pa	31.5	113,4
5, Slave	Parasol VAV 1200 HF	H-H-H-H	60 Pa	30.3	109,1
				Sum: 163.4 l/s	588,2 m³/h

The sum of the actual airflow will thus be 163.4 l/s (588,2 m³/h) which means that the difference between the required airflow and the actual airflow is about 7%.

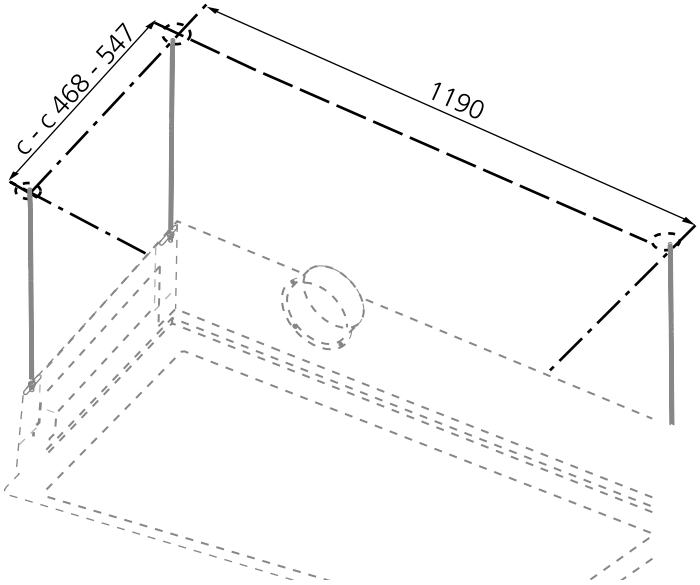
Mounting

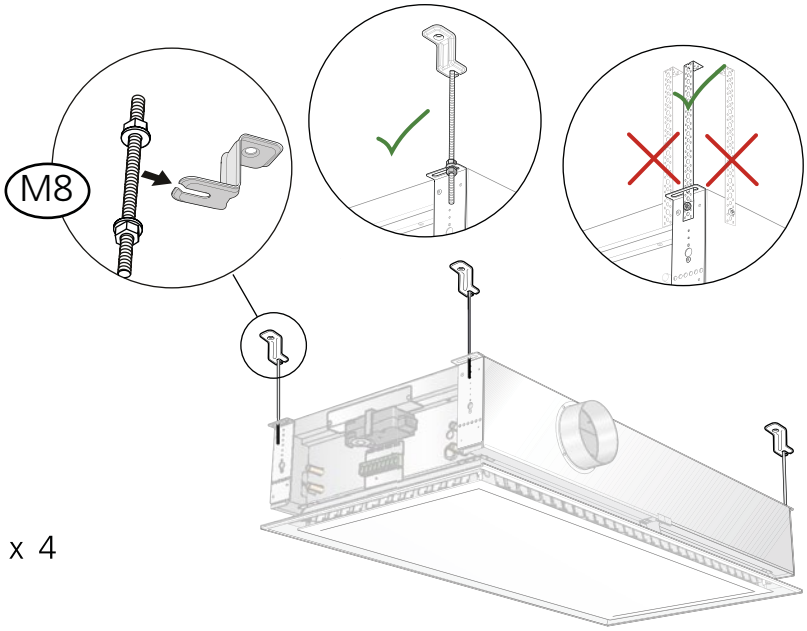
To mount the unit in the ceiling

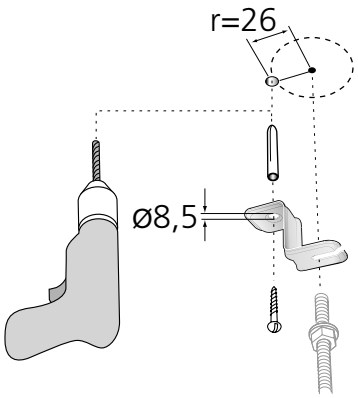
PARASOL VAV 600 / 600 PF



PARASOL VAV 1200 / 1200 PF



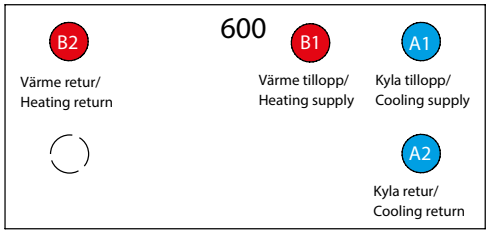


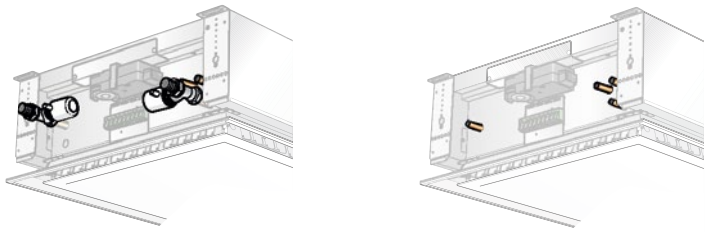


x 4

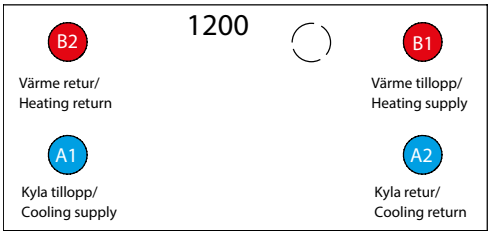
Water connections

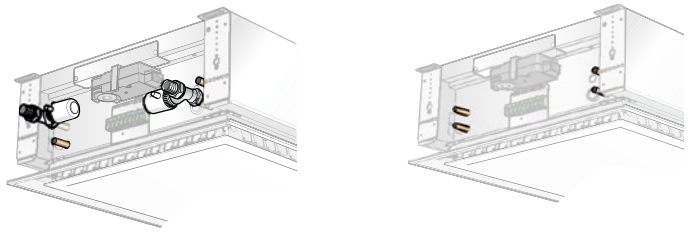
PARASOL VAV 600 / 600 PF





PARASOL VAV 1200 / 1200 PF





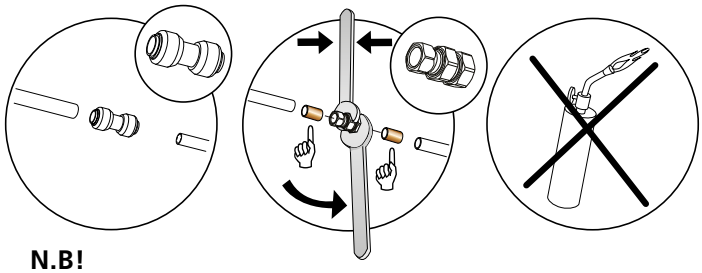
Connection dimensions:

Water connections with factory fitted valves

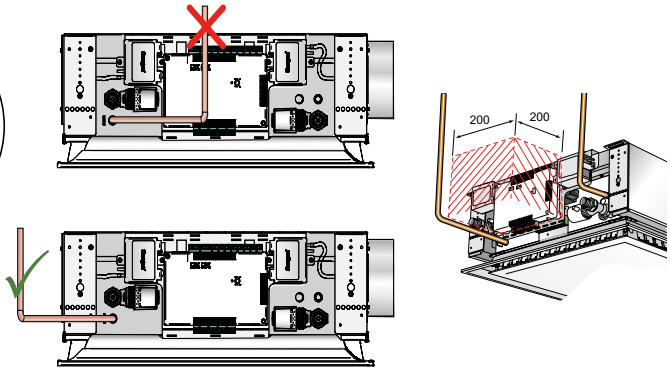
A1	Inlet, chilled water	ø 12 × 1.0 mm (Cu)
A2	Return, chilled water	male threads, DN (1/2")
B1	Inlet, heated water	ø 12 × 1.0 mm (Cu)
B2	Return, heated water	male threads, DN (1/2")

Water connections without valves

A1	Inlet, chilled water	ø 12 × 1.0 mm (Cu)
A2	Return, chilled water	ø 12 × 1.0 mm (Cu)
B1	Inlet, heated water	ø 12 × 1.0 mm (Cu)
B2	Return, heated water	ø 12 × 1.0 mm (Cu)

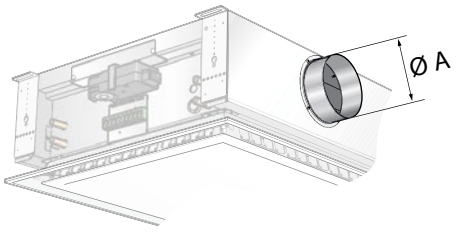


N.B!
Use support sleeves inside the pipes together with compression ring couplings.



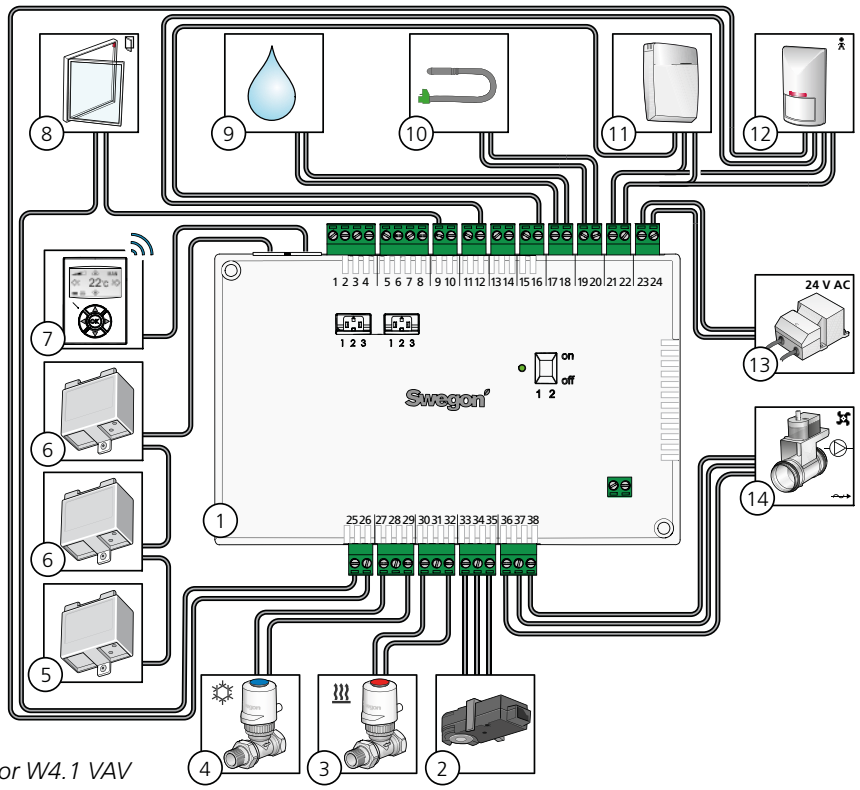
N.B!
Connect the pipes in such a way to provide a clear space for service in front of the Conductor W4.1 VAV.

Air connection



Unit	A
PARASOL VAV 600	Ø 125
PARASOL VAV 600 PF	Ø 160
PARASOL VAV 1200	Ø 125
PARASOL VAV 1200 PF	Ø 160

Master, wiring diagram

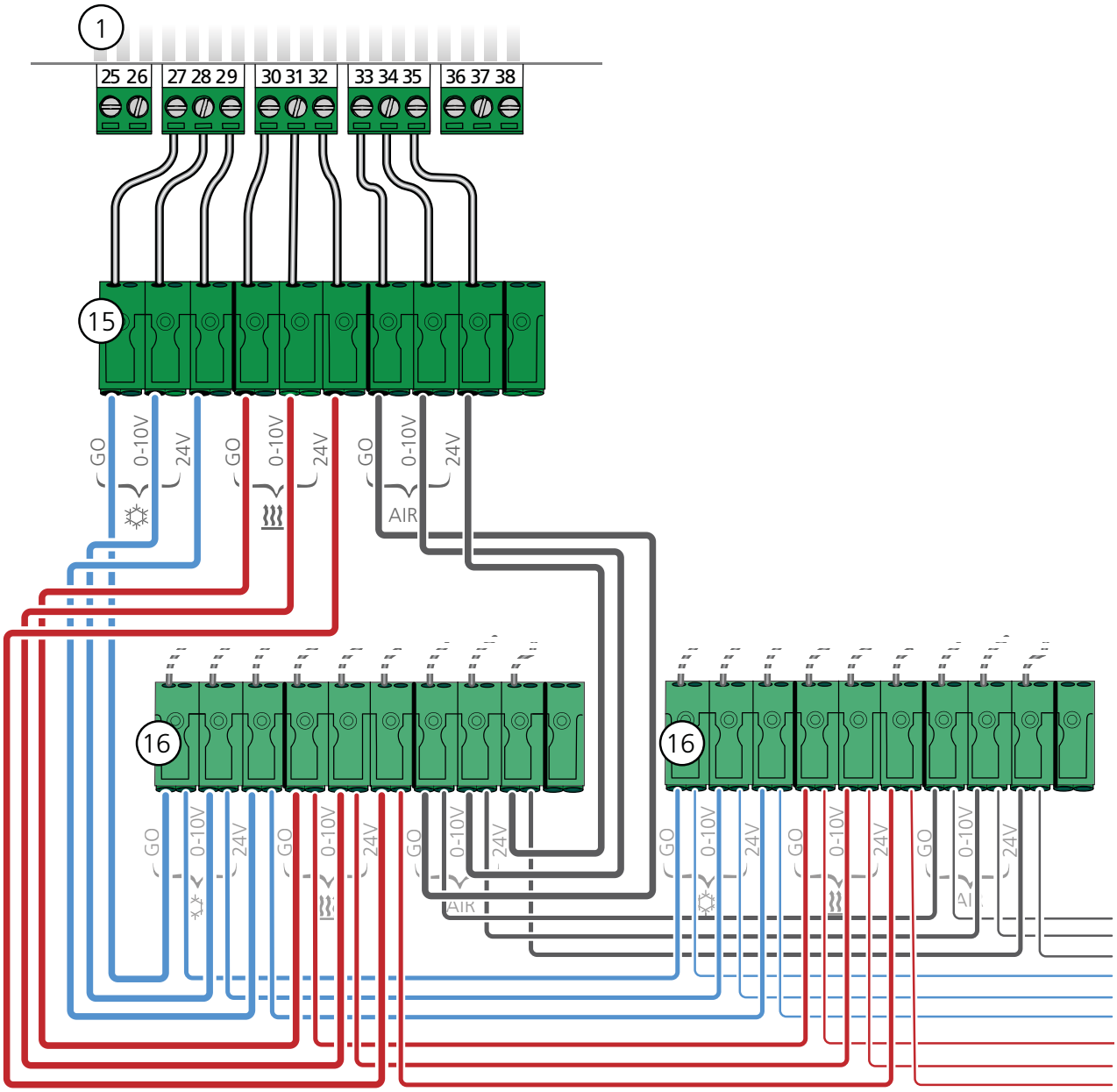


Master with Conductor W4.1 VAV

Pos.	Description	Installation	Conn.	Data
1	Conductor W4.1 VAV	Factory-mounted on the module or can be ordered separately for upgrading a slave module to Master.		
2	Damper motor for supply air	Factory mounted on module	33	-G0
			34	0-10V
			35	+24V
3	Valve actuator for heated water (optional)	Factory mounted on module	30	-G0
			31	0-10V
			32	+24V
4	Valve actuator for chilled water (optional)	Factory mounted on module	27	-G0
			28	0-10V
			29	+24V
5	Pressure sensor, extract air (optional)	To be installed in room/zone	RJ12	Modular connector
6	Pressure sensor, supply air (RJ12)	Factory mounted on module	RJ12	Modular connector
7	Room unit [coils (wireless) or RJ12]	To be installed in room/zone	RJ12	Modular connector
8	Window contact (optional)	To be installed in room/zone	25	10V
			10	10V
9	Condensation sensor (optional)	Factory mounted on module	17	Resistor
			18	
10	Temperature sensor (optional)	To be installed in room/zone	19	KTY
			20	
11	Carbon dioxide sensor* (optional)	Can be supplied in factory-mounted condition on the module or can be ordered separately for installation in the room/zone.	16	0-10V Signal
			21	+24V AC
			22	-G0
12	Occupancy detector*	To be installed in room/zone	26	10V
			12	0-10V
			21	+24V AC
			22	-G0
13	Transformer (optional)	To be installed in room/zone	23	+ 24V AC
			24	-G0
14	Damper motor for extract air* (optional)	To be installed in room/zone	36	-G0
			37	0-10V
			38	+24V

** Separate instructions are available at swegon.com*

To wire the slave modules to the Master

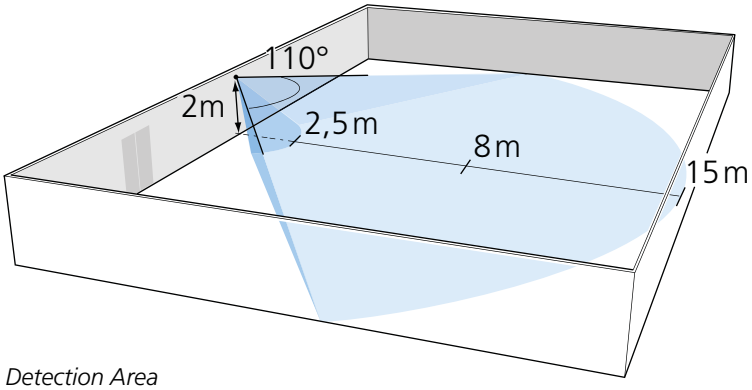


Pos.	Description
1	Conductor W4.1 VAV on Master
15	Wiring terminals on the Master
16	Wiring terminals on the slave modules

Wire the slave modules according to the diagram above.

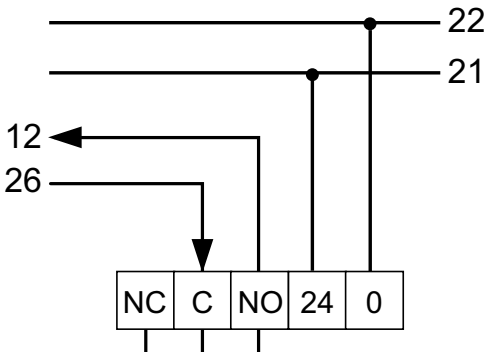
Where to install and how to wire the occupancy detector

Install the occupancy detector in a suitable place in the room,
see the detection area.



Detection Area

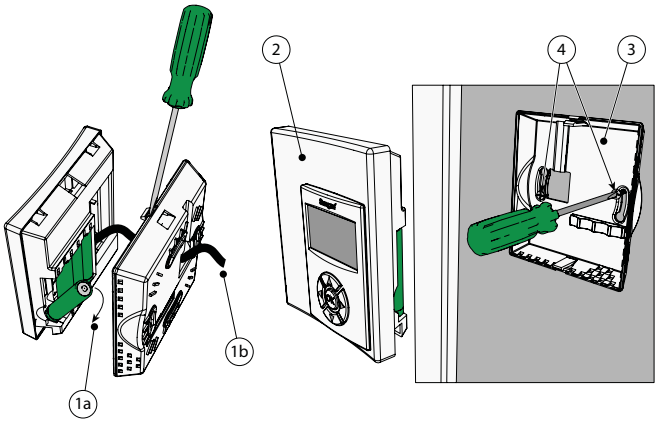
Wire the occupancy detector according to the wiring diagram.



Wiring diagram

Install and connect the room unit

- Recommended installation height above the floor: standard height for switches.
- Locate the room unit where it will not be exposed to direct sunlight or other harmfull heat sources.
- Ensure that room air can circulate around the front and sides of the room unit.

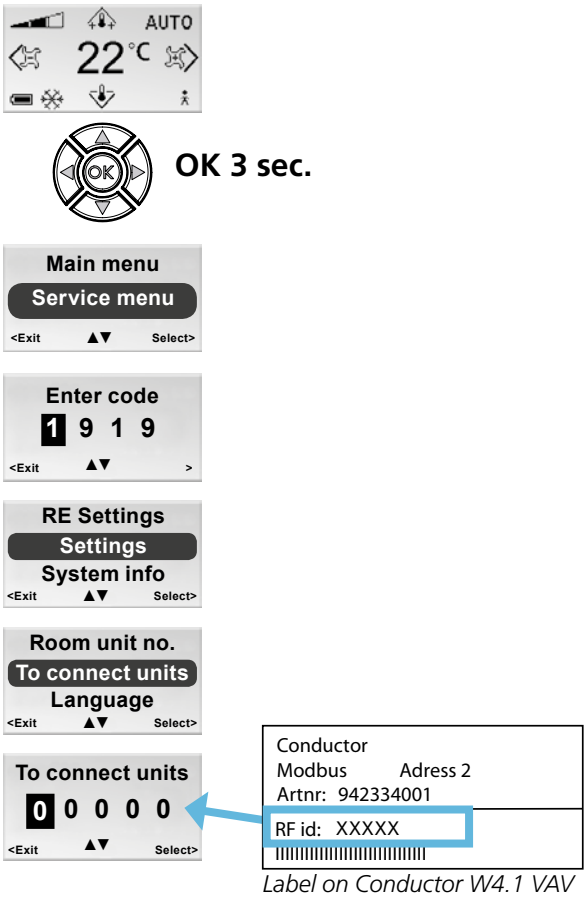


To install the room unit (thermostat).

Pos.	Description
1a	Wireless: 3 × AAA batteries
1b	Cable: RJ12
2	Front
3	Back piece
4	Screws appropriate for the wall material

Wireless connection

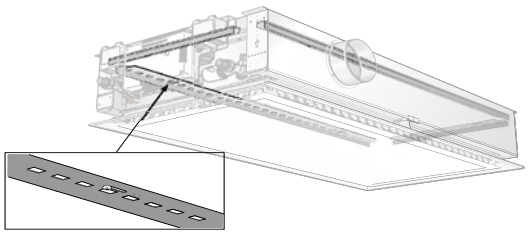
Interconnect the room unit and Conductor W4.1 VAV by entering the RF ID in the room unit.

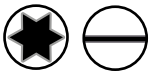


Label on Conductor W4.1 VAV

Commissioning

Nozzle configuration





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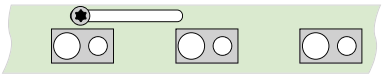
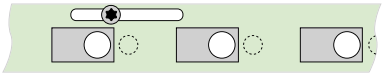
High (H) → Medium (M) → Low (L)

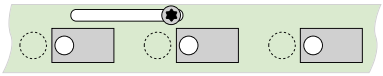
H =



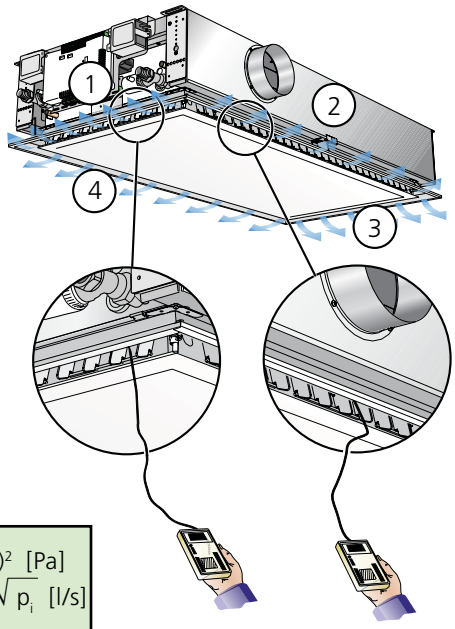
M =



L =



Measurement of airflows



$p_i = (q/k)^2$ [Pa]
$q = k \times \sqrt{p_i}$ [l/s]
p_i [Pa]
q [l/s]
k = C-factor

PARASOL VAV	Nozzle configuration per side	Side	C-factor
600	L	1, 3	0.25
600	L	2, 4	0.25
600	M	1, 3	0.44
600	M	2, 4	0.44
600	H	1, 3	0.69
600	H	2, 4	0.69
600 PF	L	1, 3	0.28
600 PF	L	2, 4	1.29
600 PF	M	1, 3	0.44
600 PF	M	2, 4	1.45
600 PF	H	1, 3	0.69
600 PF	H	2, 4	1.70
1200	L	1, 3	0.25
1200	L	2, 4	0,66
1200	M	1, 3	0.44
1200	M	2, 4	1,16
1200	H	1, 3	0.69
1200	H	2, 4	1,82
1200 PF	L	1, 3	0.28
1200 PF	L	2, 4	2,59
1200 PF	M	1, 3	0.44
1200 PF	M	2, 4	2,98
1200 PF	H	1, 3	0.69
1200 PF	H	2, 4	3.53

To calculate the airflows

Short sides (1+3)

Fetch the C-factor for the sides (1+3) from the table. Measure commissioning pressure p_i for the sides (1+3). Then calculate the airflow for the sides (1+3) using the formula:

$k\ (1+3) \times \sqrt{(p_i\ (1+3)} \Rightarrow q\ (1+3)$

Long sides (2+4)

Fetch the C-factor for the sides (2+4) from the table. Measure commissioning pressure p_i for the sides (2+4). The calculate the airflow for the sides (2+4) using the formula:

$k\ (2+4) \times \sqrt{(p_i\ (2+4)} \Rightarrow q\ (2+4)$

Total airflow

The total airflow of the module is the sum of the short and long sides:

$q_{tot} = q\ (1+3) + q\ (2+4)$

N.B! p_i (1+3) ≠ p_i (2+4)
NOTE: The commissioning pressure is different for the short sides (1+3) and the long sides (2+4).

Conductor W4.1 VAV,

Commissioning/Checking the airflows

This information is a summary of the most important points in connection with commissioning, checking the airflows and adjustments.

For more detailed information see also *Conductor Technical Manual* and *Parasol VAV Product Datasheet* at swegon.com.

- Use CONTROL Zone dampers or equivalent dampers for the best operation and constant pressurisation in the zone.
- Check that all the products/constituent units are energised.
- Check that Conductor W4.1 VAV is set to Parasol VAV.
  - Appl. parameter
  - P_1964
  - Value = 3
- Check that the Modbus address is correct if Super WISE or another BMS is used.
  - The Modbus address is unique for each room.
- For a correct Modbus addressing in the SuperWISE, the room numbering is done in steps of 4.
  Example

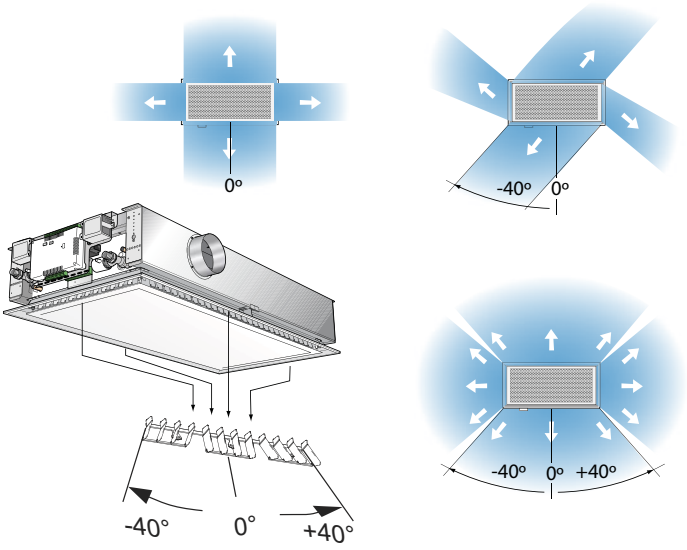
  The master product in room no 1 shall have Modbus ID 4
  The master product in room no 2 shall have Modbus ID 8
  The master product in room no 3 shall have Modbus ID 12
- Check the pressure sensor's address
  - SA1 = 3
  - SA2 = 6
  - *EA = 4 (optional: extra pressure sensor if the extract air damper is controlled from Conductor)*

To set the C-factors and airflows

The Conductor W4.1 VAV calculates how the air damper should either open or close in order to obtain the required airflow. The Conductor W4.1 VAV calculates the airflow in the air duct on the basis of the C-factor (resistance) and the pressure in each air duct.

The C-factor SA1 and SA2 respectively are the sum of C-factor of SA1: long sides (side 2 + 4) and SA2: short sides (side 1 + 3) for all the modules (Master and slave modules) connected to a Conductor W4.1 VAV.

- Check and adjust, if required, the C-factors and airflows
- Ensure that the C-factors of the SA1 and SA2 and the required airflows are correct:
  - RE Settings
  - C-factor SA1 = Enter the total C-factor for the long sides.
  - Norm SA1 = Enter room's required airflow for occupancy.
  - Boost SA1 = Enter the maximum airflow for the room.
  - C-factor SA2 = Enter the total C-factor for the short sides.
  - Boost, SA2, does not have to be changed since the setting for SA1 is used even here.



Vacancy flow

Conductor W4.1 VAV can also manage extract airflows.

Enter the vacancy flow as a percentage of the occupancy flow (Norm SA1).

- Check and adjust the vacancy flow in menu P_1938.

To check the performance of the actuators

- Check that the valve actuators for chilled water and heated water are operating correctly.
  - Settings - *Commissioning – Water*
  - Activate and open the valve actuators with *Cool valve - Open* or *Heat valve – Open.*
  - Check after 2 - 3 minutes the actuator's indicator which should now be in the raised position above the enclosure which indicates that the actuator is in the open position.

Commissioning and checking the airflows

Before you begin commissioning, ensure the following:

- The air handling unit has been started up
- The fire dampers, if required, are fully open
- The zone damper is in full operation
- Open the air damper of all the modules:
  - Settings - *Commissioning – Water*
  - *Air – Max.Occ – On*

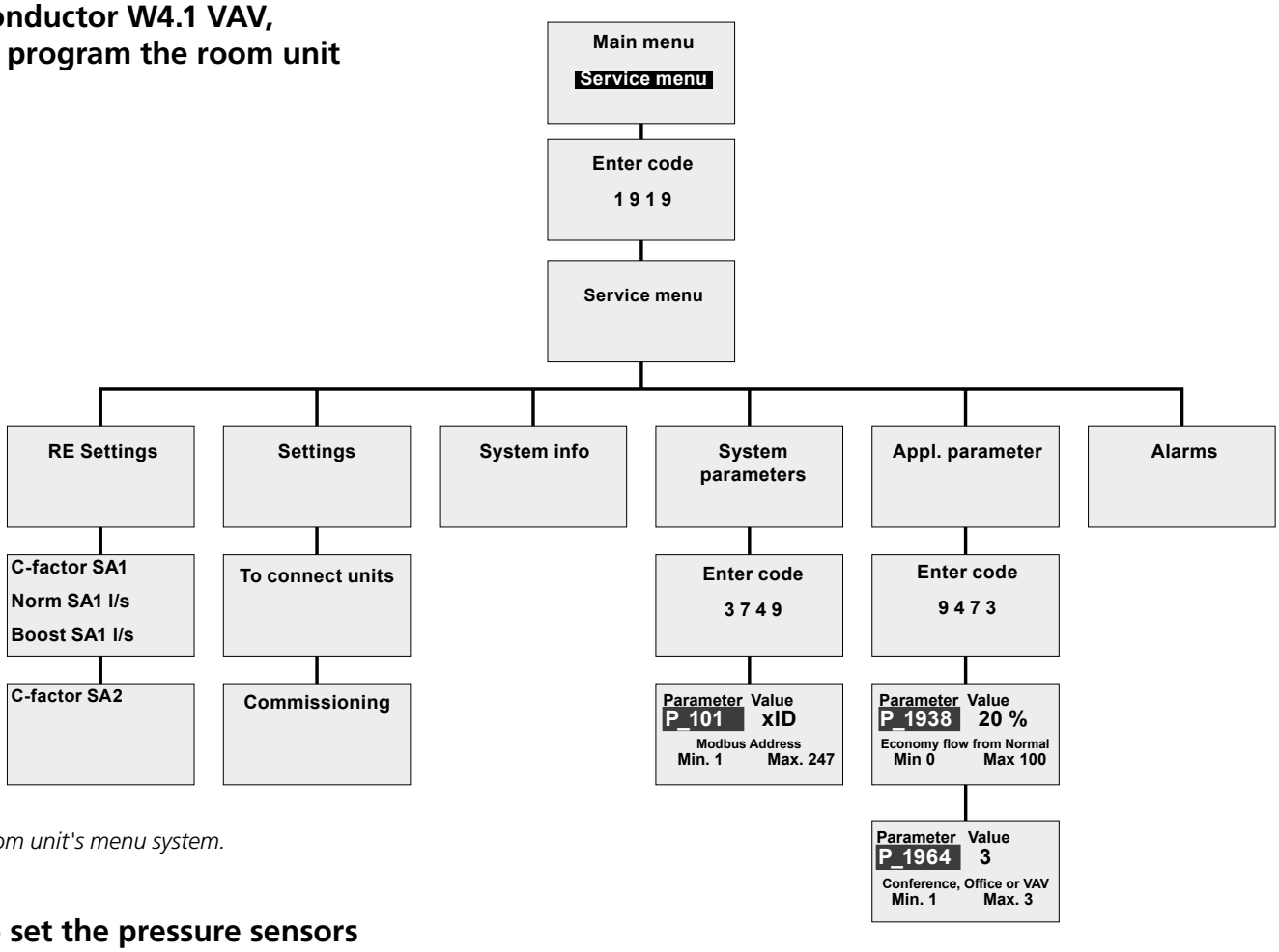
The modules will now adjust themselves to product the airflow that has been entered in *Boost SA1*.

- Check that the max. flow has been reached.
  - Adjust the pressure setpoint of the zone dampers upwards using the TUNE Control hand-held terminal until the correct airflow has been obtained. If the max. flow has still not been obtained, you can close another/other zone damper(s).

The module (reference module) with the greatest deviation from the design max. flow can be found by measuring the max. flow of all the modules in the zone.

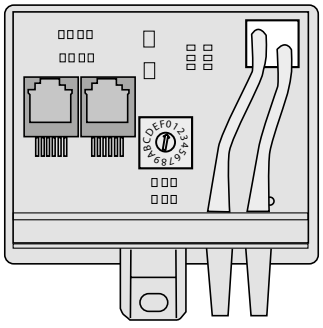
- Measure and record the airflow for the max. flow setting on the reference module in the zone.
- Reset the module to the min. flow setting, measure and record the airflow.
- Adjust the remaining zones following the same procedure.
- Check and adjust the previous shut-off zones in the same way.
- Restore the pressure setpoints on all the zone dampers.
- Identifiy the reference zone, i.e. the zone with the lowest airflow compared with the design max. flow (for example by measuring relevant flow across all the zone dampers using the TUNE Control hand-held terminal).
- Set the minimum flow on a number of modules or use the zone damper for setting the minimum flow so that the ventilation system responds to the simultaneous load.
- Adjust the pressure setpoint of the air handling unit so that the zone damper of the reference zone is 85 – 90% open. (Managed by the SuperWISE if one is used).
- Reset all the settings and set the Conductor W4.1 VAV back to the normal operation setting.
- Check the measured max. and min. flows using the room unit or via the Super WISE if one is used.

Conductor W4.1 VAV, to program the room unit

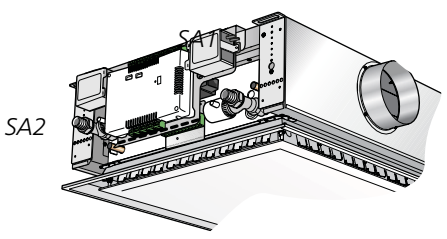


Room unit's menu system.

To set the pressure sensors



Set pressure sensor SA1 to 3, SA2 to 6 and EA to 4.



Locations of SA1 and SA2 on Master.

Maintenance