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# Description of the air handling unit

#### General

The Compact Air room unit is a complete air handling unit with supply air and extract air fans, Supply air and extract air filters, rotary heat exchanger, silencer and built-in lowvelocity air diffuser. The control equipment is also integrated into the unit.

The Compact Air unit is well-suited for use in classrooms, day nurseries, conference halls, offices, workrooms, shops, restaurants and similar public premises.

Compact Air is available in two capacity variants. The size 08 Compact Air units are designed for ventilating normal classrooms and comparable rooms. The size 11 Compact Air units are designed for ventilating larger rooms and/or more than one room.

The unit should be installed in the room to be ventilated and is connected to the mains by means of an electric plug to an earthed electric socket. The ducts for outdoor air and exhaust air should be connected to the top of the unit and should be arranged to lead out through the periphery wall.

The unit is automatically controlled between normal airflow and low airflow by the timer or occupant detection sensor (accessories). The performance of the unit can be checked and temporary changes can be entered via an control display on the front of the unit.

The unit has a beige painted finish.

#### **Extra Accessories**

Occupant detection sensor El. air heater, 1 kW. Exterior wall hood. One-week timer. Extract air connection. Unit-to-ceiling infill piece. Separate lower unit section Air distribution plate

#### **Replacement Material**

Filter, 1 pc, F85/EU7

### Specification

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Compact Air Roc Size 08, 11	om Unit	CACA-2-aa-bb
Language varia Swedish Norwegian Danish Finnish English	ant in the display	
English German French	= 22	



Compact Air Room Unit Registered design. Registered trademark.

#### **Extra Accessories**

Occupant Detection Sensor	CACZ-1-01
Electric air heater, 1 kW	CACZ-1-02
Exterior Wall Hood	CACZ-1-03
One-week timer	CACZ-1-05
Extract Air Connection Piece	CACZ-1-06
Unit-to-ceiling infill piece	CACZ-1-07
Separate lower unit section	CACZ-1-08
Air Distribution Plate	CACZ-1-10-a_
Variant 1, 2, 3, 4 🔶	
Replacement Material	
Filter, 1 pc, F85/FU7	CACZ-1-04-7



# Description of the air handling unit

#### Operation

The Compact Air room unit is a complete air handling unit designed for supplying air according to the displacement ventilation principle.

Outdoor air is supplied via a duct to the unit where it passes through the filter, the built-in silencer and the electric air heater, if fitted. After that, the air passes through the built-in silencer and is discharged via the low-velocity air diffuser into the room.

In that the supply air has a slightly lower temperature than the room air, the room air is pressed upward toward the ceiling. The Compact Air then sucks in extract air via an intake at the top of the unit. The air passes the silencer, filter and heat exchanger and is then discharged via duct to the open air.

#### Casing

The unit casing is of double-skin design with 30 mm thick insulation sandwiched between sheet steel.

The visible parts of the unit are painted in a beige colour tone. The air handling unit is mounted on base beams. A base plate, painted black, is used to cover them. The base plate is supplied in unmounted condition.

The inspection door is hung on hinges secured to the left-hand edge. The door can only be opened using a special key. When

the door is opened, a switch interrupts the power supply to the fans and the heat exchanger.

#### **Division into Sections**

The Compact Air unit is always supplied as one complete air handling unit. If transporting the unit within the site proves difficult, the unit can be split into an upper section and a lower section. The fans, heat exchanger, filters, intermediate level and inspection door can also easily be dismantled from the upper section.

#### Airflows

To provide the best operating economy, the Compact Air unit is designed for supplying a normal airflow while the room is occupied and low-velocity airflow whenever the room is unoccupied.

The airflows can be preset as follows:

#### Size 08

For normal airflow, variable from 83 to 222 l/s (300-800 m<sup>3</sup>/h). For low-velocity airflow, switched off or variable from 83 to 222 l/s (300-800 m<sup>3</sup>/h).



#### Size 11

For normal airflow, variable from 83 to 305 l/s (300-1,100 m<sup>3</sup>/h). For low-velocity airflow, switched off or variable from 83 to 305 l/s (300-1,100 m<sup>3</sup>/h).

#### Filters

The Compact Air unit is equipped with ample fine filters for both the supply air and the extract air. The filters are disposable. Class F85/EU7 filters are used.

#### **Heat Recovery**

The rotary heat exchanger is of Reconomic type, patented by Swegon. Its temperature efficiency is 84% at an airflow rate of 167 I/s (size 08) and 83% at 250 I/s (size 11). The amount of heat required is controlled by automatically regulating the heat exchanger's rotation speed.

#### **Connection to Power Supply**

The unit is connected to the mains by means of an electric plug to an ordinary earthed, single-phase, 10 A, 230 V socket-outlet.

	without el. air heater		with el. air heater		
Size	Active power (W)	Current (A)	Active power (W)	Current (A)	
08	480	3,3	1480	7,7	
11	710	3,4	1710	7,8	



# **Description of the Control System**

### **Control Display**

The Compact Air unit is equipped with an electronic control display positioned on the exterior of the unit's inspection door.

The control display is used for entering all the automatic control system settings. The current operating situation can be viewed here and the display is also used for viewing alarms and tracing faults. The preset values are then stored in a type of memory that is unaffected by power failures.

The Compact Air unit can also be manually controlled via the control display.

#### Settings

All the airflow, temperature and other settings can be entered in the control display in conjunction with commissioning the unit.

#### Use

The control display shows the current operating situation in plain text. To alter any of the preset values, press the appropriate keys to advance to the various menus where new values can be entered.

Scope is available for entering temporary manual changes. If it is desirable to temporarily change the airflow, simply press the keys for – or + to decrease or increase the airflow. It is also possible to request the airing mode (max. airflow and reduced supply air temperature for 15 min.).

All the manually entered changes return to the automatic operating settings after a specific period. This feature corrects forgotten settings or entries made out of pure mischief.

#### Alarms and Fault Tracing

Alarm indications for necessary filter change and possible malfunction are displayed in plain text. These are accompanied by a flashing red warning LED.

### **Airflow Control**

Either a one-week timer or an occupant detection sensor is used for switching between the normal flow and low flow modes.

#### **One-week timer**

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The one-week timer is well-suited for rooms that are regularly in use.

The desired times for switching between the low flow and normal flow modes can be individually preset for various days of the week.

#### **Occupant Detection Sensor**

The one-week timer is well-suited for rooms that are regularly in use.

If the occupant detection sensor is used, the unit operates in the low flow mode as long as the sensor does not register any occupant in the room. As soon as it registers an occupant, the unit is switched over to the normal flow mode.

The automatic airing function can also be preset in conjunction with the use of an occupant detection sensor.



The control display and two typical menus.





# **Description of the Control System**

### **Temperature Control**

#### **Control Sequence**

When heating is required, the controller first increases the speed of the rotary heat exchanger. Then it switches in the electric air heater, if fitted, to generate heat. If no electric air heater is installed, or if the heater's output is insufficient, the controller slightly decreases the speed of the supply air fan to achieve the correct temperature.

#### **ERS Control**

The Compact Air unit employs ERS Control (extract air temperature related supply air temperature control). This involves controlling the supply air temperature relatively to the extract air temperature.

This type of temperature control offers optimal operating economy and heat recovery, and makes it possible to do without any reheating coil.

Compact Air offers two options for controlling the supply air temperature. Either according to Alternative 1 that involves following the extract air temperature or according to Alternative 2 that involves maintaining the desired room temperature if the extract air temperature is high.

#### Alternative 1:

#### **Supply Air Temperature**

The supply air temperature is controlled in relation to the extract air temperature. Control can be carried out according to three alternative steps.

Step 1 provides the best operating economy and cooling power in warm rooms whereas Steps 2 and 3 may be of special interest in day nurseries where children often spend time at floor level.

The difference between the three steps is illustrated in the following chart.



Extract air temperature, °C

The blue broken line shows the difference between Steps 1 and 3 at a given extract air temperature (32°C).

Step 1 indicates a supply air temperature of 18.8°C and Step 3 indicates 21°C.

#### Alternative 2: Room temperature

If control of the supply air temperature as described above does not provide adequate cooling power, control of the room temperature can be selected as an alternative.

In this mode the supply air temperature will instead be controlled and the unit will then attempt to maintain a specific room temperature with the following reservations.

1. The temperature of the air supplied from the Compact Air unit will never be higher than the room temperature.

2. The temperature of the air supplied from the Compact Air unit will never by lower than that of the outdoor air.

3. The desired room temperature can be programmed in 1°C increments within the interval of 19-24°C.

The lowest permissible supply air temperature can be programmed in 1°C increments within the interval of 15-19°C. This minimum permissible supply air temperature setting has desired effect only when the room temperature is within the interval of 19-24°C.



The blue broken line shows how the supply air temperature varies depending on the extract air temperature if the preset room temperature is 21°C and the lowest permissible supply air temperature is 16°C.

\*)

The term room temperature is used in this connection to make it easier for the user to understand the control function.

However, the term extract air temperature is in fact more correct.



# **Description of the Control System**

### **Special Functions**

#### **Airing Out**

the Compact Air unit is equipped with an airing out function. The function causes the unit to operate at maximal airflow supplying air at reduced temperature for 15 minutes.

The function can be manually selected in the control display. If the unit is controlled by an occupant detection sensor, the automatic airing function can be selected.

Automatic airing out is conditional on the unit having supplied normal airflow for at least 10 minutes (i.e. the occupant detection sensor has registered the presence of one or more occupants and after that not registered any presence for 5 minutes).

#### **Summer Night Cooling**

The summer night cooling function is a simple method for supplying cool outdoor air to the room.

Within specific conditions and temperature limits the Compact Air unit automatically operates in the high speed mode.

The function can be manually selected in the control display.

#### Limiting the Supply Air Temperature

If the heating system in the building is shut down or is set to substantially reduce night-time heating, a setting for limiting the supply air temperature can be preset to avoid chilling the rooms.

This limit setting has effect regardless of whichever airflow control options and other temperature limits have been preset.

Keep in mind that ventilation performance may be below normal when this function is activated.

It should be pointed out that the unit does not have capacity for heating the room it serves; it solely ventilates it.

See also the coming subsections about Reduced Nighttime Temperature under Sizing the Heating System under the section: Installation Tips.

#### **Duct Pressure Drop Calibration**

The pressure drop in the ducting is calibrated when the unit is commissioned. The results of this calibration are stored as fundamental information about the conditions that existed when the unit was initially started up and are used as a basis for subsequent filters tests described below.

#### **Filter Test**

Every time the unit is controlled from normal airflow to the low airflow mode, an automatic filter test is conducted. As the filters become fouled, the pressure drop across them increases. By comparing the initial conditions with current conditions, the controller can indicate when it is time to change the filters.

When the pressure drop exceeds the alarm limit, an alarm appears in the control display.

#### **Automatic Fan Speed Adjustment**

The Compact Air unit has a self-adjusting fan speed feature for maintaining the preset airflow rate.

A pressure rise in the system, caused by fouled filters for instance, is therefore automatically compensated to always achieve the preset airflow.

#### Alarms

Besides alarms for necessary filter change, alarms for possible malfunctions are also indicated.

Alarms are indicated in the control display by a flashing red LED and by a malfunction message in plain text.

Group alarms can be connected to a central alarm station.

The three most recent alarms are stored in the memory of the controller.



# **Description of the Accessories**

### **Accessories for Simple Installation**

#### **One-week timer**

The one-week timer is well-suited for rooms that are regularly in use.

The one-week timer is a switching clock used for controlling the Compact Air unit between the normal airflow and low airflow modes individually for various days of the week.

The timer should be wired to ready-to-use 12 V power supply terminals on the top of the air handling unit.

See also previous section "Airflow Control".

#### **Occupant Detection Sensor**

The occupant detection sensor is well suited for use in rooms that are not regularly occupied.

The occupant detection sensor is a type of motion detector that senses infrared light. The unit operates at low airflow as long as the sensor does not register presence inside the room. As soon as it registers an occupant, the unit is switched over to the normal flow mode. When the room is unoccupied again, the unit returns, after a slight delay, to the low airflow mode.

The automatic airing function can also be preset in conjunction with the use of an occupant detection sensor.

The timer should be wired to ready-to-use 12 V power supply terminals on the top of the air handling unit.

See also previous section "Airflow Control".

#### **Electric Air Heater**

The electric air heater is available as an accessory for special needs.

See also the coming section: "Installation Tips, ERS Control".

The output of electric air heater is 1000 W. The thermal overload protector is included. The air heater is supplied loose for installation at the building site. It should be located at a specific spot between the heat exchanger and the supply air fan and be wired by means of its ready-touse quick connector.

#### **Exterior Wall Hood**

The exterior wall hood is designed for the admission of outdoor air and the discharge of exhaust air. The hood is made of galvanized sheet steel and has a black painted finish.

The exhaust air is horizontally discharged through a circular wire mesh grille at the front of the hood. Outdoor air is admitted through a wire mesh grille at the bottom of the hood. This design effectively prevents short-circuit flow between the outdoor air/exhaust air.

The exterior wall hood is equipped with Ø250 mm sleeve couplings fitted with a type-approved rubber ring seal.

The connections can be reversed to fit various connection options. This is easily done at the building site.



The outdoor air/extract air can easily be reversed at the building site.

#### Unit-to-ceiling infill piece

The unit-to-ceiling infill piece makes it possible to conceal the duct connections at the top of the air handling unit. If the building has high ceilings, several infill pieces can be fitted in a series upward.

The infill pieces consist of three sections (end pieces + long side) to be assembled together. The end pieces cannot be used if the ducts extend out to the side.

The infill pieces are made of galvanized sheet steel painted in the same coulor as the Compact Air unit.



We reserve the right to alter specifications.



# **Description of the Accessories**

### Supply Air – Additional Rooms

#### Separate Lower Unit Section with Bench Top

With the separate lower unit section accessory fitted, the Compact Air unit can discharge supply air to two adjacent rooms.

The separate lower unit section is a complete lower section for the Compact Air unit with heat exchanger, supply air diffuser and base.

The airflow through the lower section of the unit is equivalent to the airflow through the separate lower section. The air distribution plate accessory can be used if different air distribution is desirable.

A bench top is supplied together with the separate lower unit section. The bench top is beige and has a light pattern (type Perstorp 5050). The top is 29 mm thick.



If a separate lower unit section is used, two adjacent rooms can be ventilated by means of displacement ventilation.

#### **Air Distribution Plate**

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The air distribution plate accessory makes it possible to control the distribution of air if a separate lower unit section is used. The air distribution plate is a perforated galvanized sheet steel plate that can be secured by screws either in the lower section of the unit or in the separate lower unit section. The function of the air distribution plate is to throttle the flow of air discharged from the diffuser in which it is fitted.

The plate is available with perforations in 4 different variants that distribute air at the airflow rates tabulated below:

Total Airflow I/s	Variant 1 l/s	Variant 2 I/s	Variant 3 I/s	Variant 4 I/s
277	177/100	211/66	229/48	241/36
222	144/78	172/50	183/39	191/31
167	104/63	127/40	133/34	145/22

# **Extract Air – Additional Rooms**

#### **Extract Air Connection Piece**

The extract air connection piece is used if it is desirable to ventilate other spaces than the room in which the Compact Air unit is installed, such as pantries, offices or WCs.

The extract air connection piece is made of galvanized sheet steel. It has four 125 mm dia. circular duct connections for extract air from other rooms and a rectangular opening for extract air from the same room where the unit is installed. The rectangular opening is adjustable, enabling airflow adjustments.

125 mm dia. spiral insertion joints are required for connecting spiral ducts. Spiral ducts or insertion joints are not included in the supply. The connections that are not needed should be fitted with a cover.





# **Installation Tips**

### **General Information about Temperature Control**

#### **ERS Control**

The Compact Air unit controls the temperature of the supply air on the basis of the temperature of the extract air. This type of control is called "extract air temperature related supply air temperature control", i.e. ERS Control.

#### **Reheaters Can Be Left Out in Most Applications**

The temperature of the supply air discharged into the room is one or several degrees lower than the temperature of the air extracted from it. This makes it possible to optimally utilise the heat exchanger.

Therefore, in normal applications, no reheating coil is needed. This has a positive effect on total economy, both in terms of installation and running costs.

If the performance of the heat exchanger still is not sufficient for keeping the supply air temperature up to expected level, the Compact Air unit automatically and variably reduces the supply airflow. This provides the heat exchanger with "surplus" heat from the extract air enabling it to serve its purpose.

#### Sizing the Heating System

The supply of air at a temperature slightly below room temperature presupposes that there is surplus heat in the room being ventilated. If this is not the case (no heating load in the room at night, for instance), the heating system of the room must be sized so that its output will compensate the below-room-temperature air supplied to the room.

If no reheater is installed, sizing/presetting the ordinary heating system of the premises must take into account the fact that the Compact Air unit will supply air at a reduced airflow rate during periods of extremely cold weather. The outdoor air that at low outdoor temperatures seeps in through leakage sources such as windows and doors, must be heated by the ordinary heating system of the premises.

#### **Reduced Night-time Temperature**

For optimal operating economy, the Compact Air unit should be operated in the low fan speed mode when the room is not used, e.g. at night and during weekends and holidays. Even during these periods, the Compact Air unit will operate with air cooler than room temperature. If the heating system of the building is programmed to operate at a lower temperature setting at night, the air supplied by the Compact Air unit will still be a few degrees cooler than the extract air (the air in the building).

Consequently, it is advisable to always keep in mind how the Compact Air unit operates before programming a reduced night-time temperature setting in the ordinary heating system of the building.

#### **Extract Air Intake**

The purpose of ERS Control is supply air at a temperature that is one or more degrees lower than the extract air temperature, i.e. a few degrees lower than the room temperature.

If the Compact Air unit is installed in such a way that extract air is also taken from another room with a different temperature, the temperature of the supply air may cause short-circuit airflows or give rise to draught problems.

The extract air sensor is mounted by the extract air intake on the top of the Compact Air unit. Its exact location should be carefully considered if the extract air connection accessory is used.

#### **Transfer Air**

Transfer air grilles or door slots to adjacent rooms have a strong influence on the system's performance.

Air transfer grilles positioned low, cause "unused air" to be transferred to adjacent rooms and impair the ventilation performance in the room where the unit is installed.

Air transfer grilles positioned high involve the risk that "used" air will be transferred to adjacent rooms. Ventilation is however not impaired in the room where the unit is installed.

Important! If the doors are open, the adjacent room will also be ventilated due to the displacing air supply.



# **Installation Tips**

### **Typical Simple Installation for One Room**

To achieve optimal operating economy it is important to design the duct system with as low pressure drop as possible.

Therefore the designer should strive to arrange ducts that are as short as possible and avoid including more duct bends than are necessary. The duct connections on the Compact Air unit are arranged to enable ducts to be run in any direction without blocking one another.

The design of the hoods, grilles, etc. for outdoor air/exhaust air are also important. The special design of the exterior wall hood for the Compact Air unit minimizes pressure losses.

The illustration to the right shows typical Compact Air unit locations in a room.



Alternative locations of the Compact Air unit in a room. The runs of ducting will be the simplest and shortest if the room unit is located against a periphery wall.

### Installation Examples for Supply Air/Extract Air in Several Rooms

The Compact Air unit can also supply and/or extract air to/from more than one room. Ventilation professionals should be engaged for the planning and installation of all such ventilation systems.

The Compact Air unit can supply air to several rooms via door slots, transfer air grilles or the separate lower unit section accessory.

Extract air can also be taken from other spaces conveyed through ducts and the extract air connection piece accessory.

For particulars of the extract air intake and transfer air, see also Installation Tips on the previous page.



The unit supplies air to several rooms via doors with an air slot at the bottom. Extract air from adjacent rooms is conveyed to the unit via extract air devices and ducts and in the extract air connection piece accessory.



The unit supplies air to several rooms via transfer air grilles. Extract air from adjacent rooms is conveyed to the unit via extract air devices and ducts and in the extract air connection piece accessory.



The unit supplies air to two rooms via the separate lower unit section accessory. Extract air from adjacent rooms is conveyed to the unit via extract air devices and ducts and in the extract air connection piece accessory.

# Sizing

### **Capacity - Airflows**

The chart shows available pressure over and above that of the normal installation (short outdoor air and exhaust air ducts each with its own 90° bend and both sharing a common exterior wall hood).



Example (broken line):

If an aiflow of 167 l/s (600 m<sup>3</sup>/h) is desirable, the pressure drop (in connected ducts and diffusers, for instance) must be no more than 140 Pa.



Example (broken line):

If an aiflow of 250 l/s (900 m<sup>3</sup>/h) is desirable, the pressure drop (in connected ducts and diffusers, for instance) must be no more than 90 Pa.

# **Comfort boundary**

Airflow, room temperature and supply air temperature influence the comfort boundary of the unit (how close can an occupant be without feeling a draught). The velocity of the air discharged from the diffuser section of the Compact Air unit is very uniform and the normal comfort boundary from the face of the diffuser is approx. 1 metre.

# Sound

The tables below show the sound pressure level for various airflows and pressures.

A normal installation with short outdoor air and exhaust air ducts and an exterior wall hood generate a noise value as specified in the 0-20 Pa column in the table.

The columns that contain a dash are irrelevant.

#### Size 08

Sound pressure level in dB(A) <sup>1)</sup>				
	Stati	c pressur	re, Pa	
Airflow l/s (m³/h)	Normal installation 0-20	60	100	140
222 (800)	29	31	33	
195 (700)	26	28	30	32
167 (600)	25	27	30	32
140 (500)	23	26	29	_

#### Size 11

Sound pressure level in dB(A) <sup>1)</sup>				
Static pressure, Pa				
Airflow l/s (m³/h)	Normal installation 0-20	60	100	140
305 (1100)	34	_	—	
250 (900)	30	32	34	—
195 (700)	26	28	30	32

#### Indoors

The sound pressure levels tabulated above are applicable to the reverberant field in normal rooms where people congregate. The difference between the sound power level and the sound pressure level( $L_w - L_p$ ) = 12 dB. If the extract air connection piece is used, sound pressure levels other than the ones tabulated may arise.

#### Outdoors

The sound pressure levels tabulated above are applicable to + 8 dB at a distance of 10 m from the exterior wall hood. The difference between the sound power level and the sound pressure level( $L_w - L_p$ ) = 25 dB.



# **Dimensions and Weights**

#### **Compact Air**



Overall weight: 300 kg Upper section: 185 kg, lower section: 115 kg 1100 mm free space is required for opening the front panel (left-hand hung).



#### Separate Lower Unit Section with Bench Top

Dimensions and weights according to the above without upper section The dimensions of the bench top itself are slightly larger than those specified above.

Dimensions of the opening for a separate lower unit section in a wall Height: 880 mm, width: 1120 mm



#### CACZ-1-03 Exterior wall hood



The provisions for extract air/outdoor air can be reversed at the installation site.

#### CACZ-1-06 Extract air connection piece





The sketch shows that the extract air connection piece with 90° bends does not add more to the installation height than do the 90° bends for the unit's spiral connections.

### CACZ-1-07 Infill piece



The infill piece consists of three parts: 1 long side and 2 end plates that have to be assembled together.







