ADAPT Parasol EX

Energy-saving, suspended comfort module

QUICK FACTS

- Suspended comfort modules for demand-controlled ventilation and Swegon's WISE system.
- Energy-efficient operation since the room is ventilated, heated and cooled exactly as called for by the load, neither more nor less.
- Highest possible comfort with provision for individual control on the product or at room level.
- Waterborne cooling and heating.
- Draught-free indoor climate, 4-way air distribution and Swegon's ADC (Anti Draught Control) provide maximum comfort and flexibility both today and for future needs.

Size (mm)					
Single-module unit			Two-modult unit		
Length	Width	Height	Length	Width	Height
690	690	230	1290	690	230

Primary airflow:	Up to 55 l/s
Pressure range:	50 to 150 Pa
Total cooling capacity:	Up to 1930 W
Heating capacity:	Up to 2450 W

Swegon

Contents

Technical description

ADAPT Parasol EX comfort module

The ADAPT Parasol EX is based on a standard Parasol EX but is also equipped with functions for demand control of the indoor climate. Available as single and two-module units:

Sizes:	690 x 690; 690 x 1290
Modules:	Supply air and cooling Supply air, cooling and heating
Installation:	Suspended, close to ceiling

Function

The essential function of the comfort modules is closely related to that of climate beams. The major difference is that comfort modules distribute air in four directions instead of two. This maximizes the area for the induction of room air with the supply air which enables the modules to deliver a high capacity without occupying more ceiling space than necessary. The comfort modules are also optimized to quickly mix the supplied air with the room which provides better comfort in the room. In heating applications, this technique also ensures heat is conveyed along the ceiling in a better way. The built-in DCV function assumes that the duct pressure is maintained constant by means of a zone damper for example.

Demand-controlled indoor climate

Demand-controlled ventilation involves ventilating and conditioning the air in a room precisely to meet our needs – no more and no less. The potential for savings is substantial, especially in premises where there is considerable variation between low and high load conditions in rooms and during times when there are few or no occupants - which is the case in many premises. Offices for example have in many cases an occupancy rate of less than 50 %!

The ADAPT Parasol EX combines the best attributes from two worlds – demand-controlled ventilation with all its potential for savings combined with the comfort module's high capacity and performance for air conditioning rooms.

Flexibility

The easily adjustable nozzles in combination with Swegon's ADC (Anti Draught Control) offer maximum flexibility for future changes in the room layout. All sides of the unit can be set independently of one another and this enables the comfort module to distribute more air or less air to each of the four sides and deliver the air in the preferred direction in the room.

Design

The face plate of the ADAPT Parasol EX is available in three different perforation patterns. As standard, the face plate has round perforations arranged in a triangular pattern however other optional patterns are available to special order.

Draught-fee indoor climate

The ADAPT Parasol EX distributes air in four directions at low air velocity. The low air velocity is created by distributing air cooler than room temperature over a large area. The special design of the outlet creates a turbulent flow enabling the supply air to be quickly mixed with the room air. The comfort module's closed design with a circulation opening for recirculated air in the face plate of the module also contributes to its excellent mixing performance.

The ADAPT Parasol EX is available in the following coil/heat exchanger variants:

Variant A: Supply air and waterborne cooling from coil.
Variant B: Supply air, waterborne cooling and heating from coil.

EUROVENT CERTIFIED PERFORMANCE www.eurovent-certification.com

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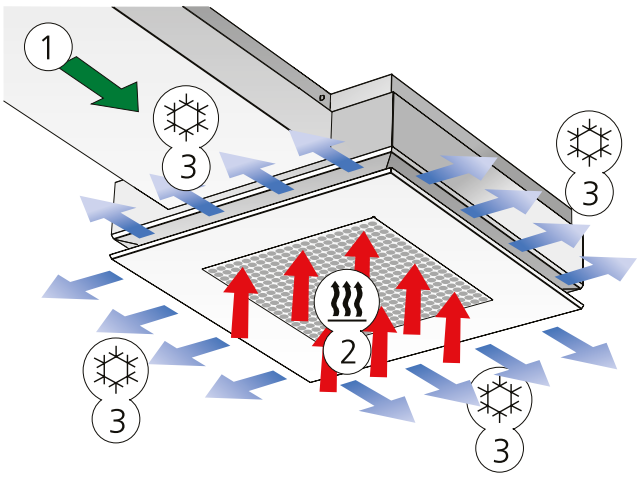


Figure 1. Variant A: Cooling and supply air operation
1 = Primary air
2 = Induced room air
3 = Primary air mixed with chilled room air

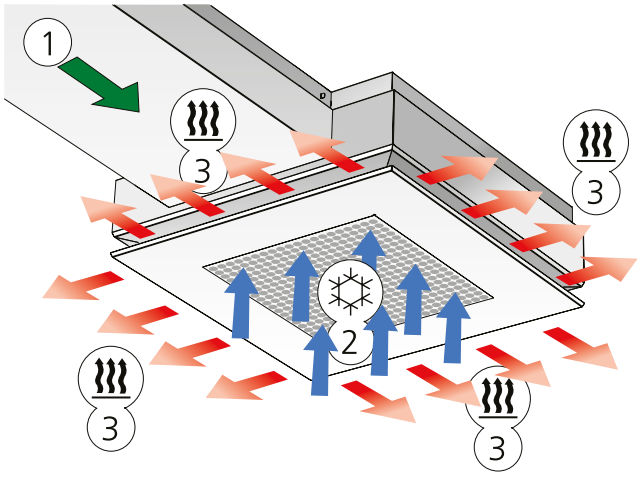


Figure 2. Variant B: Heating and supply air operation (also includes cooling operation)
1 = Primary air
2 = Induced room air
3 = Primary air mixed with heated room air

Compact and intelligent unit

The ADAPT Parasol EX is supplied as a compact and intelligent unit in which the damper and motor are integrated into the product. The controller with pressure sensor and wiring terminals are pre-mounted on a mounting plate, which can be easily fitted onto the duct where it will be concealed by the duct casing.

The sensor module, which is a vital part of the product, is a combined presence detector and a temperature sensor. Its default location is within the face plate, however it can also be mounted on a wall.

The package together with its intelligent control system where numerous adaptations can be made, contribute to making the product very flexible and future secure proof.

As an example, it is noteworthy that all the units can operate as master or slave, simply adjustable by changing a parameter together with repositioning an RJ cable. This means that in the event an open-plan office, for example, is divided up into office cells, the extra work involved in adapting the product to the new operating conditions is minimized.

High capacity

With its high capacity, the ADAPT Parasol EX utilizes 40-50% less ceiling area for handling the cooling load in a normal office, compared with a traditional climate beam.

Simple to adjust

By means of built-in nozzle regulation with numerous possible settings, the ADAPT Parasol EX offers optimum comfort and can be easily adapted to meet a change in room size or operations conducted inside the premises. The comfort module can be set so that different air volumes are diffused on each side and can be set for both high and low airflows.

Simple to install

The small dimensions offer benefits in handling, especially at the building site, with easier installation and reduced health and safety issues.

Range of Application

The ADAPT Parasol EX is ideal for use as a standard application in such premises as:

- Offices and conference rooms
- Classrooms
- Hotels
- Restaurants
- Hospitals
- Shops
- Shopping centres

With its numerous possible settings, the functions of the ADAPT Parasol EX can easily be adapted to new businesses or changes in the design of the premises.

Location

Since each side of the ADAPT Parasol EX is individually adjustable to provide the appropriate airflow, the comfort modules can be positioned anywhere in the room. Whether they are located at the front edge, centre, and rear edge or symmetrically in the room is of no importance. In rear edge solutions for cellular offices, for instance, the unit can be installed near the corridor wall. The only operation that needs to be done is to reduce the volume of air distributed towards the corridor wall and instead open up more on the three other sides (see Figure 3). This is of benefit in comparison with other rear-edge solutions, because you can make use of the partition walls to increase the air mixing zone. This provides low air velocities and a healthy room climate.

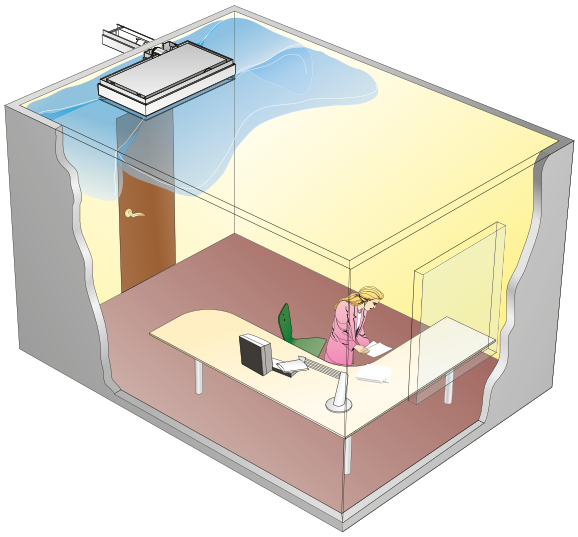


Figure 3. ADAPT Parasol EX as a rear-edge solution

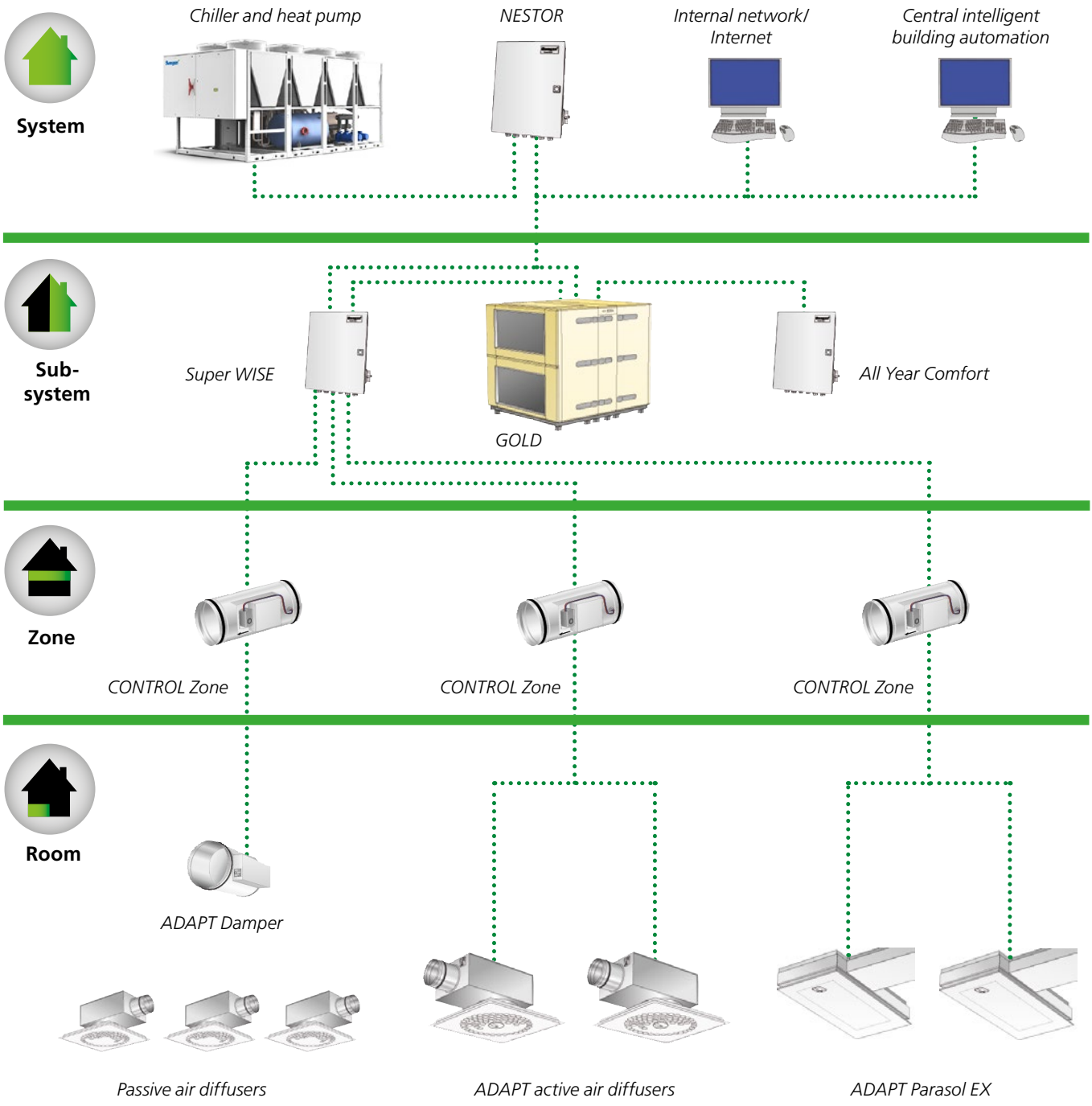


Figure 4.

Component of the WISE system

The ADAPT Parasol EX is a component of Swegon's WISE System for demand-controlled ventilation.

Via the SuperWISE, a communication unit, which, via Modbus RTU, ties all the components in the WISE system together, ADAPT Parasol EX communicates with other WISE products in the system and all the way up to the GOLD air handling unit.

One of the advantages with the ADAPT Parasol EX is that the pressure in the nozzles can be kept at a high level, and this means controlled throw lengths, high capacity and maintained Coanda effect of the air regardless of the operating conditions.

The Swegon CONTROL Zone damper is used for maintaining constant pressure in the zone.

Demand-controls the climate in the room

- Stepless regulation of the airflow as required – temperature or the air quality.
- If an air quality sensor is used, it overrides the temperature sensor.
- Same stepless function regardless of whether it concerns one product in an individual-room office or several products in an open-plan office or a conference room.
- Besides ventilating in an efficient way, the room temperature is regulated by means of both waterborne and airborne cooling.
- Can advantageously discharge heated air from the ceiling – all in one product
- Can be combined with radiators or floor heating – the product then takes this into consideration and regulates the room temperature in an energy-efficient way, for example by increasing the airflow on increased heat demand.

Selection of sequence, Water / Air

- The control sequence involves prioritising waterborne cooling before airborne cooling
- For an occupied room, the airflow is steplessly regulated between min. and max. depending on the room temperature (or the air quality if an air quality sensor is used).
- If the room needs to be cooled, ensure first that the airflow generates sufficient pressure in the module which will allow the water valve to open. The reason for this is to ensure comfort in the room, i.e. to prevent cold down draughts from the product.
- After that the water valve is allowed to open to supply chilled air to cool the room. If there is still a cooling demand when the cooling valve is fully open, the built-in air damper opens to cool more with air.

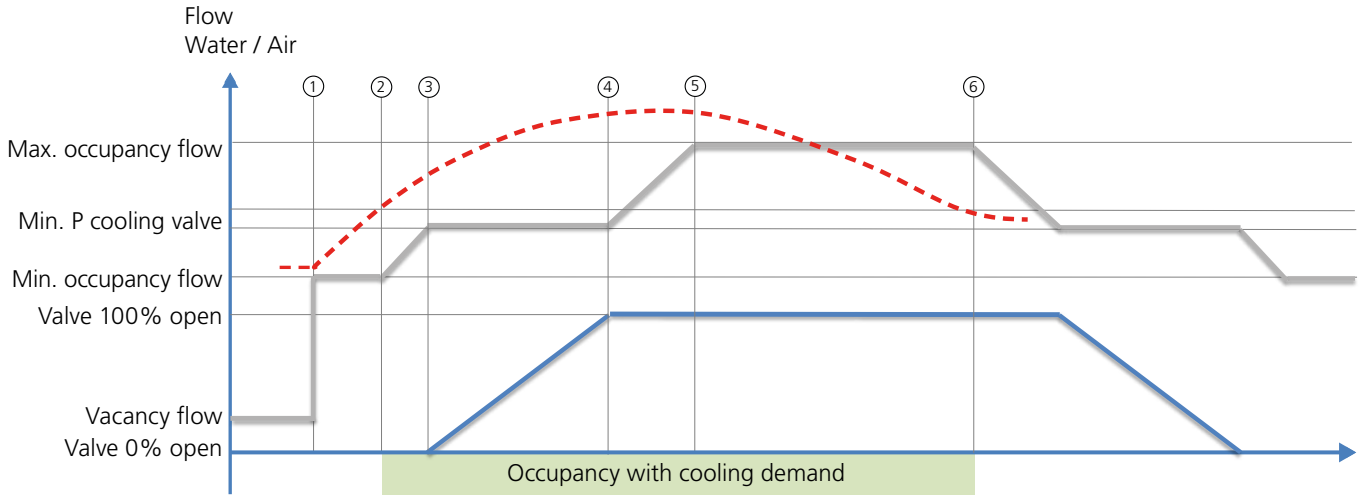


Figure 5.

1. Occupancy – temperature rises
2. The room temperature reaches level for cooling demand – air damper opens in order to reach minimum pressure which alllows cooling valve to open.
3. Cooling valve is allowed to open
4. Cooling valve is fully open but there is still a cooling demand in the room – the air damper opens in order to cool with more air
5. Cooling valve and air damper fully open
6. The temperature reaches the room set point; the damper and valve close

= Water

= Air

= Room temperature

Selection of sequence, Air / Water

- The control sequence involves prioritising airborne cooling before waterborne cooling
- For an occupied room, the airflow is steplessly regulated between min. and max. depending on the room temperature (or the air quality if an air quality sensor is used).
- If there is a cooling demand, the air damper first steplessly opens to the fully open position; if a cooling demand remains the water valve also opens.

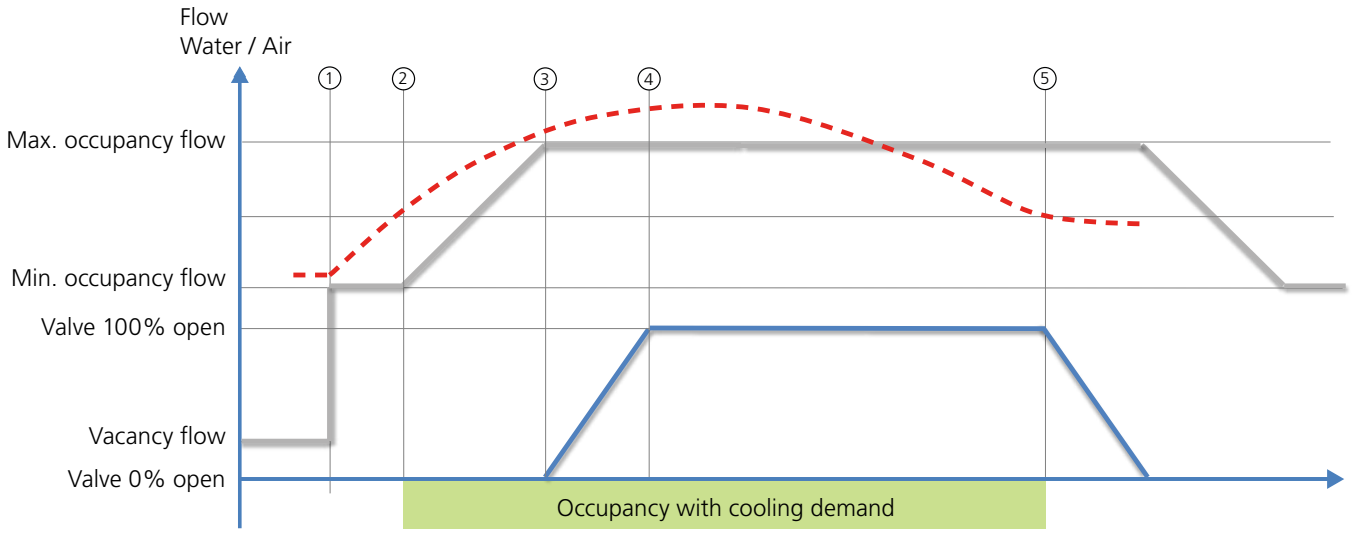


Figure 6.

1. Occupancy – temperature rises
2. Room temperature reaches level for cooling demand – air damper opens
3. Cooling valve is fully open but cooling is still required in the room – the valve opens in order to cool with water
4. Air damper and water valve fully open
5. The temperature reaches the room set point; the damper and valve close

Sequence, Air quality

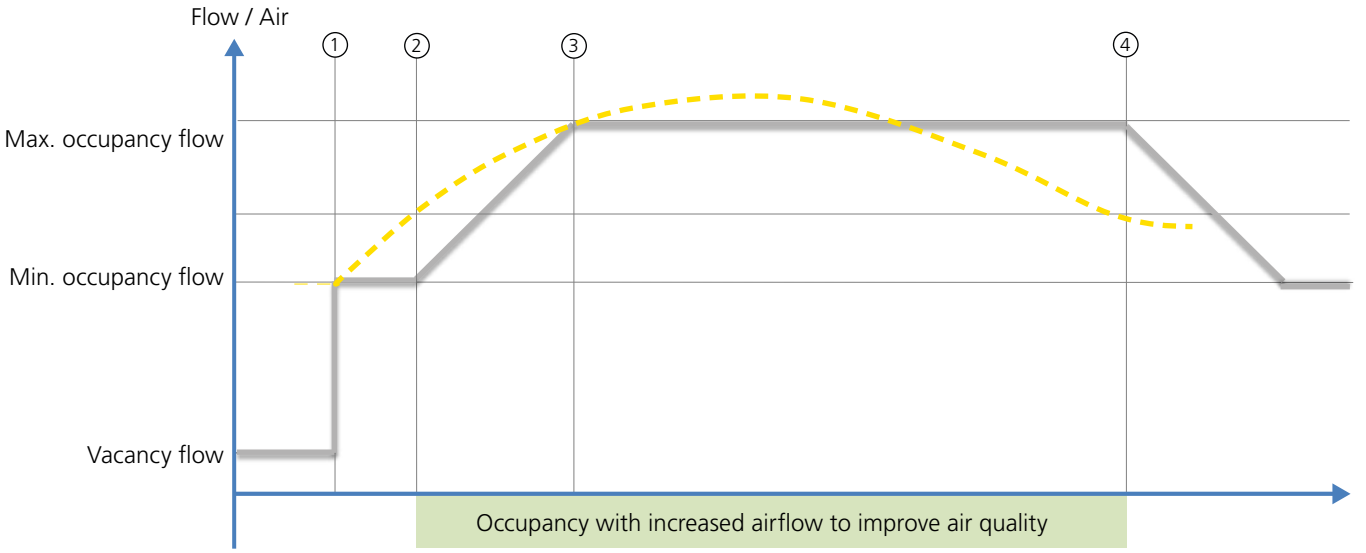


Figure 7.

1. Occupancy – CO_2 / VOC content rises
2. CO_2 / VOC content reaches the permissible upper limit value – the air damper steplessly opens
3. Fully open air damper
4. CO_2 / VOC content reaches the permissible lower limit value – the air damper closes

Operating mode

Depending on the status of connected sensors, the controller adjusts the outputs from any of several possible operating conditions.

The operating conditions based on occupancy in the room, the status of the sensor in use or signals from a main control system are described below.

Operating modes

There are numerous functions in the ADAPT Parasol EX:

- Occupancy mode.
- No occupancy mode.
- Holiday.
- Stand-by, idle mode.
- Emergency mode.
- Commissioning.
- Summer night cooling.

Occupancy mode

When the ADAPT Parasol EX receives signals via presence detector indicating that someone is in the room, the valve actuator for chilled water or heating water as the case may be is controlled according to the selected temperature setpoint for cooling or heating associated with this operating mode. The airflow is controlled to the preselected occupancy flow, but is influenced of course by sensors such as condensation sensors, temperature sensors, window contacts, air quality sensors, if required, etc.

No occupancy mode

When the No occupancy mode function is active, the system automatically switches over to the energy-save mode. The system returns to the Occupancy mode and normal operation when occupancy is registered again. In the energy-save mode/no occupancy mode, the valve actuator is controlled to regulate the chilled water flow or hot water flow according to the status on other sensors in the room, but normally with a greater permissible deadband from the temperature setpoint for cooling or heating than in the occupancy mode, whilst the air is controlled to the min. flow setting.

Holiday.

When the Holiday operating mode is active, the system automatically switches over to the energy-save mode just as in the case of the No Occupancy mode, but with scope for allowing further greater temperature differential. Controlled from a main control system.

Stand-by, idle mode

When the control system registers that a window is open, the controller switches over to the Stand-by mode. When the window is closed, the controller switches over to the Occupancy mode. The controller is in the Stand-by mode, the room temperature is kept above 10°C (frost protection).

Emergency mode

In the event of a fire alarm, the controller opens or closes the air damper in the extract air duct, depending on how the control system is set. In the Emergency mode, cooling and heating are switched off. Supply air is normally switched off.

The Emergency mode can only be managed in control systems that are connected to a main control system via Modbus RTU.

Commissioning level

The “First open” function involves having the water valves open while the installation work is in progress, which simplifies filling, pressure testing and venting the water system

The function will be automatically deactivated after approx. 6 minutes while the system is energised.

A clicking noise can be heard when the valves and dampers change over to the NC mode (normally closed) and the normal control function is activated.

Further particulars of the commissioning mode can be read in the description of the sensor module on page 12.

Summer night cooling

The function involves the use of cold air from outdoors for cooling the room at night to the predefined level.

The function can only be handled in the control system that is connected to a main control system via Modbus RTU.

Functions

Change over

The function involves the use of only one valve actuator which should be wired to the cooling output terminal. This actuator then controls both the heating water and the chilled water, which is transported in the same pipe. An external temp. sensor should be used and this component should take measurements on the pipe through which water always circulates.

In winter, when heating is required, the valve opens if the water in the pipe is warmer than the temperature set point. If the water is colder, the valve does not open.

In summer, when cooling is required, the valve opens if the water in the pipe is colder than the temperature set point.

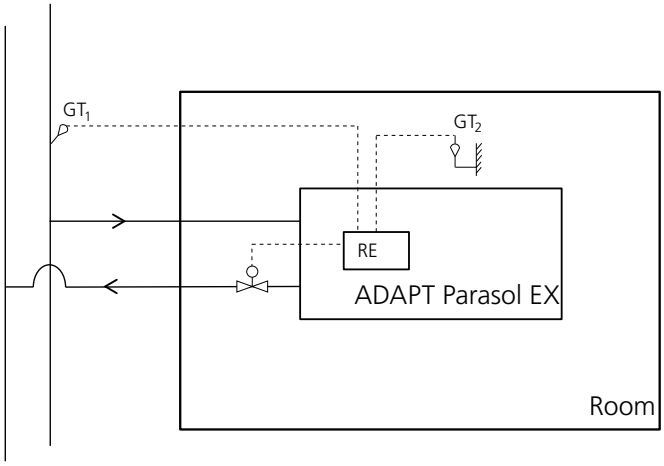


Figure 8.

- 2-pipe system with chilled water in the summer and heated water in the winter
- GT_1 is located where heated or chilled water always circulates
- Summer: If the room temperature T_2 is higher than the water temperature T_1 the valve opens if there is a cooling demand.
- Winter: If the room temperature T_2 is lower than the water temperature T_1 the valve opens if there is a heating demand.
- GT_1 is wired to the controller as an external temperature sensor.
- In the SWICCT or SuperWISE, the operator has enter a setting in the controller indicating that the sensor is to be used for Change-Over operation.
- GT_2 is the temperature sensor that is mounted in the Sensor module
- The valve actuator should be wired to the cooling output of the controller.

SWICCT:

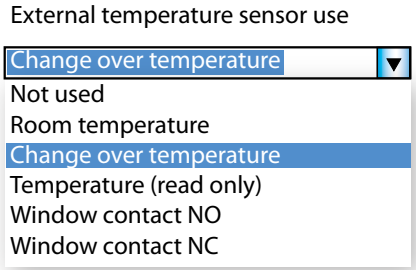


Figure 9.

Exercising of valves

The function involves exercising the water valves regularly by means of automatic control equipment to prevent them from seizing or becoming stuck. During the exercising process, all the valves wired to the controller open to the max. setting for 6 minutes and then close. The valves of the cooling system are exercised first; after that the valves of the heating system are exercised.

Frost protection

The function involves starting heating operation at 10°C to prevent the risk of damage that otherwise could occur due to freezing.

Specific nozzle settings

To specify nozzle settings, always begin from the side where the water pipes are located. From there, proceed in counter-clockwise direction and specify side after side, see Figures 10 and 12. Units can be ordered with nozzles factory-preset (this does not apply to units held in stock).

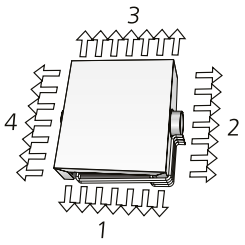


Figure 10. Top view, sides 1-4 ADAPT Parasol EX 690

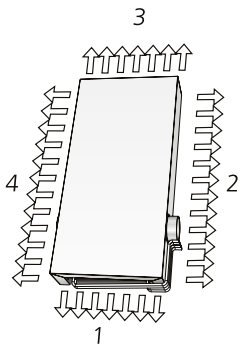


Figure 11. Top view, sides 1-4 ADAPT Parasol EX 1290

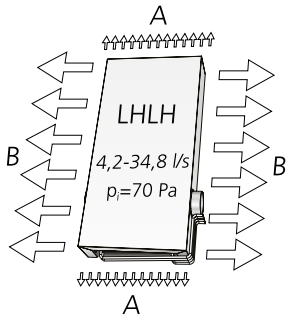


Figure 12. Example 1. A = 2.1 l/s, B = 15.3 l/s

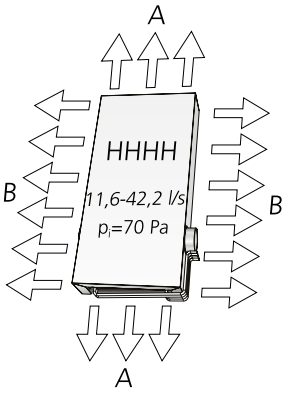


Figure 13. Example 2. A = 5.8 l/s, B = 15.3 l/s

Example 1:
Nozzle setting LHLH produces the lowest possible No Occupancy flow (sides 1 + 3 open). This produces a min. flow/no occupancy flow of approx. 4 l/s and a max. flow of approx. 35 l/s at p_i= 70 pa

Example 2:
If it is instead more important to obtain the highest possible max. flow/capacity, the nozzles should be set to the HHHH position, i.e. fully open on all sides. A higher max. flow will then be obtained, however the No Occupancy flow will consequently also be slightly higher.

These adjustments are only different settings on the same physical product which makes the unit very flexible and adaptable, particularly together with the integrated software.

K-factors for each side can be obtained from Tables 2-5 or from the installation instructions on the Internet, however the easiest way to do this is in ProSelect where you can quickly test various variants.

Nozzle setting

The unique built-in nozzle control in the ADAPT Parasol EX makes it possible to individually set each one of the four sides. Depending on the unit's location and the room's primary air requirement, the primary air can be guided in all desired directions. The direction of the air-flow can be easily optimized using the Swegon ProSelect sizing program that is available from www.swegon.com.

The required nozzle setting is preset from the factory, but if required it can be simply changed at the site.

K-factor

Each nozzle setting has a specific K-factor. A total K-factor for the unit can be determined by adding together the K-factors for the nozzle settings on each side. The relevant K-factor for optimized nozzle setting can also be obtained in ProSelect.

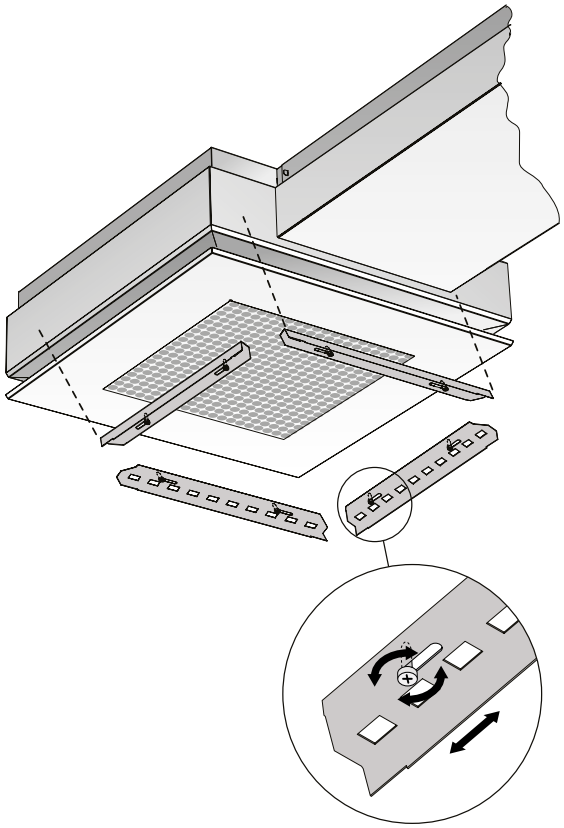


Figure 14. Nozzle setting

The sensor module

The sensor module consists of a presence detector and a temperature sensor in the same unit.

This component is mounted as standard in the face plate on the ADAPT Parasol EX but it can also be ordered as an accessory for wall mounting, and in that case either recessed in a standard electrical component box or surface-mounted on the wall.

By pressing the appropriate buttons on the sensor module, you can adjust the temperature in the room, set the ADAPT Parasol EX to the commissioning mode and read the alarm list.

6 light-emitting diodes indicate in the normal mode which temperature level has been selected. If an error occurs, the current alarm is shown as a series of flashes that are translatable using an alarm list.

Use an RJ12 cable to connect the sensor module to the controller.

The floor area covered by the presence detector is approx. 24 m^2 if it is mounted at a height of 2.7 metres above the floor and in parallel with the floor.

Entering temperature adjustments

To lower the temperature setting, press down the left-hand button.

To raise the temperature setting, press down the right-hand button.

Each diode corresponds to a one degree increase or decrease of the set point. The base setting of temperatures is entered in SWICCT or SuperWISE

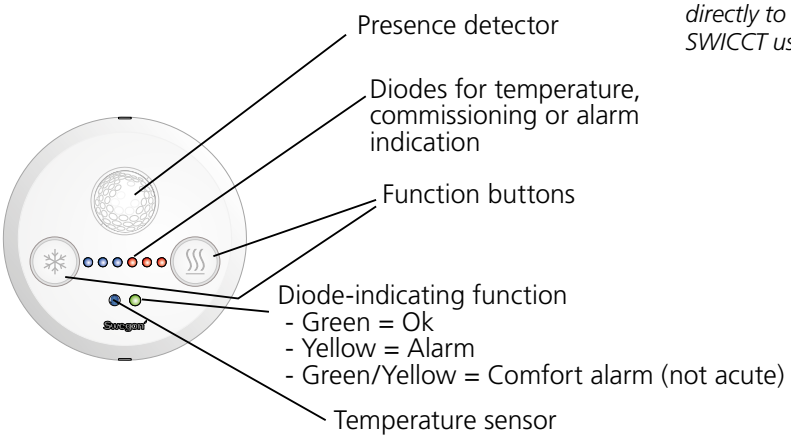


Figure 15. Sensor module viewed from the front

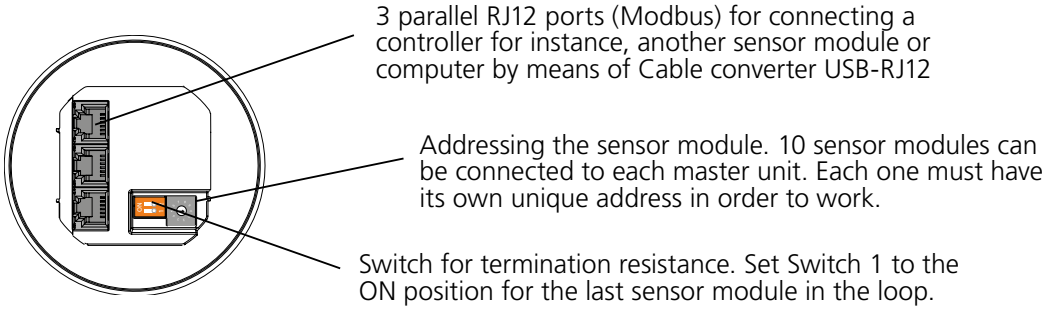


Figure 16. Sensor module viewed from rear

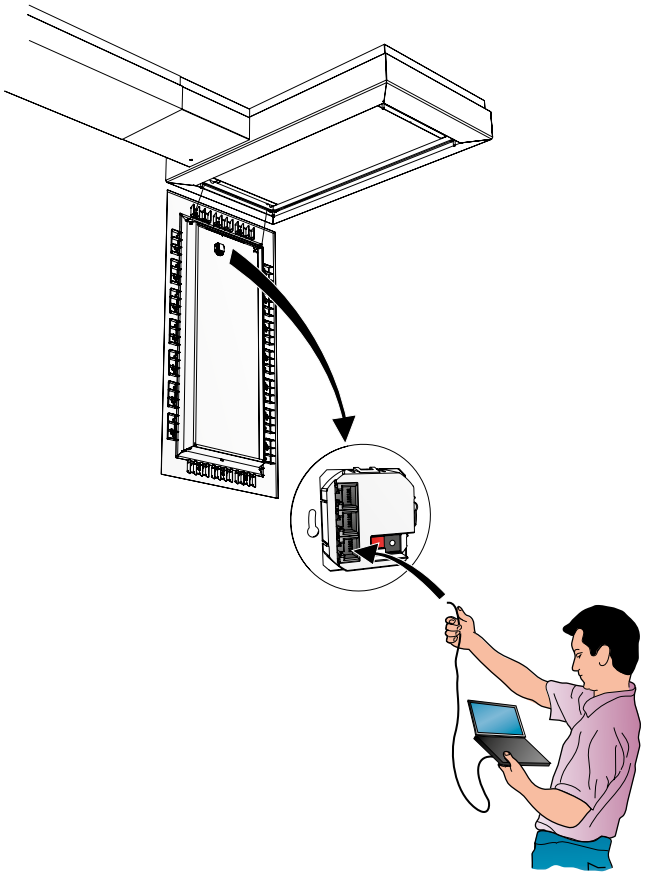


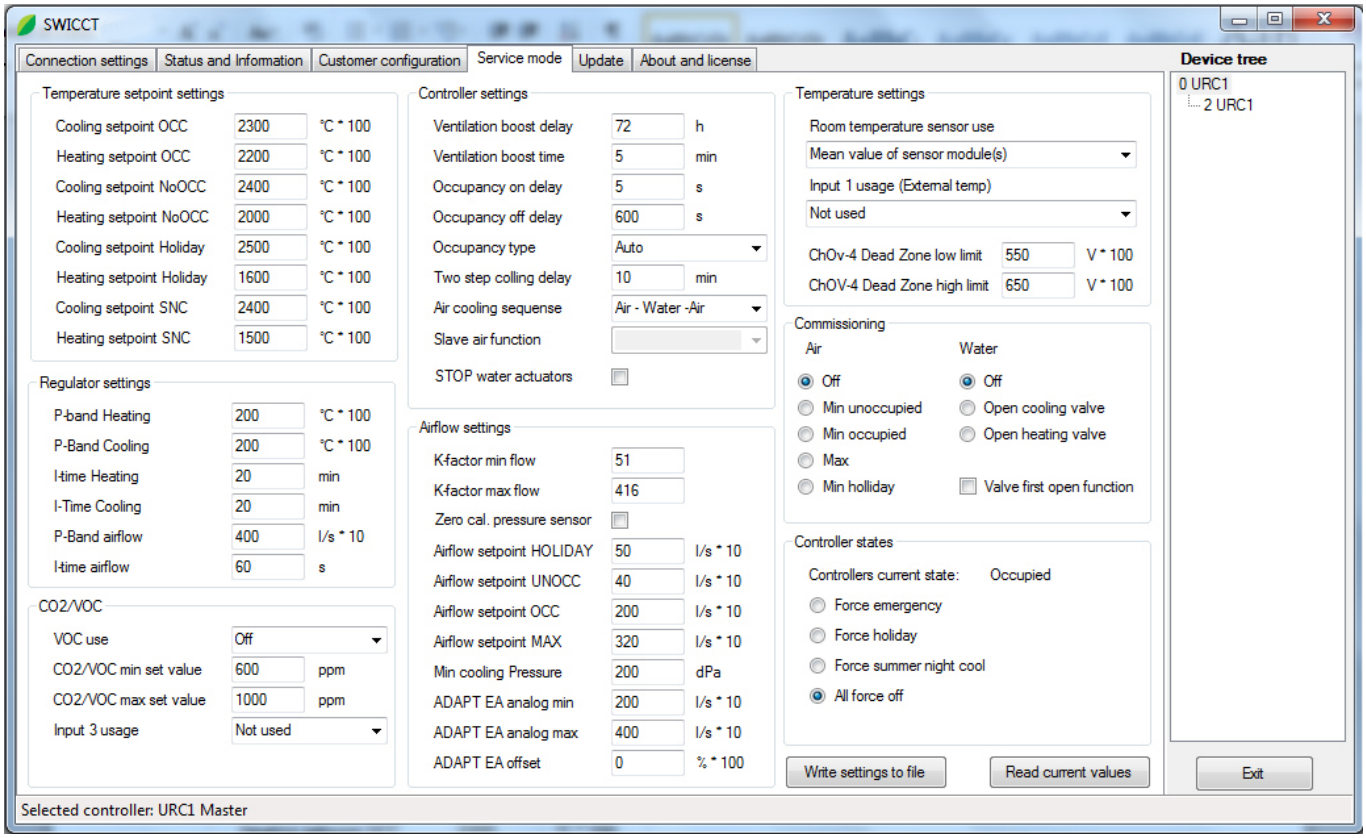
Figure 17. The CABLE CONVERTER USB-RJ12 (RS485) cable can be easily used for connecting a computer to the module for e.g. entering software settings. The cable can be connected either to a socket on the rear of the Sensor module as illustrated, or directly to the controller. How this is done is described in the SWICCT user's manual.

SWICCT

SWICCT (SWegon Indoor Climate Configuration Tool) is the software that makes the entering of settings into the controller a simple task.

Here you can make all the necessary settings for the Product, for example:

- Base settings for temperature
- how to use external sensors, e.g. for air quality
- Airflows
- Commissioning



SWICCT can be downloaded from www.swegon.se; both the software and a separate manual.

Typical installations:

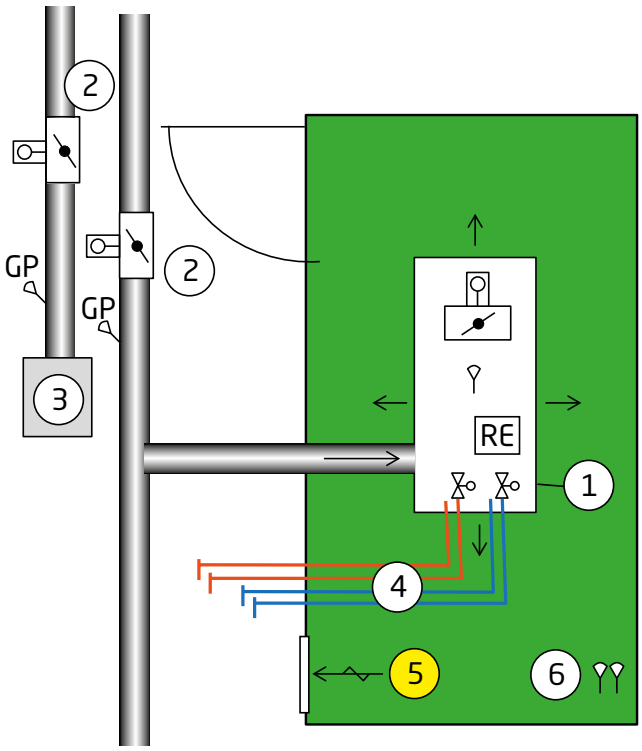


Figure 18. Typical room 1 shows ADAPT Parasol EX in an office room
Extract air via transfer air grille (balance at zone level)

1. *ADAPT Parasol EX comfort module with supply air, cooling and heating*
   - *Pressure sensor*
   - *Communication unit/controller*
   - *Damper with motor.*
2. *CONTROL Zone damper*
3. *Extract air diffuser*
4. *Cooling water and heating water*
5. *Extract air via transfer air grille to the corridor*
6. *External sensor module (occupancy and temperature sensor)*

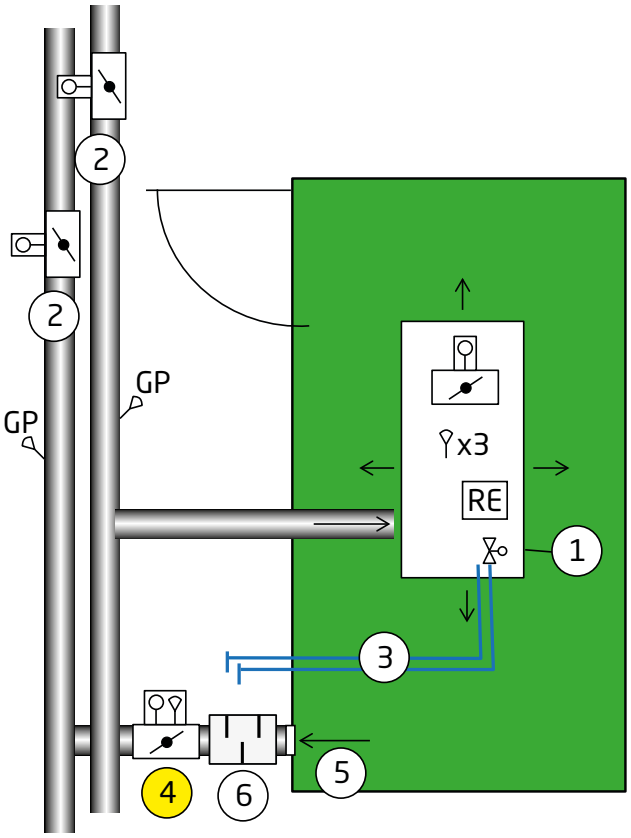


Figure 19. Typical room 2 shows ADAPT Parasol EX in an office room
Supply and extract air in balance.

1. *ADAPT Parasol EX comfort module with supply air and cooling*
   - *Pressure sensor*
   - *Presence detector*
   - *Temperature sensor*
   - *Communication unit/controller*
   - *Damper with motor.*
2. *CONTROL Zone damper*
3. *Chilled water*
4. *Extract air via ADAPT Damper slave-controlled from ADAPT Parasol EX*
5. *Grill or fully opened extract air register (EXC)*
6. *Sound attentator CLA/SORDO*

ADC

All comfort modules are supplied with ADC air deflectors. ADC stands for Anti Draught Control, which enables you to set the diffusion pattern of the air being distributed to avoid risk of draught. A number of ADC sections with four air deflectors per section are arranged on each side of the unit. Each section is adjustable from a straight setting to 40° air deflection to the right or left in increments of 10°. This offers enormous flexibility and can be easily adjusted without affecting the

sound level and the static pressure. The water capacity is reduced by 5 - 10% when the ADC is adjusted to "Fan-shape".

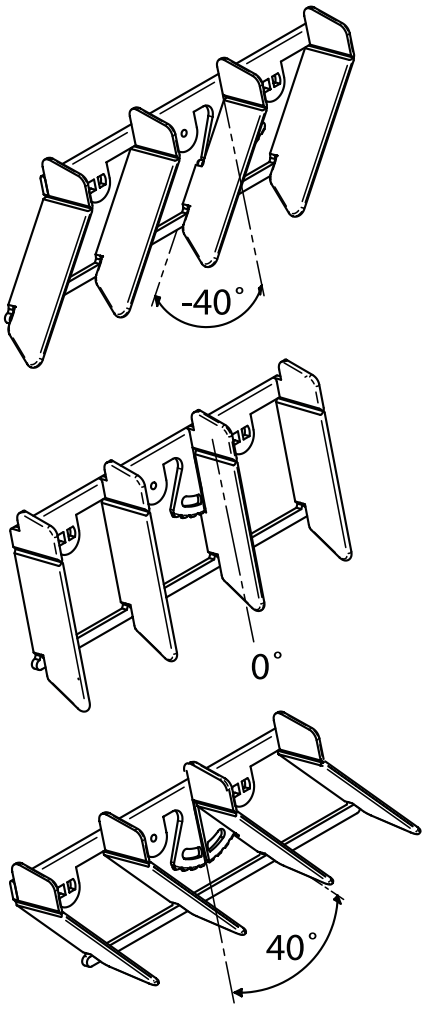


Figure 20. ADC, setting range from -40° to +40° in increments of 10°

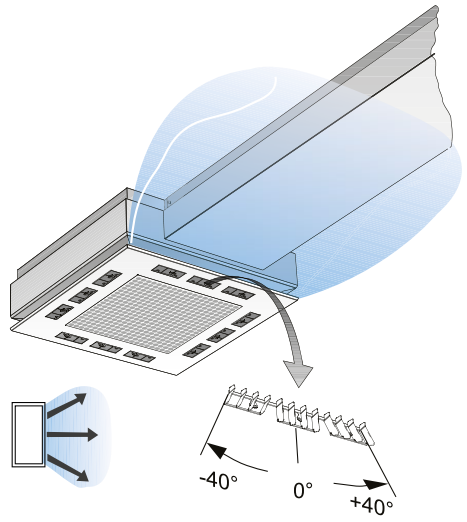


Figure 21. Possible settings for the ADC, Fan-shape

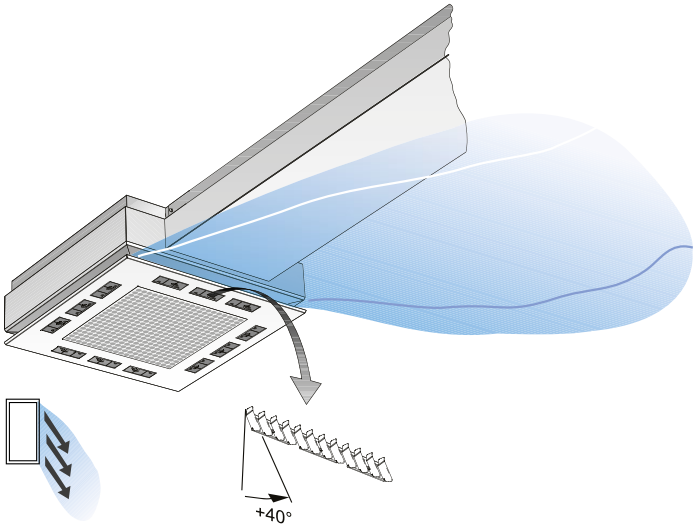


Figure 22. Possible settings for the ADC, X-shape

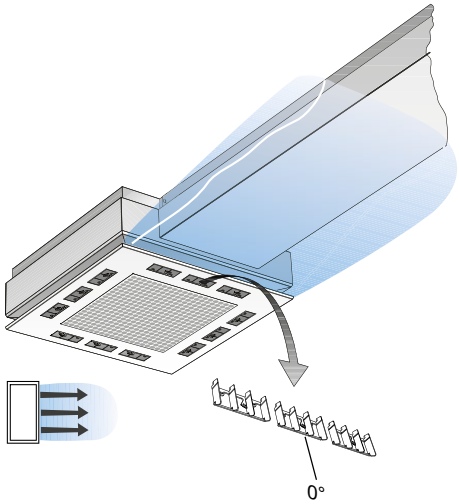


Figure 23. Possible settings for the ADC, Straight airflow setting

Technical data

Total cooling capacity, max.	1930 W
Total heating capacity, max.	2450 W
Airflow	
Single module unit	7-34 l/s
Two-module unit	9-55 l/s
Length	
Single module unit	690 mm
Two-module unit	1,290 mm
Width	690 mm
Height	230 mm

Dimensions of the units have a tolerance of (±2) mm.

Table 1. Weight

ADAPT Parasol EX	Dry weight	Chilled water volume	Heating water volume
690 A	21.4	20	21.2
690-B	22.6	20.6	22.1
1290-A	34.4	30.8	32
1290-B	39.1	34.8	37.2

Exkl. sensor module 0.1 kg.

Power consumption

Power consumption for dimensioning transformer:

Actuator	6 VA
Damper motor	2 VA*
Controller	1 VA*
Sensor Module	1 VA*

** Allways included in product*

Example A:

ADAPT Parasol EX 1290-B-HF; 6+2+1+1 = 10 VA

6 VA for cooling OR heating actuator as the normally operate in sequence.

Example B:

ADAPT Parasol EX 1290-B-HF; 6+6+2+1+1 = 16 VA

For Radiator Heat and Cold draught protection, means 6+6 VA for actuators as they don´t operate in sequences.

Recommended limit values

Pressure levels

Working pressure, coil, max.	1600 kPa *
Test pressure, coil, max.	2400 kPa *

* Applies to module without installed control equipment

Nozzle pressure

50-150 Pa

Recommended lowest nozzle pressure if coil heating is used, p_i 70 Pa

Recommended lowest nozzle pressure with the face plate in the high capacity position, p_i 70 Pa

Water flow

Ensures evacuation of any air pockets in the system.

Cooling water, min.	0.030 l/s
Heating water, min.	0.013 l/s

Temperature differentials

Chilled water, temperature increase	2-5 K
Heating water, drop in temperature	4-10 K

Temperature differences are always expressed in Kelvin (K).

Flow temperature

Chilled water	**
Heating water, max.	60°C

** Chilled water must always be kept at a level that ensures that no condensation will form.

Designations

P	Capacity (W)
t_l	Temperature of the primary air (°C)
t_r	Temperature of the room air (°C)
t_m	Mean water temperature (°C)
ΔT_m	Temperature differential t_r- t_m(K)
ΔT_l	Temperature differential t_l- t_r (K)
ΔT_k	Temperature differential between the cooling water inlet flow and return (K)
ΔT_v	Temperature differential between the heating water inlet flow and return (K)
v	Water velocity (m/s)
q	Airflow (l/s)
p	Pressure (Pa)
Δp	Pressure drop (Pa)

Supplementary index: k = cooling, v = heat, l = air, i = commissioning, corr = correction

Nozzle pressure (commissioning pressure)

$$p_l = (q_l / k_{pl})^2$$

p_l	Nozzle pressure (Pa)
q_l	Primary airflow (l/s)
k_{pl}	Pressure drop constant for nozzle setting, see Tables 2-3

Cooling

Standard

The cooling capacities have been measured in conformance with EN 15116 Standard and have been recalculated for a constant water flow according to Diagram 2/3.

Calculating formulae – Cooling

Below are formulae that enable the user to calculate what comfort module is best suited for the application. The values for the calculations can be taken from the tables.

Pressure drop in cooling coil

$$\Delta p_k = (q_k / k_{pk})^2$$

Δp_k Pressure drop in cooling coil (kPa)

q_k Flow of chilled water (l/s), see Diagram 1

k_{pk} Pressure drop constant for cooling coil, see Tables 2-3

Cooling capacity of the air

$$P_l = 1.2 \cdot q_l \cdot \Delta T_l$$

P_l Primary air cooling capacity (W)

q_l Primary airflow (l/s)

ΔT_l Temperature differential between primary air (t_l) and room air (t_r) (K)

Cooling capacity of the water

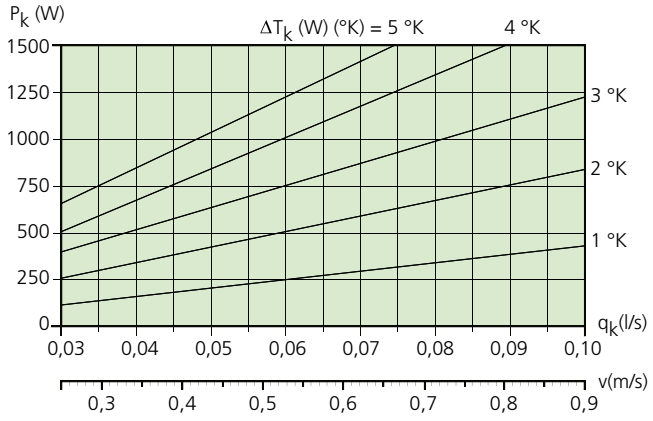
$$P_k = 4186 \cdot q_k \cdot \Delta T_k$$

P_k Cooling capacity of the water (W)

q_k Chilled water flow (l/s)

ΔT_k Temperature differential between the cooling water inlet flow and return (K)

Diagram 1. Water Flow – Cooling Capacity



Corrected capacity – water flow

Different water flow rates to some extent have effects on the capacity output. By checking obtained water flow against Diagrams 2 or 3, the capacity indicated in Tables 2-3 may need to be slightly adjusted up or down.

$$P_{corr} = k \cdot P_k$$

P_{corr} Corrected capacity (W)

k Correction factor

P_k Cooling capacity of the water

Diagram 2. Corrected capacity – Water flow, ADAPT Parasol EX 690

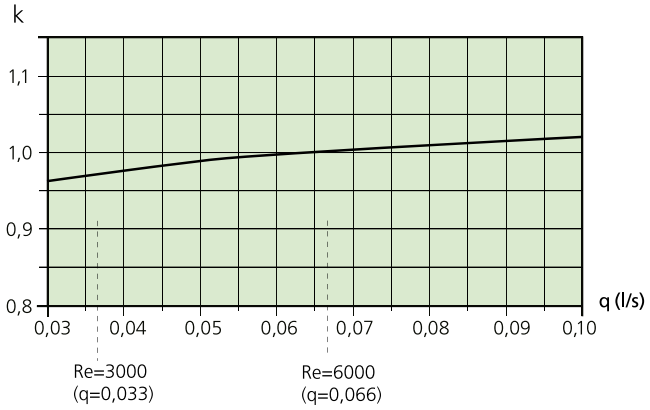


Diagram 3. Corrected capacity – Water flow, ADAPT Parasol EX 1290

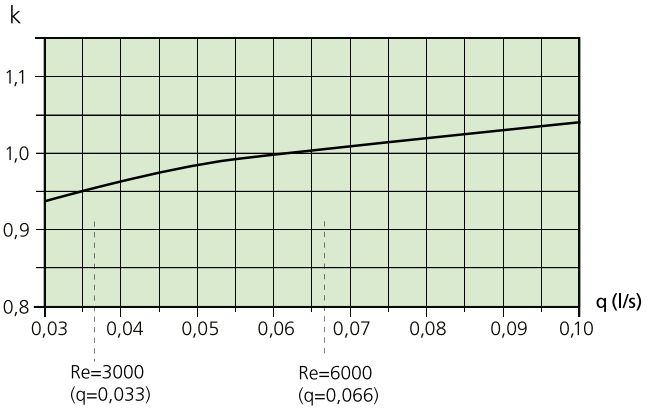


Diagram 4. Pressure drop – Chilled water flow

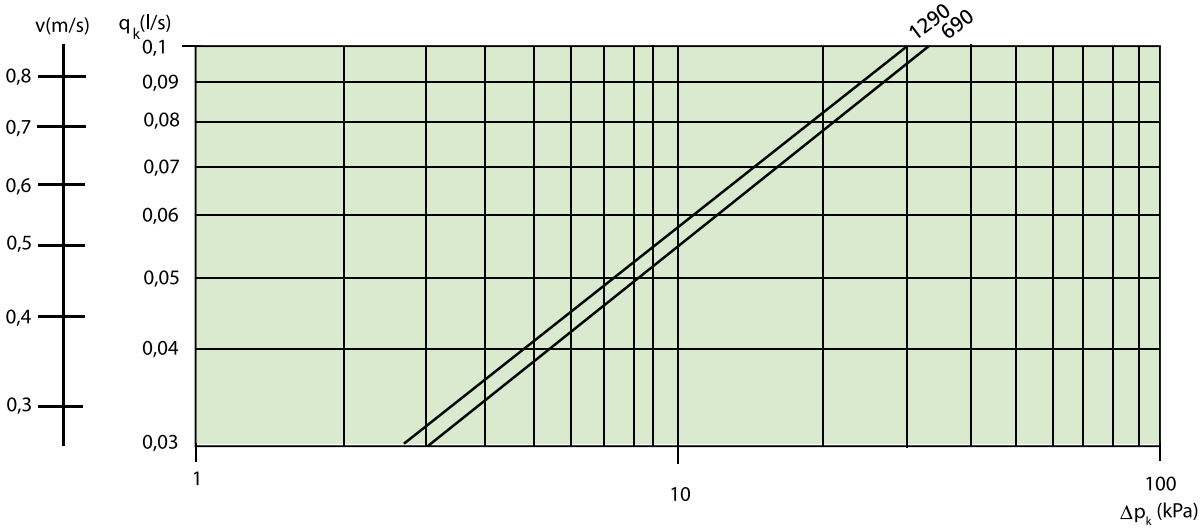


Table 2. Cooling capacity of the ADAPT Parasol EX 690

Nozzle pressure	Nozzle setting 1)	Primary airflow rate (l/s)	Sound level, dB(A) 2)	Cooling capacity of primary air (W) for ΔT_l				Cooling capacity of the water (W) for ΔT_{mk} 3)						Pressure drop constant air/water	
				6	8	10	12	6	7	8	9	10	11	k_{pl}	k_{pk}
50 Pa	LLLL	7.2	<20	52	69	86	104	166	194	219	246	271	298	1.01	0.0173
	LHLH	13.4	<20	96	129	161	193	218	254	287	323	359	392	1.89	0.0173
	HHHH	19.6	20	141	188	235	282	236	275	315	354	390	429	2.77	0.0173
70 Pa	LLLL	8.5	<20	61	82	102	122	197	226	259	288	321	353	1.01	0.0173
	LHLH	15.8	24	114	152	190	228	257	299	337	378	420	461	1.89	0.0173
	HHHH	23.2	25	167	223	278	334	278	323	368	413	458	498	2.77	0.0173
90 Pa	LLLL	9.6	20	69	92	115	138	217	254	287	323	359	392	1.01	0.0173
	LHLH	17.9	27	129	172	215	258	283	329	375	420	466	507	1.89	0.0173
	HHHH	26.3	29	189	252	316	379	310	360	409	458	502	551	2.77	0.0173

Table 3. Cooling capacity of the ADAPT Parasol EX 1290

Nozzle pressure	Nozzle setting 1)	Primary airflow rate (l/s)	Sound level, dB(A) 2)	Cooling capacity of primary air (W) for ΔT_l				Cooling capacity of the water (W) for ΔT_{mk} 3)					Pressure drop constant air/water	
				6	8	10	12	6	7	8	9	10	k_{pl}	k_{pk}
50 Pa	LLLL	13	<20	94	125	156	187	349	404	459	515	569	1.84	0.0183
	LHLH	29.4	22	212	282	353	423	444	517	583	649	715	4.16	0.0183
	HHHH	35.6	26	256	342	427	513	463	531	599	667	740	5.04	0.0183
70 Pa	LLLL	15.4	<20	111	148	185	222	389	457	518	580	641	1.84	0.0183
	LHLH	34.8	26	251	334	418	501	498	578	651	730	802	4.16	0.0183
	HHHH	42.2	29	304	405	506	608	519	594	669	749	823	5.04	0.0183
90 Pa	LLLL	17.5	<20	126	168	210	252	425	491	558	630	696	1.84	0.0183
	LHLH	39.5	29	284	379	474	569	541	626	704	788	864	4.16	0.0183
	HHHH	47.8	32	344	459	574	688	555	643	722	807	892	5.04	0.0183

1) For particulars on the sizing of alternative nozzle settings, use Swegon's ProSelect sizing program available at www.swegon.com
2) Room attenuation = 4 dB
3) The specified capacities could vary depending on the nature of the installation and how the air deflectors have been set. The primary air capacity is not affected.
N.B.! The total cooling capacity is the sum of the airborne and waterborne cooling capacities.

Table 4. Cooling Capacity for natural convection

Unit (mm)	Cooling capacity (W) for temperature differential, room – water ΔT_{mk} (K)						
	6	7	8	9	10	11	12
690	17	21	25	29	34	39	43
1290	41	51	61	72	83	95	107

Calculation example – cooling

A cellular office without suspended ceiling having dimensions w × d × h = 2.4 × 4 × 2.7 m is to be fitted with a comfort module. The total cooling demand is estimated to be 50 W/m^2 To meet this cooling load, an ADAPT Parasol EX that will generate 50 x 2.4 x 4 = 480 W is required. Design room temperature (t_r) 24°C, cooling water temperature (inlet flow/return) 14/16°C and primary air temperature (t_l) 16°C produces:
ΔT_k= 2 K
ΔT_{mk}= 9 K
ΔT_l= 8 K
The required primary air flow to the room (q_l) has been determined to be 16 l/s. A zone damper ensures that the pressure in the duct should be kept at a constant 73 Pa which in this case produces a nozzle pressure of 70 Pa. The sound emitted from the unit must not exceed 30 dB(A).

Solution

Cooling

The cooling capacity of the primary air can be calculated using the following formula: $P_l = 1{,}2 \cdot \Delta T_l \cdot q_l$
$P_l = 1{,}2 \cdot 8 \cdot 16 = 154$ W
The ADAPT Parasol EX comfort module should therefore be able to generate 480 – 154 = 326 W in cooling capacity on the water side.
In Table 2 we can read that one 690 x 592 mm ADAPT Parasol EX with LHLH nozzle settings for a primary air flow of 15.8 l/s generates 378 W in cooling capacity on the water side. This is thus sufficient for meeting the cooling demand in the room.

At the same time, this nozzle configuration makes it possible to save a large air volume when the module operates in the no occupancy mode, which in this case involves 4.3 l/s (see ProSelect).

As an alternative, the nozzles can be set to the HHHH settings. This then delivers more air when the room is unoccupied (less savings) but an over capacity of air volume and cooling to utilise if, for example, there are often visitors to the office.

Chilled water

With a cooling capacity requirement of 326 W for the chilled water, the necessary water flow can be read in Diagram 1. With a temperature increase of ΔT_k= 2 K the water flow will be 0.039 l/s.
In Diagram 2 we can read that a water flow of 0.039 l/s does not produce a fully turbulent outflow, but that the capacity must be corrected by a reduction factor of 0.97. The loss of capacity can be compensated by calculating the comfort modules required cooling capacity as follows:
P_k = 326 / 0.97 = 336 W.
A new water flow can be obtained from Diagram 1, q_k = 0.040 l/s.
The pressure drop can now be read to be 5.5 kPa from Diagram 4.

Heating

Heating function

The comfort module's capability of quickly mixing the primary air with the room air, makes the ADAPT Parasol EX ideally suited for managing both cooling and heating. Heating premises with air heated above room temperature delivered from the ceiling is, in other words, an excellent alternative to traditional radiator heating solutions. Some of the benefits achieved include lower installation costs, simpler installation and perimeter walls free from piping and radiators. When you set the ADAPT Parasol EX to maintain a high nozzle pressure, under low airflow conditions, there will be a certain heating capacity, even while the module is operating during weekends, for instance, when the flow is reduced for a longer period.

Regardless of the type of heating system installed, it is important to consider the operative temperature in a room. Most people are comfortable when the operative temperature in winter is in between 20–24°C. The optimum comfort requirements are normally met when the room temperature is 22°C. This means that in a room with a cold perimeter wall, the air temperature must be higher than 22°C to compensate for the radiant cooling. In new buildings with normal insulated perimeter walls and normal standards of window glazing, the difference between the room air temperature and the operative temperature is small. But for older buildings with worse windows, it may be necessary to raise the air temperature to compensate for the chilling effect. Different operating scenarios can be simulated easily using the Swegon ProClim Web software where both the room air temperature and operative temperature are specified.

Supplying heated air from the ceiling results in some stratification of the air. For a supply flow temperature of max. 40°C, the stratification is non-existent, while at 60°C it can be around 4 K in the occupied zone. This only applies during the warming-up phase, when the room is unused and there is no internal load. When the room is in use, the lighting is on, a computer is running and occupants are in the room, the stratification will decrease or disappear depending on the heating energy demand.

When heating with the ADAPT Parasol EX, it is advisable to use an external temperature sensor or an extra sensor module in the room.

Calculation formulae - waterborne heating

Below are formulae that enable the user to calculate what comfort module is best suited for the application. The values for the calculations are specified in Tables 5-6.

The cooling or heating capacity of the air

$$P_l = 1.2 \cdot q_l \cdot \Delta T_l$$

P_l The cooling or heating capacity of the air (W)

q_l Primary airflow (l/s)

ΔT_l Temperature differential between primary air (t_l) and room air (t_r) (K)

Pressure drop for heating circuit

$$\Delta p_v = (q_v / k_{pv})^2$$

Δp_v Pressure drop in heating circuit (kPa)

q_v Heating water flow (l/s), see Diagram 6

k_{pv} Pressure drop constant for heating circuit, see Tables 5-6

Heating capacity of the water

$$P_v = 4186 \cdot q_v \cdot \Delta T_v$$

P_v Heating capacity of the water (W)

q_k Heating water flow (l/s)

ΔT_v Temperature differential between the heating water inlet flow and return (K)

Diagram 5. Water Flow – Heating Capacity

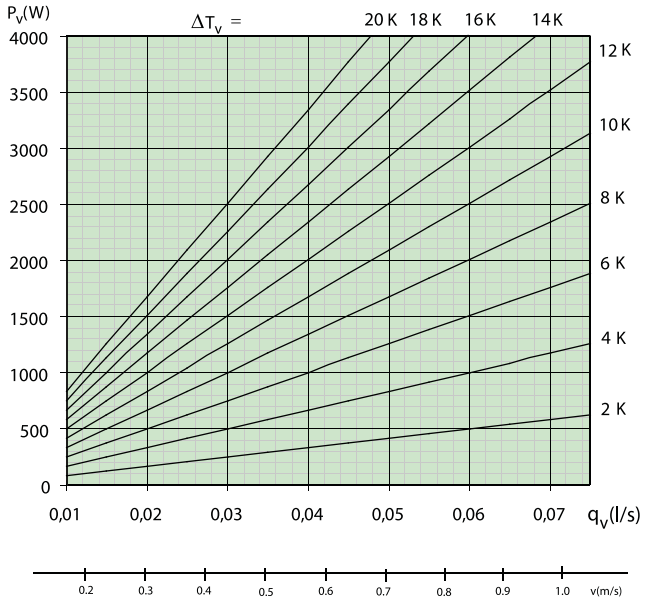


Diagram 6. Pressure drop – heating water flow

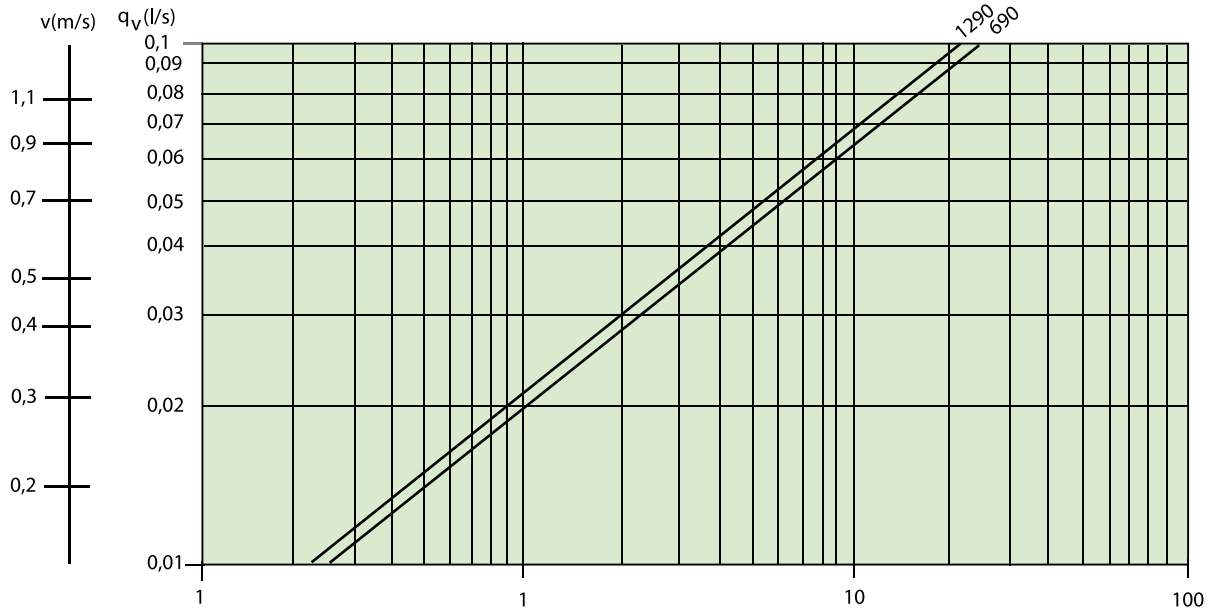


Table 5 - Heating capacity, ADAPT Parasol EX 690

Nozzle pressure	Nozzle setting 1)	Primary airflow (l/s)	Sound level dB(A) 2)	Heating capacity, water (W) for ΔT_{mv} 3)						Pressure drop constant air/water	
				5	10	15	20	25	30	k_{pl}	k_{pv}
50 Pa	LLLL	7.2	<20	114	190	285	379	473	567	1.01	0.0200
	LHLH	13.4	<20	125	248	365	485	600	716	1.89	0.0200
	HHHH	19.6	20	135	270	396	524	647	774	2.77	0.0200
70 Pa	LLLL	8.5	<20	110	221	331	442	552	661	1.01	0.0200
	LHLH	15.8	24	140	281	416	551	682	816	1.89	0.0200
	HHHH	23.2	25	151	304	448	592	733	875	2.77	0.0200
90 Pa	LLLL	9.6	20	124	245	365	488	609	731	1.01	0.0200
	LHLH	17.9	27	152	306	453	600	745	890	1.89	0.0200
	HHHH	26.3	29	165	327	485	641	797	950	2.77	0.0200

Table 6 - Heating capacity, ADAPT Parasol EX 1290

Nozzle pressure	Nozzle setting 1)	Primary airflow (l/s)	Sound level dB(A) 2)	Heating capacity, water (W) for ΔT_{mv} 3)						Pressure drop constant air/water	
				5	10	15	20	25	30	k_{pl}	k_{pv}
50 Pa	LLLL	13	<20	155	313	584	850	1008	1163	1.84	0.0213
	LHLH	29.4	22	199	394	735	1072	1272	1471	4.16	0.0213
	HHHH	35.6	26	205	410	760	1110	1311	1515	5.04	0.0213
70 Pa	LLLL	15.4	<20	176	353	658	959	1136	1312	1.84	0.0213
	LHLH	34.8	26	220	439	819	1201	1421	1645	4.16	0.0213
	HHHH	42.2	29	225	455	846	1237	1466	1691	5.04	0.0213
90 Pa	LLLL	17.5	<20	190	384	712	1044	1234	1428	1.84	0.0213
	LHLH	39.5	29	239	474	885	1298	1537	1767	4.16	0.0213
	HHHH	47.8	32	245	490	912	1334	1579	1811	5.04	0.0213

1) For particulars on the sizing of alternative nozzle settings, use Swegon's ProSelect sizing program available at www.swegon.com

2) Room attenuation = 4 dB

3) The specified capacities could vary depending on the nature of the installation and how the air deflectors have been set. The primary air capacity is not affected.
N.B.! The total heating capacity is the sum of the airborne and waterborne heating capacities. If the primary air temperature is lower than the room temperature, it causes negative impact on the total heating capacity.

Calculation example - heating

In a cellular office without suspended ceiling, with dimensions w × d × h = 2.4 × 4 × 2.7 m (the same room as in the example for cooling) there is also a heating demand of 450 W in the winter. The primary air flow should be the same as in the summer case, 16 l/s
and the duct pressure is now kept constant.
Disign room temperature (t_r) 22 °C, heating water temperature (supply/return) 45/39 °C and the primary air temperature (t_l) 20 °C produces:
ΔT_v= 6 K
ΔT_{mv}= 20 K
ΔT_l= -2 K

Solution

Heating

The primary airflow of 16 l/s in combination with the primary air temperature of 20 °C produces a negative impact on the heating capacity: 1.2 x 16 x (-2) = -38 W. The required heating capacity from the heating water thus increases to 450 + 38 = 488 W. From Table 7 we obtain from ΔT_{mv} = 20 K and the primary airflow 16 l/s a heating capacity of

P_v = 585 W from a single module unit with LHLH nozzle settings, which is sufficient for meeting the heating load.

Heating water

With a heating capacity requirement of 488 W and ΔT_v = 6 K the necessary water flow is obtained in Diagram 5: 0.019 l/s. The pressure drop for the heating water is calculated on the basis of a water flow of 0.019 l/s and pressure drop constant k_{pv} = 0.0200, which is taken from Table 5. The pressure drop will then be: $\Delta p_v = (q_v/k_{pv})^2$ = $(0.019 / 0.0200)^2$ = 0.90 kPa. As an alternative, the pressure drop can be read in Diagram 6.

Acoustics

Natural attenuation and end reflection

natural attenuation ΔL (dB) including end reflection.

Table 7. Natural attenuation ΔL (dB) ADAPT Parasol EX 690

	Octave band (Hz)							
Nozzle setting	63	125	250	500	1k	2k	4k	8k
LLLL	19	20	17	16	17	16	15	15
MMMM	17	18	15	14	15	14	13	13
HHHH	15	16	13	12	13	12	11	11

Table 8. Natural attenuation ΔL (dB) ADAPT Parasol EX 1290

	Octave band (Hz)							
Nozzle setting	63	125	250	500	1k	2k	4k	8k
LLLL	18	19	16	15	16	15	14	14
MMMM	16	17	14	13	14	13	12	12
HHHH	14	15	12	11	12	11	10	10

Installation

ADAPT Parasol EX – Component parts

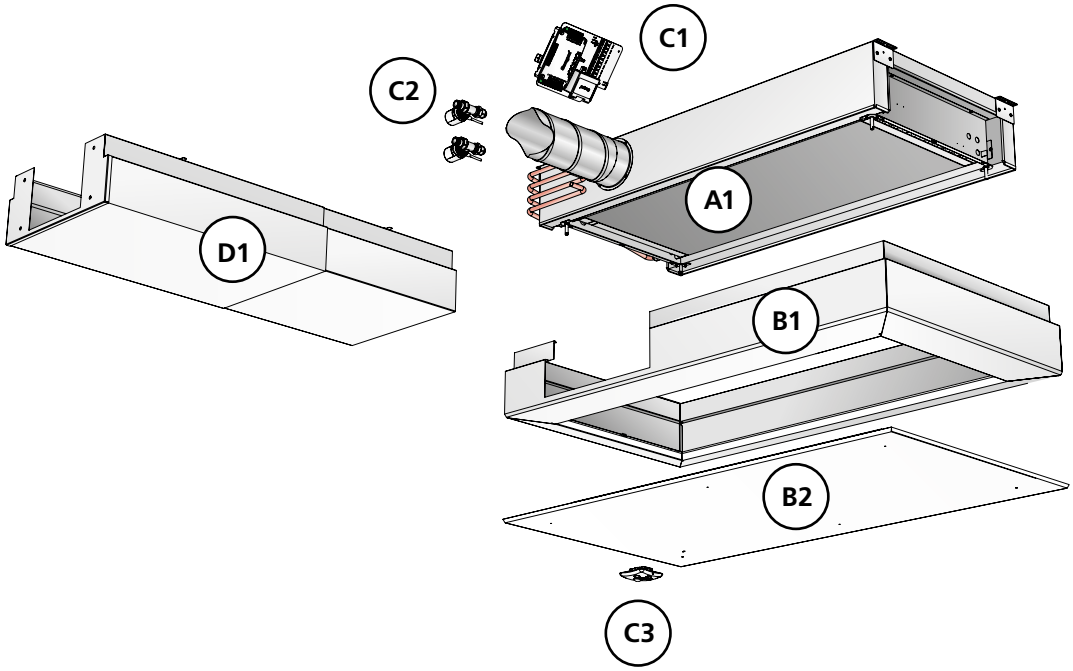


Figure 24. The ADAPT Parasol EX is delivered in several sections: A, B, C, D.

A1: Duct module
B1: Design frame
B2: Face plate
C1: Guide kit plate
C2: Valve actuator
C3: Sensor module
D1: Connection casing (Accessory) with wall mounting bracket

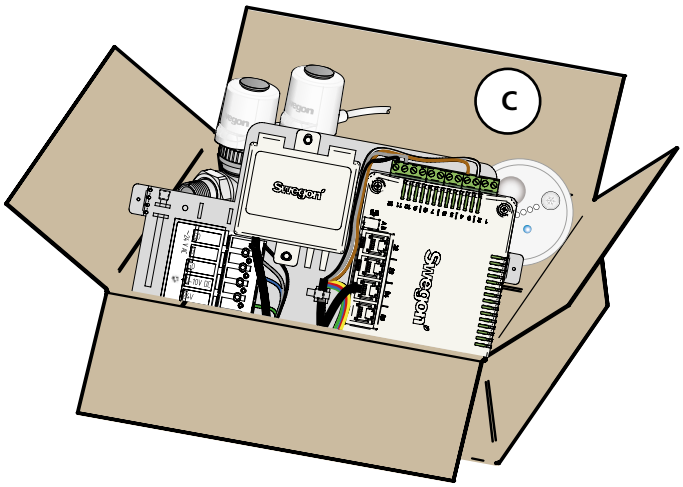


Figure 25. The following is supplied together with each ADAPT Parasol EX: a carton containing a guide plate with mounted controller and pressure sensor, sensor module, valve actuator, as well as other control components which have been ordered as accessories.

Recommended types of ceiling

The ADAPT Parasol EX is designed for suspended installation from hangers or mounting directly against the ceiling.

Suspension

The ADAPT Parasol EX has four mounting brackets for their suspension.

No extra mounting parts are needed if the module is installed directly against the ceiling.

If you suspend the modules, use a threaded rod in each mounting bracket (Figure 26). The threaded rods, assembly piece SYST MS M8 (Figure 27) must be ordered separately.

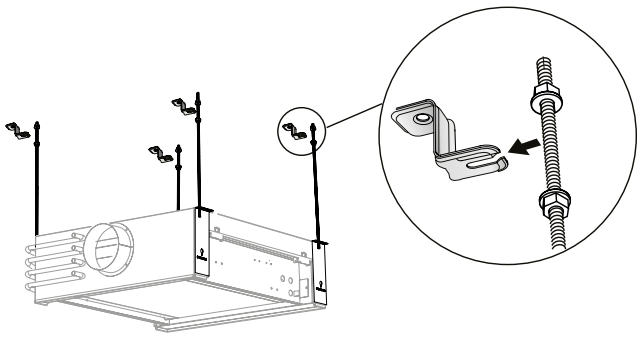


Figure 26. Suspension. No extra mounting parts are needed if the module is installed directly against the ceiling. If you suspend the module with hangers, use the SYST MS M8, to be ordered separately.

Connection dimensions

Water

Without valves:
Coooling, plain end (Cu) Ø 12 x 1.0 mm
Heating, plain end (Cu) Ø 12 x 1.0 mm

With factory-fitted valves:
Cooling, DN15 (1/2") male threads
Heating. DN15 (1/2") male threads

Air
Connection spigot Ø 125 mm

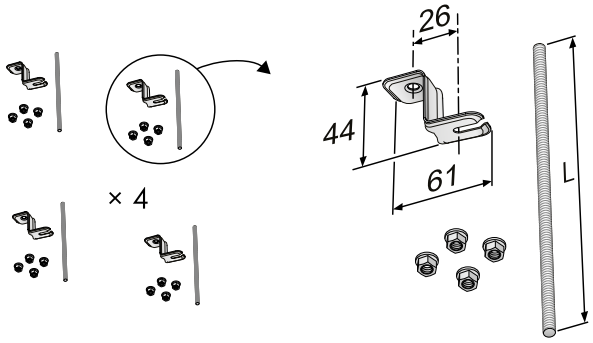


Figure 27. Assembly piece SYST MS M8-1, ceiling mount and threaded rod

To connect air
The ADAPT Parasol EX is supplied with the connection spigot on the same side as the water connections.

There is a cover on the opposite side, which on the ADAPT Parasol EX can only be used as a cleaning cover. The pipe kit and casings will not fit if you use the cleaning cover as an air connection.

To connect the water pipes
Connect the water pipes using push-on couplings or clamping ring couplings if the product is ordered without valves.

Note that clamp ring couplings require support sleeves inside the pipes. Do not use couplings that have to be brazed for connection of the water pipes.

High temperatures could damage the unit's existing brazed joints.

Flexible connection hoses for water are available for both plain ends as well as valves and should be ordered separately.

Condensation-free cooling
Since the comfort modules have to be designed to operate without condensation, no drainage system is required.

To wire the control equipment
See separate installation instructions.

Dimensions

ADAPT Parasol EX 690

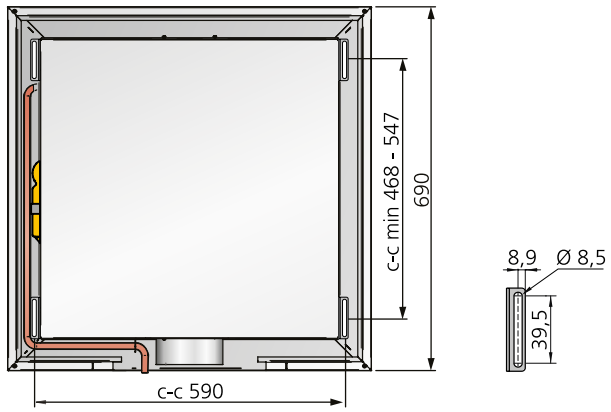


Figure 28. ADAPT Parasol EX 690, top view

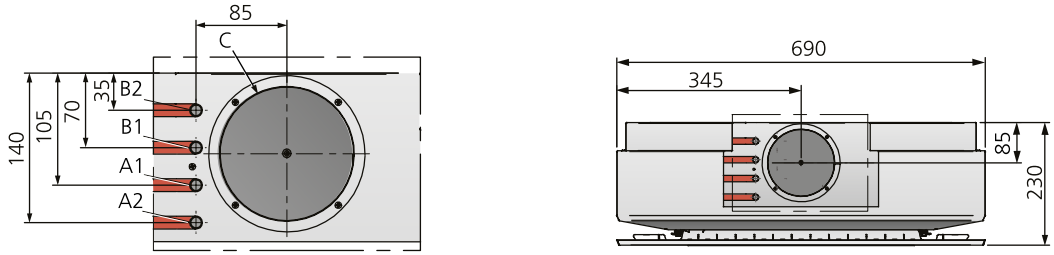


Figure 29. ADAPT Parasol EX 690, side view

A1 = Chilled water inlet connection ø12x1.0 mm (Cu)
A2 = Chilled water return connection ø12x1.0 mm (Cu)
B1 = Heating water inlet connection ø12x1.0 mm (Cu)
B2 = Heating water return connection ø12x1.0 mm (Cu)

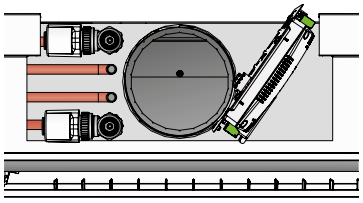


Figure 30. ADAPT Parasol EX 690 with the valves mounted and with guide kit plate
A2 = Return, cooling water, DN15 (1/2") male threads
B2 = Return, heating water, DN15 (1/2") male threads

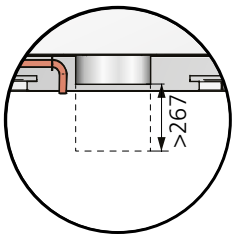


Figure 31. Fit the Guide kit plate onto the air duct and ensure a distance of 267 mm between the fastening points.

ADAPT Parasol EX 1290

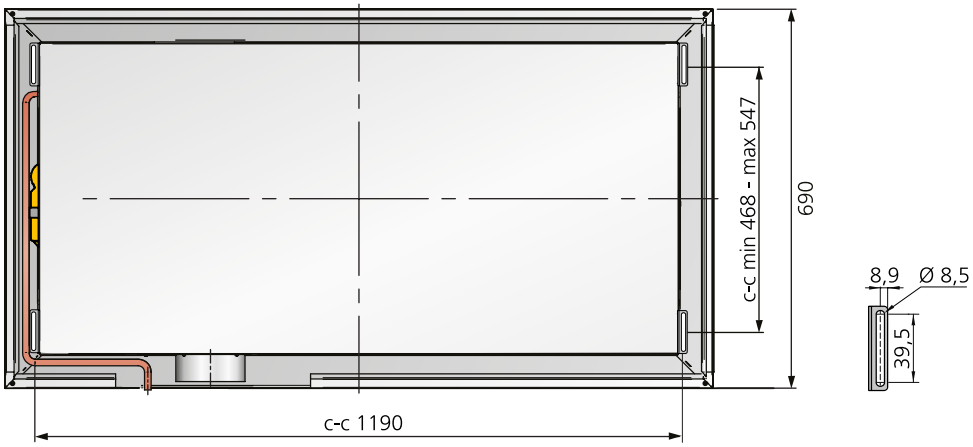


Figure 32. ADAPT Parasol EX 1290, top view

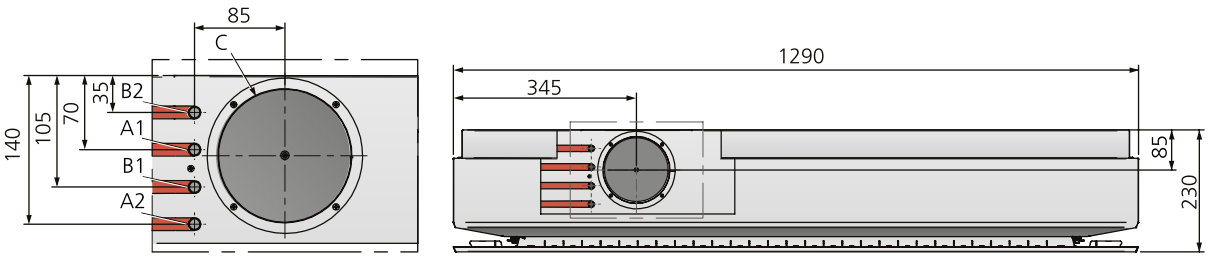


Figure 33. ADAPT Parasol EX 1290, side view

A1 = Chilled water inlet connection ø12x1.0 mm (Cu)
A2 = Chilled water return connection ø12x1.0 mm (Cu)
B1 = Heating water inlet connection ø12x1.0 mm (Cu)
B2 = Heating water return connection ø12x1.0 mm (Cu)

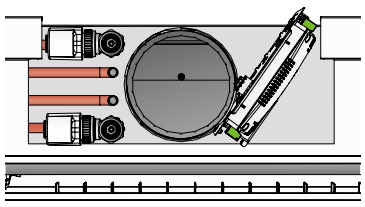


Figure 34. ADAPT Parasol EX 1290 with the valves mounted and with guide kit plate
A2 = Return, cooling water, DN15 (1/2") male threads
B2 = Return, heating water, DN15 (1/2") male threads

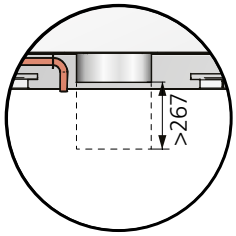


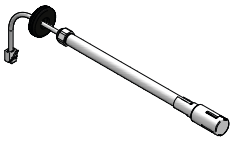
Figure 35. Fit the Guide kit plate onto the air duct and ensure a distance of 267 mm between the fastening points.

Accessories

Factory-fitted

Detect Qa Co_2 sensor
Analogue carbon dioxide sensor to be fitted concealed from view above the face plate.
See separate product datasheet at www.swegon.com.

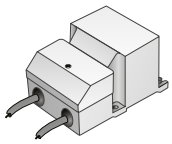
VOC sensor, Detect VOC-2
Modbus-connected air quality sensor to be fitted concealed from view above the face plate.



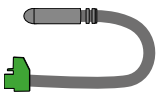
The factory-fitted accessories above can also be ordered as individual items of equipment.

Others

SYST TS-1 72 VA Transformer
Double-insulated protective transformer, 230V AC/24 V AC
See separate product datasheet at www.swegon.com.



CONDUCTOR T-TG temperature sensor
External temperature sensor. Used for example if the room temperature is to be measured at a location other than by the sensor module or for measuring the temperature on the main pipe in a change-over system.



External sensor module
Sensor module with temperature sensor and presence detector for wall mounting when an extra sensor module is required in the room (1 pc is always supplied with the ADAPT Parasol EX)

Available in a circular or rectangular model and is always supplied with both mounting frame for the most common existing electrical connection boxes as well as a protruding frame for surface mounting. Cable must be ordered separately, see SYST CABLE RJ12

POWER Adapt 20 VA transformer
230 V 50-60 Hz input voltage
24 V AC output voltage
20 VA capacity
IP33 rated casing

Valve with actuator, SYST VDN215 with **ACTUATOR b 24V NC** for cooling and heating.
See separate product datasheet at www.swegon.com.

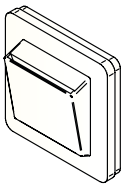
Cable, SYST CABLE RJ12 6-LED.
Cable for connection of an external sensor module to the controller or between sensor modules. Available in various lengths.

Cable, CABLE CONVERTER USB-RJ12 (RS485)
Cable with built-in modem for connecting a PC to the controller. Needed for running SWICCT or ModbusPoll, for instance.

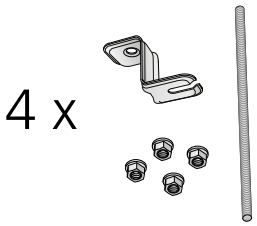
CONNECT Adapt
Connection box for connecting the cable together with a RJ12 connector and cable with multi-pin cable ends.

Can also be used for connecting an ADAPT Damper for extract air.

Key card circuit breaker, SYST SENSO
Key card holder for hotel rooms.

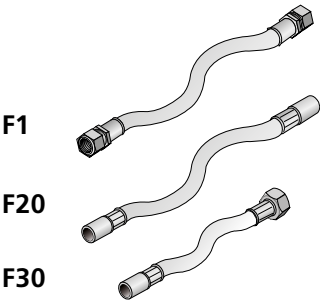


SYST MS M8 Assembly piece
The assembly piece is used for installation and consists of threaded rods, ceiling mounts as well as nuts for all four suspension mounts.

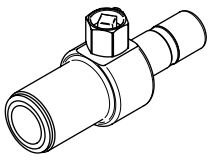


Flexible connection hoses, SYST FH
Flexible hoses are available with quick-fit, push-on couplings as well as clamping ring couplings for quick and simply connection. The hoses are also available in various lengths. Note that clamp ring couplings require support sleeves inside the pipes.

F1 = Flexible hose with clamp ring couplings
F20 = Flexible hose with quick-fit push-on couplings
F30 = Flexible hose with quick-fit push-on couplings on one end and G20ID sleeve nuts on the other end.



SYST AR-12 push-on venting nipple
A venting nipple is available as a complement to the flexible hoses with push-on couplings. The nipple fits directly in the push-on hose coupling and can be fitted in an instant.



Connection piece, air – insertion joint, SYST AD1
SYST AD1 is used as an insertion joint between the ADAPT Parasol EX and the duct system. Available in two dimensions: Ø125 and Ø160 mm.

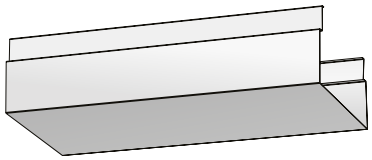
Connection piece, air, SYST CA
duct bend, 90°

Available in two dimensions: Ø125 and Ø160 mm.

Connection casing: Parasol EX c T-CC Telescopic casing for concealing ducts and pipework

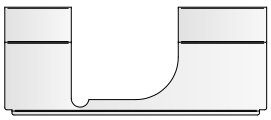
Width: 380 mm

Length interval:
175 - 250 mm
250 - 400 mm
400 - 700 mm
700 - 1200 mm
1200 - 2000 mm



Assembly piece SYST MS M8 (to be ordered separately) is needed for suspended installation from hangers. One kit is sufficient for two connection casings. No extra mounting parts are needed if the module is installed directly against the ceiling.

Cover plate, Parasol EX c T-ICP
Cover plate used to conceal the opening in the design section if a connection casing is not used.



Tool for nozzle adjustment, SYST TORX
Tool designed for easy adjustment of the nozzle plates.

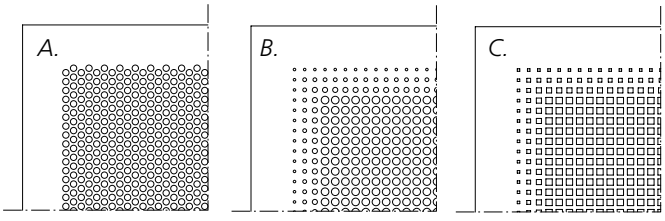
Optional perforation patterns
The face plate of the unit is available with three different perforation patterns that make it easily adaptable to suit different types of ceiling components, e.g. light fittings and exhaust grilles that share the surface of a suspended ceiling. A suspended ceiling containing different types of perforation patterns could be perceived as disturbing to the eye.

Other patterns are of course available on special order. For further details, contact your nearest Swegon representative.

A. Face plate, standard PB
Circular holes arranged in a triangular pattern.

B. Face plate, PD
Circular holes arranged in a square pattern with a graduated border.

C. Face plate, PE
Square holes arranged in a square pattern with a graduated border.



Specification

Function	The units can be ordered in various functional versions: A = Cooling and supply air B = Cooling, heating and supply air
ADC	Factory-fitted ADC supplied as standard
Airflow variant	Single module unit: ADAPT Parasol EX 690 Two-module unit: ADAPT Parasol EX 1290
Software configuration	The product can be supplied with certain software settings preconfigured from the factory. For example: Occupancy flow and temperature set point.
Nozzle setting	Each side can be set in four different ways: L, M, H L = Low airflow M = Medium airflow H = High airflow
Colour	The units are supplied painted in Swegon's standard shade of white, RAL 9003, degree gloss level 30 ±6%
Communication	Modbus RTU

Contractor demarcation

Swegon's delivery ends at the connection points for water and air as well as for wiring the room control equipment (see Figures 28, 29, 30, 31 as 32, 33, 34 and 35).

- The pipework contractor connects the connections points for water to the plain pipe ends and fills the system, vents it and tests the pressure.
- The ventilation contractor connects ducting to the air connection spigot.
- The electrical installation contractor connects the power (24 V) and the signal cables to the wiring terminals equipped with spring-loaded pressure connections. The maximum permissible cable cross-sectional area is 2.5 mm^2. For reliable operation we recommend the use of cable ends with multi-pin connectors.

Summary of accessories

Sensor module	
Valve actuator	ACTUATOR b 24V NC
Valve	SYST VDN215
CO_2 sensor	DETECT Qa
Temperature sensor	CONDUCTOR T-TG
VOC sensor	DETECT VOC-2
Tool for nozzle adjustment	SYST TORX
Transformer	SYST TS-1, 72 VA
Transformer	POWER Aa, 20 VA
Connection piece, air – insertion joint	SYST AD1
Connection piece, air – 90°	SYST CA
Assembly piece	SYST MS M8
Assembly piece for casing	
Flexible connection hose, with clamp ring couplings.	SYST FH F1
Flexible connection hose with quick-fit couplings (push-on)	SYST FH F20
Flexible connection hose with quick-fit coupling (push-on) in one end and G20ID sleeve nut in the other end.	SYST FH F30
Venting nipple, push-on	SYST AR-12
Connection casing	Parasol EX c T-CC
Cover plate	Parasol EX c T-ICP
Cable (2xRJ12)	SYST CABLE RJ12 6-LED.
Cable (USB+RJ12)	CABLE CONVERTER USB-RJ12 (RS485)
Connection box	CONNECT Adapt
Key-card circuit breaker	SYST SENSO
Perforated face plate, (in addition to PB standard perforations)	PD PE

Ordering Key

ADAPT Parasol EX b 690

ADAPT Parasol EX b 690	a-	MF-	bcde
Function: A = cooling and supply air B = Cooling, heating and supply air			
Airflow variant: MF = Medium flow			
Nozzle setting: Side 1: L; M; H Side 2: L; M; H Side 3: L; M; H Side 4: L; M; H			

ADAPT Parasol EX b 1290

ADAPT Parasol EX b 1290	a-	HF-	cdef
Function: A = cooling and supply air B = Cooling, heating and supply air			
Airflow variant: HF = High flow			
Nozzle setting: Side 1: L; M; H Side 2: L; M; H Side 3: L; M; H Side 4: L; M; H			

Ordering example

Suspended comfort module for integrated control and regulating equipment for demand-controlled airflow / indoor climate

ADAPT Parasol EX b 1290-A-HF-LHLH

ADAPT Parasol = Family of products

EX = Suspended

b = version letter

1290 = Measurement

A = Function: Cooling and supply air

HF = High flow variant: High flow

LHLH = Nozzle settings