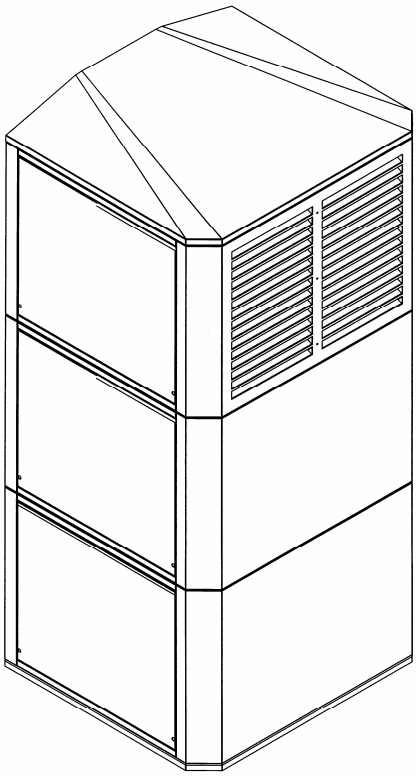
Silencio

Service manual

EN

No. 018717 • ver. 1.1 • 23.01.2007



Introduction

Overview

Introduction

This is the service manual for the Dantherm Air Handling Silencio unit.

The table of content below gives you an overview of the main sections. Please see the complete table of content for further information about the sections.

Table of content

This service manual covers the following main topics:

Table of content

Introduction

This is the complete table of content covering all sections in this service manual.

Each main section will begin with an introduction including a separate table of content covering the exact section.

Table of content

This service manual covers the following topics:

Continued overleaf

Table of content, *continued*

Table of content, ***continued***

General information

Introduction

This section gives you the general information about the unit and this service manual.

The service manual covers all the Silencio versions.

Silencio is available in 6, 8, 10 and 14 kW.

Manual, part number

Part number of this service manual is 018717.

Target group

The target group for this service manual is the technicians who install and maintain the unit.

Copyright

Reservations

The service manual is subject to changes without notice.

CE-Declaration of Conformity

CE

Dantherm Air Handling A/S, Marienlystvej 65, DK-7800 Skive hereby declare that the units mentioned below:

365006	Silencio 600	3 × 400 V AC, 50 Hz and 48 V DC
365008	Silencio 800	3 × 400 V AC, 50 Hz and 48 V DC
365010	Silencio 1000	3 × 400 V AC, 50 Hz and 48 V DC
365014	Silencio 1400	3 × 400 V AC, 50 Hz and 48 V DC

are in conformity with the following directives:

98/37/EEC	Directive on the safety of machines
73/23/EEC	Low Voltage Directive
89/336/EEC	EMC Directive
97/23/EEC	The Pressure Equipment Directive

- and are manufactured in conformity with the following standards:

EN 292	Machine Safety
EN 60 335-1	Low voltage
EN 60 335-2	Low voltage
EN 60 000-6-2	Immunity
EN 60 000-6-3	Emission

Per Albæk
Managing director

Project manager

Skive, 01.11.2004

Recycling

The unit is designed to last for many years. When the time comes for the unit to be recycled, the unit should be recycled according to national rules and procedures to protect the environment.

Definitions

Introduction

This section gives you a definition of some of the technical words and terms used in this manual.

List

Here you have the list of words and terms with the matching definition:

Term	Definition
Return air (T_1)	Internal air entering the ACU
Ambient air (T_2)	External air entering the ACU
Exhaust air (T_3)	External air leaving the ACU
Supply air (T_4)	Internal air leaving the ACU
Cooling set point	Cooling set point (the temperature at which the active cooling starts)
Heating set point	The temperature at which heating is activated
Evaporator	The area where the refrigerant absorb the heat from the internal enclosure
Condenser	The area where the refrigerant give off heat to ambient air
Heat load	The heat incl. solar gain that is to be removed from the shelter or room

Product description

Overview

Introduction

This section will give you a description of the Silencio and its functionality.

Content

This section covers the following topics:

General description

Introduction

This section gives you a description of the unit as a whole. The following section describes the different parts in details.

Description

The Silencio is designed to control the internal environment of a universal shelter or room.

The Silencio removes excess heat from sensitive electronic equipment and is especially suited in applications where the equipment requires to be maintained within defined temperature limits to achieve optimum performance and to maximize component lifetime.

We have designed the Silencio to generate a minimum of externally generated sound bearing strict regulations of sound emissions in mind.

Silencio is designed to be mounted outdoor.

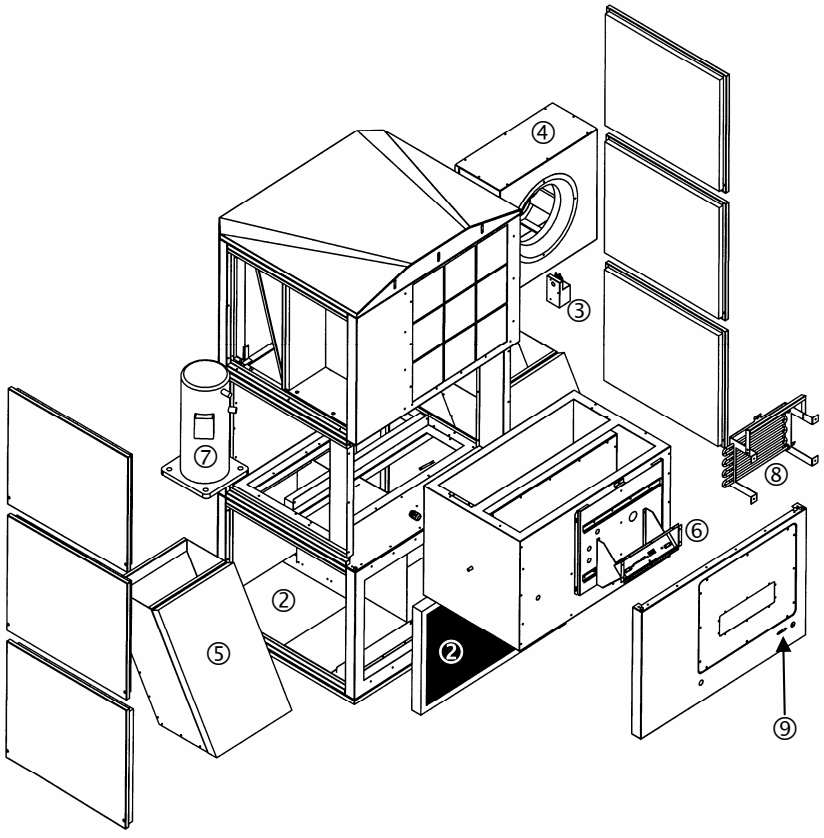
Versions

Silencio is available in the 4 sizes:

- Silencio 600, 6 kW
- Silencio 800, 8 kW
- Silencio 1000, 10 kW
- Silencio 1400, 14 kW

Drawing, internal

This drawing illustrates the different parts, visible from the internal side:

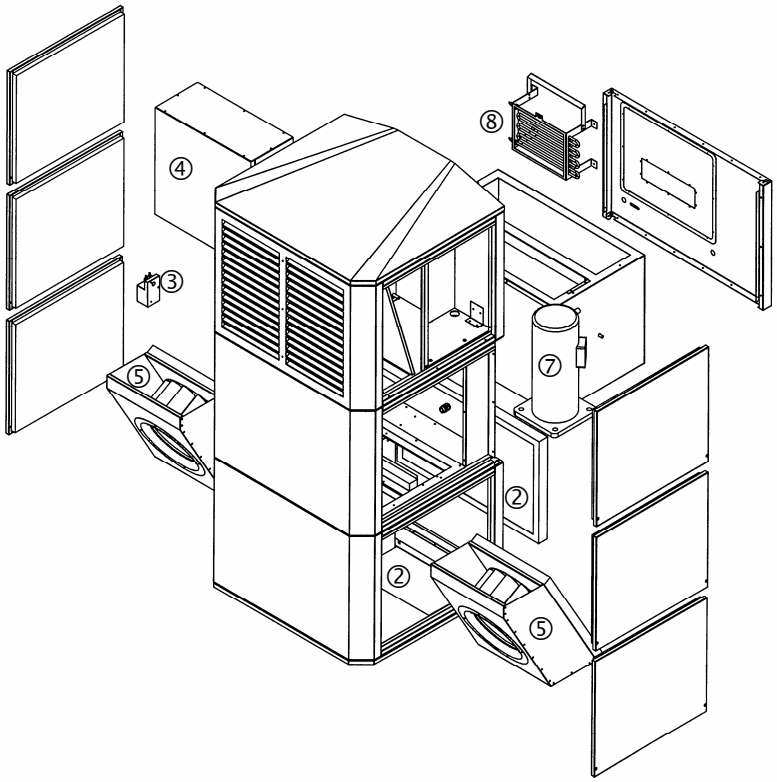


Continued overleaf

General description, *continued*

Illustration, external

This illustration gives an overview of the parts and systems, a more detailed description will follow in the section “Description of parts”, on page 11:



Part	Part
① Temperature sensors, see section “How to replace the temperature sensors”, page 56	⑤ External condenser fan
	⑥ Control board
② Filters	⑦ Compressor
③ Damper motor	⑧ Heater
④ Internal fan	⑨ 25 poled SUB-D connection

Description of parts

Introduction

This section will give you a more detailed description of the parts of the Silencio.

The parts that will be described are:

- Temperature sensors
- Filters
- Damper
- Internal fan
- External condenser fan
- Compressor
- Heater
- Control board
- 25 poled SUB-D connection

Temperature sensors

The purpose of the temperature sensors is to provide the control board with signals. High or low temperatures (compared with set points in the control board) result in a signal from the control board to either the air conditioning system or the heating system.

Sensor	Placement	Result
Return air sensor	Placed in the return air duct	Gives a representation of the enclosure temperature
Supply sensor	Placed in the supply air duct	Gives a representation of the supply air temperature
Ambient sensor	Placed below the PPI filter at the bottom of the unit, secured to the net	Gives a representation of the ambient temperature
Condenser sensor	Placed in a sensor pocket on the liquid pipe, at the cooling system	Gives a representation of the temperature of the refrigerant

Filters

The purpose of the filters is to prevent dust from entering the shelter.

The main filter is a pleated DVI filter, class F5, (96 % degree of separation).

The PPI filter is for protection of external fans and condenser against insects and leaves etc. See section “General description”, page 9 for replacement of the filters.

Damper

The damper is used when the Silencio runs in a free cooling mode or emergency cooling mode, and will move back and forth to maintain a steady temperature in the shelter or room.

The purpose of the damper is that the Silencio can run in a free cooling mode.

See more about free cooling mode in section “Functional description”, page 17.

Continued overleaf

Description of parts, *continued*

Internal fan

The internal fan draws return air from the shelter into the Silencio, to:

- Circulate the internal air, when the return temperature is not too high (Recycle)
- Draw out the return air and push it through the air condition system to cool the air (active cooling)
- Blend the return air with fresh air and push this new cooled air back to the shelter (recycle/free cooling)
- Push warm air from the shelter to the outside in order to remove excess heat (free cooling)
- Circulate the internal air and push it through the heating system to warm up the supply air back to the shelter (heat)
- The internal fan is active in all modes, and runs continuously in various speeds.

External condenser fan

The external fans draw ambient air into the Silencio to:

- Cool the condenser (active cooling), or
- Provide ambient air to the shelter (free cooling or emergency cooling)
- The external fans are active in active cooling, free cooling and emergency cooling

Compressor

The compressor circulates the refrigerant in the cooling system.

Heater

The heater keeps the internal temperature at an adequate level at low ambient temperatures, and is often also used to heat up the shelter in start up conditions.

Control board

The control board allows the user to change settings and to obtain information.

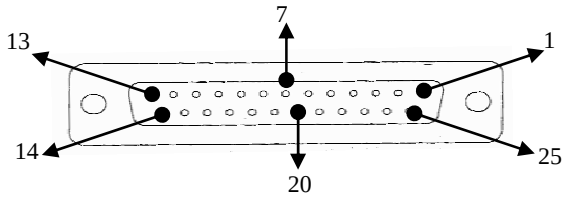
The control board controls the following active parts:

- Heater element
- Damper
- Internal fan
- Compressor
- Condenser fan

Learn more about the control board in section “Description of the control board”, page 14.

25 poled SUB-D, illustration

This illustrates the SUB-D plug:



Continued overleaf

Description of parts, *continued*

25 poled SUB-D, connections

The 25 poled SUB-D connection gives you the possibility of connecting additional external equipment (see table below).

Furthermore you have the same functionality as the RS485 communication port, for details about this, see section “Description of the control board”, page 14.

Warning!
A male Sub-D 25 connector with a connection between 5 and 12 is mounted on the female Sub-D 25 connector. A removal of this male Sub-D 25 connector during operation will cause the unit to stop.

Sub-D 25 connections
The following explain the connections. The connector is shown from above:

Pin no.	Color	Description	Function	Default setting
1	White/Blue	Hotspot sensor	Input	-
2	Blue/White	Hotspot sensor	Input	-
3	White/Orange	Alarm	Output	Normally closed
4	Orange/White	Alarm	Output	Normally closed
5	White/Green	Smoke alarm	Common	-
6	Green/White	Warning	Output	Normally closed
7	White/Brown	Warning	Output	Normally closed
8	Brown/White	Fault	Output	Normally closed
9	White/Gray	Fault	Output	Normally closed
10	Gray/White	Interconnection +	Input	-
11	Red/Blue	Interconnection -	Input	-
12	Blue/Red	Smoke alarm	Input	Normally closed
13	Red/Orange	Occupied	Input	Normally open
14	Orange/Red	Humidity sensor	Input	Normally open
15	Red/Green	Not connected	-	-
16	Green/Red	Analogue input 2	Input	-
17	Red/Brown	Analogue/Occupied/Humidity	Common	-
18	Brown/Red	Not connected	-	-
19	Red/Gray	RS485A	Output	-
20	Gray/Red	RS485B	Output	-
21	Black/Blue	Not connected	-	-
22	Blue/Black	Not connected	-	-
23	Black/Orange	Not connected	-	-
24	Orange/Black	Not connected	-	-
25	Black/Green	Not connected	-	-

Description of the control board

Introduction

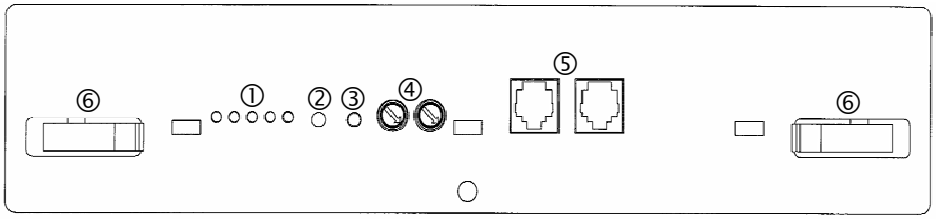
This section gives you a detailed description of the control board and its test function.
Description of how to change settings is to find in section “Users guide”, page 31.

DanCon

All Silencios are provided with a DanCon control board.

Illustration

This drawing illustrates the control board:



Part/function

This table gives you a description of each part on the control board:

Part		Function
①	LED	The LEDs show the status and the alarm Learn more about the status and alarms in the following
	Test	By pressing this button the unit will run through a quick test program. Any detected fail can be read on the fail LED
	Occupied	By pressing this bottom the unit will go into the occupied function. Learn more about the occupied/service function in section “Functional description”, page 17
	Dials	These dials give you the possibility of changing the heater and/or the cooling set points, see more in the section “Set points”, page 20 and in the “Users guide”, page 31
	RS485 communication port	These ports give you the possibility of connecting a pc and/or DanLink telemonitoring program (accessory)
	Locking mechanisms	The locking mechanisms must be released to remove the control panel. Remember to lock the locking mechanisms whenever a control board has been released.

Continued overleaf

Description of the control board, *continued*

Signals of LED

The LED gives you different signals. The below table gives you a description of each signal:

Part	Function	
1 × Green LED	Supply	Lit as soon as the controller is powered up
3 × Yellow LED	Compressor	Lit when the active cooling is operating
	Heat	Lit when the heater is operating
	Link	Lit when (and 10 min. after) valid communication is in progress
1 × Red LED	Fail	Lit in case of a detected failure, see details in section “Fault finding guide”, page 71.

Test description

When activating the test button the unit starts the test program. The unit will run through the different tests according to the below table.

The fail LED will operate normally indicating fail if and when detected.

If any fail is detected during the test, the LED will flash with a frequency of 1 Hz for 30 seconds after the test is done to indicate some fault were detected.

Test points, Silencio 600

Here are the test points for the Silencio 600:

Test point	Description	Heater	Damper	Internal fan	Compressor	Condenser fan	LED	Duration
1	IDLE	Off	Closing	Stopped	Stopped	Stopped	Jingle	30 sec.
2	Heating mode	On	Closing	400 RPM	Stopped	Stopped	Normal	60 sec.
3	Free cooling	Off	Opening	700 RPM	Stopped	450 RPM	Normal	60 sec.
4	Active cool	Off	Closing	700 RPM	Running	700 RPM	Normal	60 sec.
5	IDLE	Off	Closing	Stopped	Stopped	Stopped	Normal	30 sec.

Continued overleaf

Description of the control board, *continued*

Test points, Silencio 800, 1000 and 1400

Here are the test points for the Silencio 800, 1000 and 1400:

Test point	Description	Heater	Damper	Internal fan	Compressor	Condenser fan	LED	Duration
1	IDLE	Off	Closing	Stopped	Stopped	Stopped	Jingle	30 sec.
2	Heating mode	On	Closing	700 RPM	Stopped	Stopped	Normal	90 sec.
3	Free cooling	Off	Opening	1000 RPM	Stopped	1050 RPM	Normal	90 sec.
4	Active cool	Off	Closing	1400 RPM	Running	1400 RPM	Normal	90 sec.
5	IDLE	Off	Closing	Stopped	Stopped	Stopped	Normal	30 sec.

Functional description

Introduction

Silencio operates with 2 systems and in 7 different modes.

The 2 systems, which are described in the following, are:

- Air conditioning system
- Heating system

The 6 modes, which are described in the following, are:

- Active cooling
- Free cooling
- Recycle
- Heat
- Emergency cooling
- Service

Air conditioning system

The purpose of the air conditioning system is to cool the supply air in order to lower the temperature inside the shelter.

The air conditioning system is an on/off system.

The control board is controlling the compressor in accordance with the return temperature.

Heating system

There are two purposes of the heating system:

- Cold start-up conditions
- Cold ambient temperatures

The heating system will be operating when the temperature gets too low in the shelter.

The heat dissipation from the heater is 2000 W depending on the ambient temperatures.

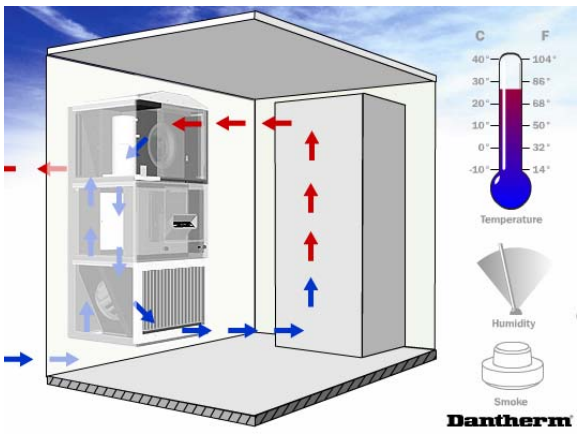
The heater turns of when the return air temperature reaches 15 °C

Active cooling

In active cooling mode the compressor, the internal fan and the external fans are operating in order to circulate refrigerated air into the shelter, and to exhaust the heat drawn from the internal air through the condenser in the external circuit.

The Silencio will switch to active cooling mode when the temperature in the shelter reaches 27 °C*)

*)Set points can be adjusted, see section Set points, page 20



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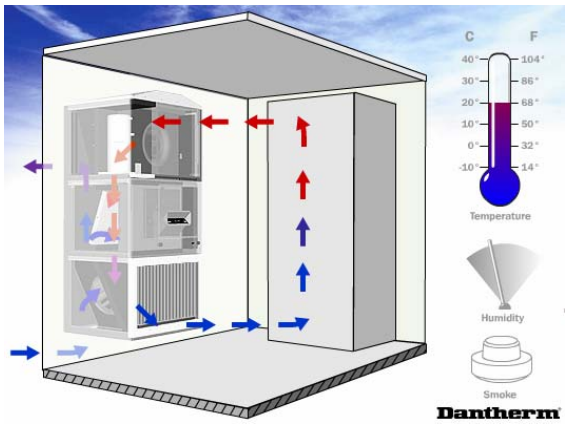
Accessories, *continued*

Free cooling

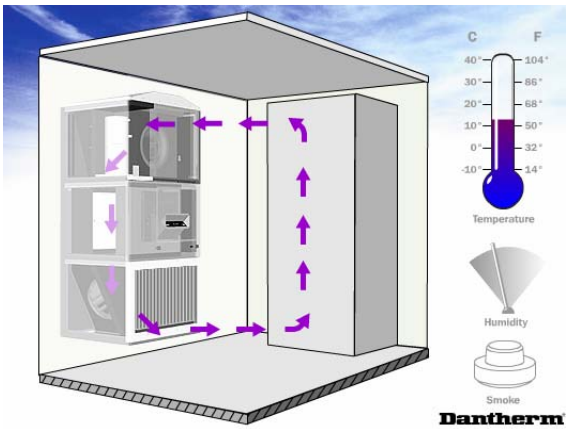
In free cooling mode the damper, the internal fan and the external fans will operate to provide exactly the fresh air amount needed to keep a constant temperature in the shelter/room (3 degrees below the cooling set point).



*Set points can be adjusted, see section Set points, page 20

Recycle

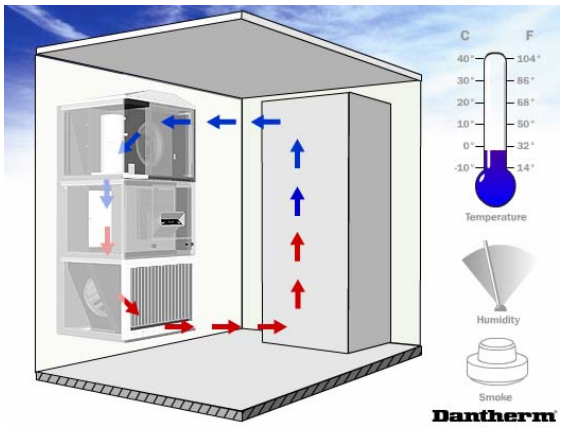
Recycle mode occurs when there is no need for cooling or heating. The only component active will be the internal fan (necessary to prevent local hot spots).



*Set points can be adjusted, see section Set points, page 20

Heat

In heating mode the heating element and the internal fan will operate to keep the shelter/room temperature above the heating set point.



Continued overleaf

Accessories, *continued*

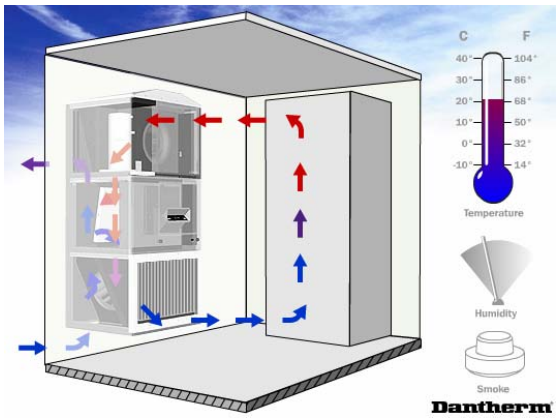
Emergency cooling

Emergency cooling will occur when there is either compressor fault or loss of AC power.

Since active cooling is not possible, the damper will attempt to provide fresh air cooling to keep the return temperature 3 degrees below set point even when it is not possible because of high ambient temperatures.

At compressor fault:
The compressor fault timer must have returned to zero before the emergency cooling situation will end.

At loss of AC mains:
Mains AC power must be back before the emergency cooling situation will end.



Service/occupied mode

The service mode should be activated to make a comfortable climate in the shelter during service.

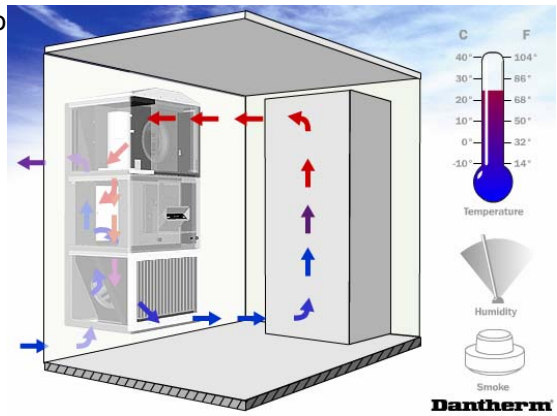
In service mode the unit will switch between active cooling, free cooling, heating and recycling to maintain:

- comfort temperature between 20-25 °C
- low fan speed to reduce sound level and air flow

Service mode is only for use when technicians are working in the shelter.

After one hour in service mode the unit automatically switches back to normal operation.

It is possible to reactivate the button for another period of one hour.



Set points

Introduction

This section gives you information about the set points.

The following topics will be described:

- Factory settings
- How to change set points

General

This section describes how to change set points on a stand alone unit without any of the accessories DanView or DanLink. Changing settings with DanView or DanLink please refer to the manuals for these products.

Factory settings

The factory settings are as follows:

Set point	Factory	Range
Heater	5 °C	0 °C to15 °C
Active cooling	27 °C	20 °C to 40 °C

How to change

Using the dials on the front of the control board you are able to change the above settings.

Limitations

Limitations in set points: Please notice that the minimum difference between cooling and heating set point must be 10 degrees or more to avoid fighting between active cooling and heating.

For further information about the set point settings, please see section “Users guide”, page 31.

Control strategy

Introduction

The control strategy ensures the best mode of operation at all times.

Measurements of ambient, supply, return and condensing temperatures decides the specific settings for fans, damper, heater and compressor.

The control board contains a programmable CPU with adjustable settings according to the exact requirements.

Strategy

The illustration on next page shows the control strategy based on the default settings:

Continued overleaf

Control strategy, *continued*

Strategy, *continued*

Action	Temp. sensor	°C	Up	Down	°C	Temp. sensor	Action
Condenser fan will increase speed by 30 RPM each 30 seconds as long as condenser is 1 or more degrees above 47 °C until maximum 1400 RPM is reached	Condenser	48 °C					
Condenser fan speed constant somewhere between 450 RPM and 1400 RPM	Condenser	47 °C					
Condenser fan will decrease speed by 30 RPM each 1 seconds as long as condenser is 1 or more degrees below 47 °C until minimum 450 RPM is reached	Condenser	46 °C					
Internal fan will increase speed by 50 RPM each 30 seconds as long as return is 1 or more degrees above set point until max 1550 RPM is reached	Return	28 °C					
"Compressor on Damper closes Internal fan will decrease speed with 50 RPM each 30 seconds as long as return is on or below set point"	Return default compressor set point	27 °C					
					26 °C	Return	"Compressor off after 9 minutes if return is 1 or more degrees below set point If after compressor stop and 60 second pause ambient is 2 to 7 degrees below set point the damper will open for 90 seconds to use free cooling instead of active cooling If after compressor stop ambient is 7 to 30 degrees below set point the damper will open for 90 seconds to use free cooling If after compressor stop ambient is 30 or more degrees below set point the damper will open for 45 seconds to use free cooling"
					22 °C	Return	Compressor off unconditionally if return is 5 °C below set point
Internal fan 700-1000 RPM External fans 750-1050 RPM Damper modulating aiming at Return = 24°C	Ambient	-40 °C to 25 °C			6 °C to 26 °C	Return	Internal fan 700-1000 RPM External fans 750-1050 RPM Damper modulating aiming at Return = 24 °C
Heater off	Return	6 °C					
Internal fan 1000 RPM	Return default heater set point	5 °C					

Get ready for use

Overview

Introduction

This section contains information about unwrapping, mounting, installation and starting up of the unit.

Content

This section covers the following topics:

Unwrapping

Introduction

This section will guide you through the unwrapping of the Silencio unit.

Important!

Do not remove the male SUB-D plug on the front of the unit!

Procedure

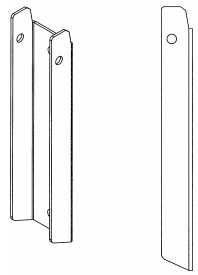
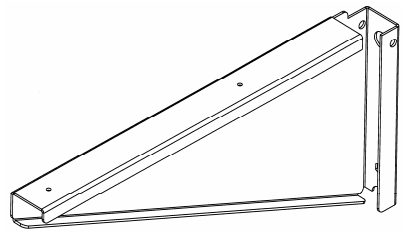
Follow these steps to unwrap the unit:

Step	Action
1	Remove all the cardboard and the plastic bag from the unit and throw it away

Check content

Please check the content when having received and unwrapped the Silencio unit.

The following should be included in a plastic bag on top of the unit under the roof:

2 ×	Wall bracket 
1 × 1 ×	Support bracket, left Support bracket, right 
2 ×	Hex head bolt M8 x 70 mm incl. 4 × Washer M8 For mounting the support brackets on the wall brackets
2 ×	Hex head bolt M8 x 40 mm incl. 2 × Nut M8 For the fine adjustment on the support brackets
7 ×	Hex head bolt M8 x 130 mm incl. 7 Washer M8 and 7 × nut M8 For mounting of the 2 wall brackets and top mounting Note: The bolts are suitable for wall thicknesses up to 100 mm. Please find suitable bolts if wall thickness is more than 100 mm
6 m	Sealing, 10 × 30 mm Norton

Mounting

Introduction

This section will guide you through mounting of the Silencio.

Warning

Silencio is not designed to be transported after it has been mounted on the container, and we strongly recommend not to mount the units until after the containers have been finally placed on site.

If, in spite of these reservations, customers choose to mount the units on the containers before these have been finally placed, Dantherm Air Handling cannot be held responsible for whatever complications might arise.

Before you start

Make sure you have the following available before you start mounting:

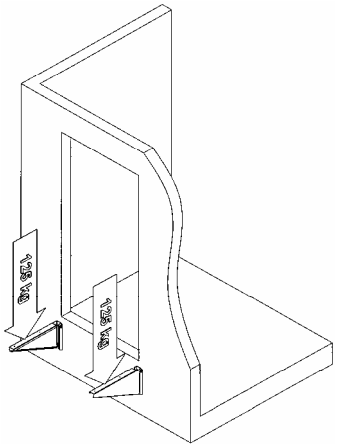
- 13 mm nut driver
- Useful tools to make the slot – dependent on the materials of the wall/shelter

Caution!

You must be certain that the wall of the shelter can carry the weight of the «Produktnavn_fx_VAM40_MK_II» unit. Weight of the «Produktnavn_fx_VAM40_MK_II»: > 250 kg

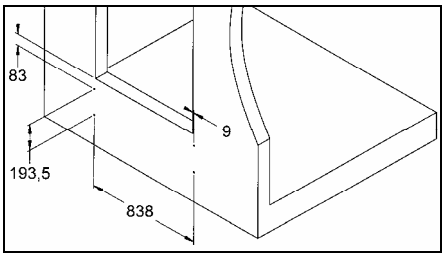
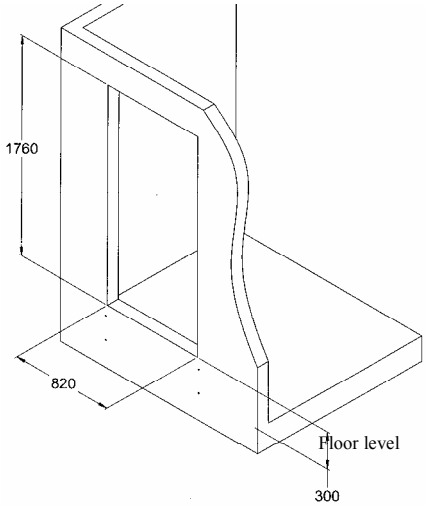
If the wall is not strong enough you must reinforce the wall!

NB: Minimum 300 mm distance between the unit bottom and the ground level, this due to the air intake at the bottom of the unit



Procedure

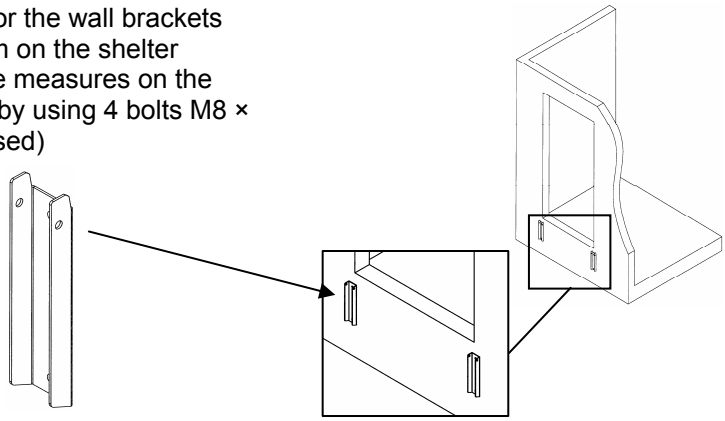
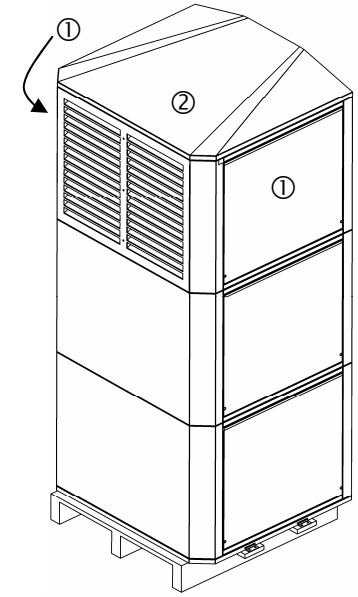
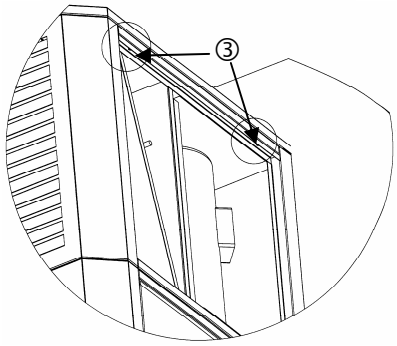
Follow these steps to mount the unit:

Step	Action
1	Mark up on the shelter according to the measures on the drawings: • where to cut the slot, see the picture to the right • where to mount the two wall bracket and , see the below picture 
	

Continued overleaf

Mounting, *continued*

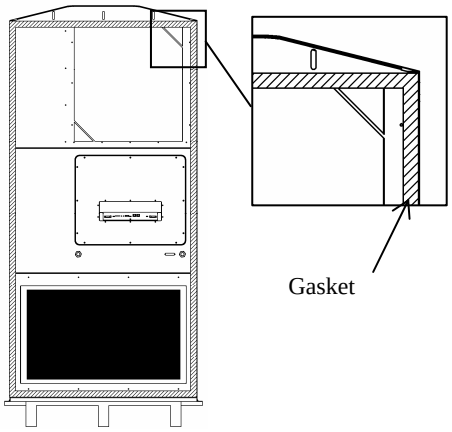
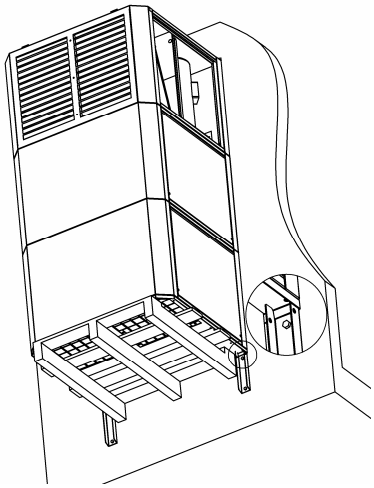
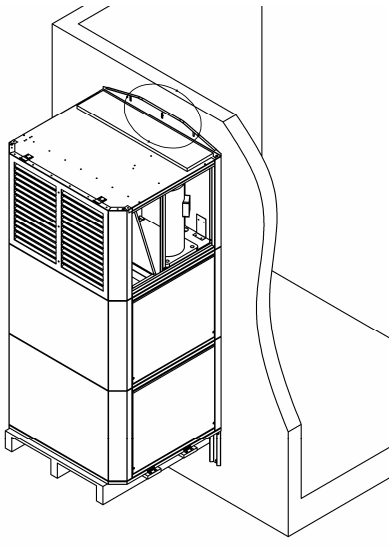
Procedure, ***continued***

Step	Action
2	Cut the slot and throw away the plate that has just been cut out
3	Drill the holes for the wall brackets and mount them on the shelter according to the measures on the drawing above by using 4 bolts M8 × 250 mm (enclosed)  Wall bracket
4	Remove the two upper side covers ① by unscrewing 4 screw on each cover plate
5	Remove the top cover ② by unscrewing 4 screws ③ from the inside of the Silencio Note: A removal of all covers as well as all 3 fans is to be recommended. Please see section “How to replace the internal fan”, page 42 and “How to replace one of the external fans”, page 44 to see the procedures for removal of the other covers and fans
	 

Continued overleaf

Mounting, *continued*

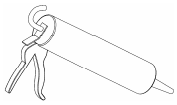
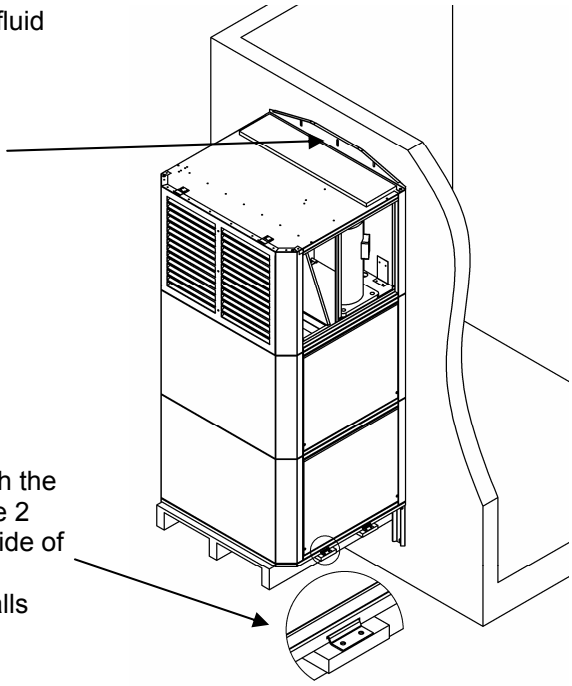
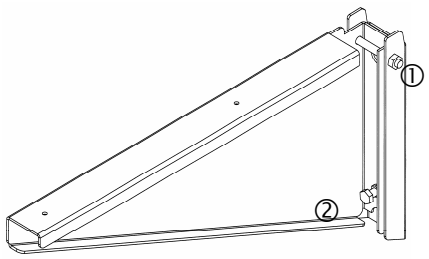
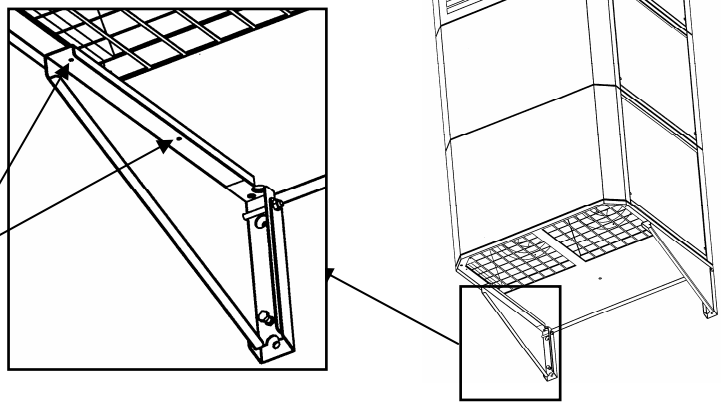
Procedure, continued, ***continued***

Step	Action	
6	Seal the unit on the back with the enclosed gasket to make sure there are no leaks between the shelter and the unit. The sealing must be placed all around at the outside edge of the unit	
7	Lift up the unit and place it very carefully on the two wall brackets and press it against the shelter wall **You must be certain that the wall of the shelter can bear the weight of the** Silencio **unit. Weight of the** Silencio**: > 250 kg If the wall is not strong enough you must reinforce the wall!**	
8	Fasten the unit to the shelter by: • Drilling 3 holes through the bracket and the shelter wall • Put one round head square neck bolt M8 x 130 mm through the drilled holes from the inside and out Note: the enclosed bolts are suitable for wall thicknesses up to 100 mm. For wall thicknesses over 100 mm: Please find suitable bolts • Fasten with 3 × Washer M8 and 3 × nut M8 on the outside	

Continued overleaf

Mounting, *continued*

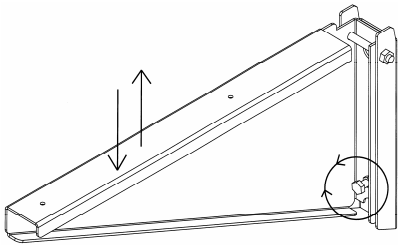
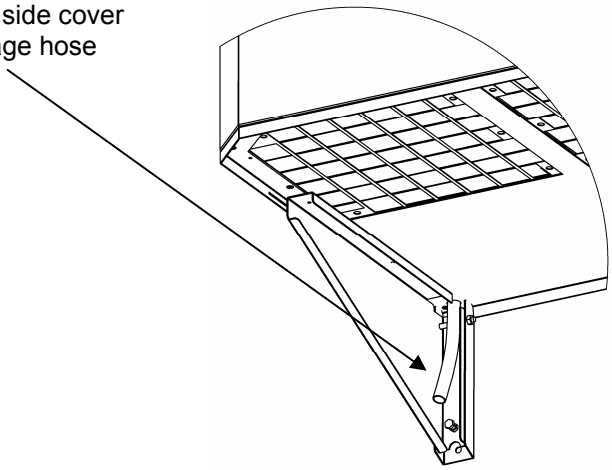
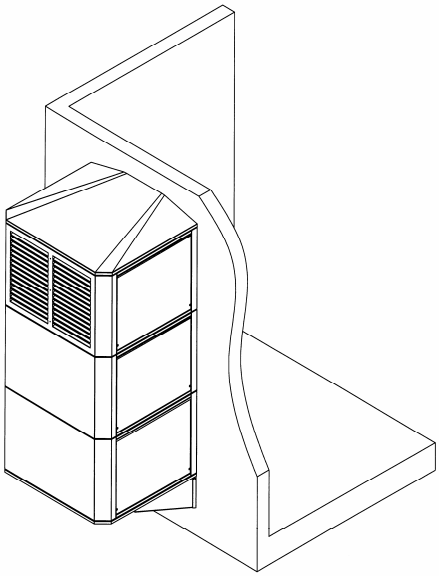
Procedure, continued

Step	Action
9	Seal the top of the unit with fluid sealant   Loosen the pallet underneath the Silencio unit by removing the 2 mounting brackets in each side of the unit. Be careful when the pallet falls down
10	Mount the two support brackets on the wall brackets by tightening the: • upper bolt (enclosed) that goes through both the bracket and the bracket fitting ① • lower bolt (enclosed) ②. This bolt makes it possible to fine adjust the height of the bracket 
11	Tighten (optional) the unit with screws. 2 screws on each support bracket at the bottom  Mounting holes

Continued overleaf

Mounting, *continued*

Procedure, continued

Step	Action
12	Adjust perpendicular position to the unit by using the adjustment screws (enclosed) 
13	Remove the left, lower side cover and lead out the drainage hose 
14	Remount the all the covers  *Mounted* Silencio

Installation and starting

Introduction

This section will guide you through the installation and the starting of the Silencio.

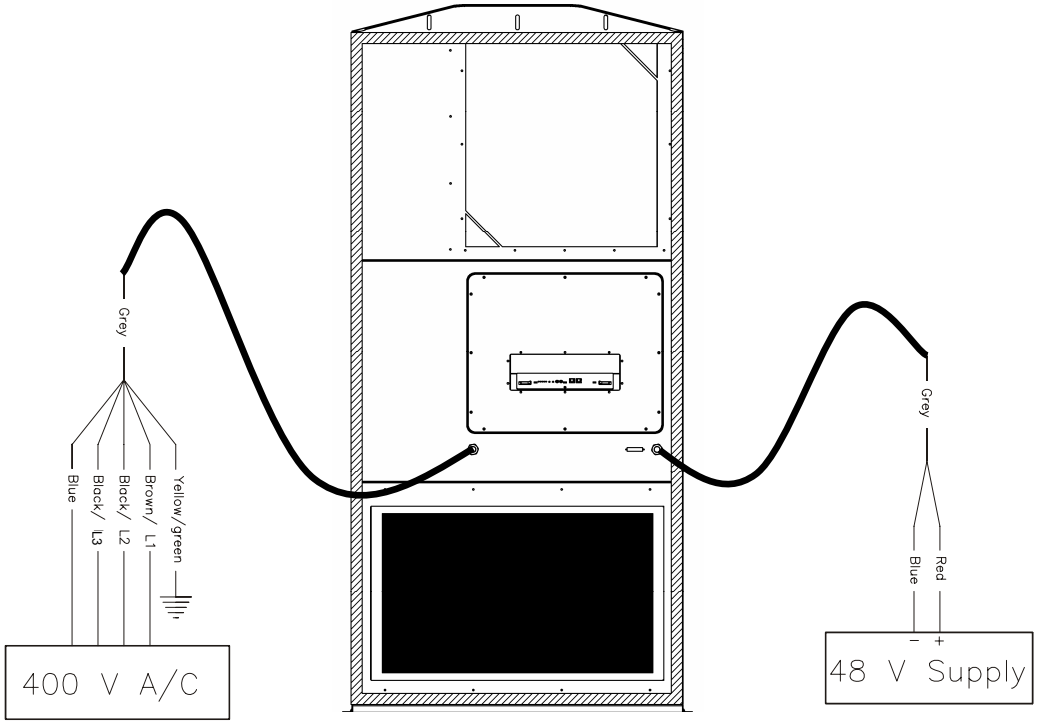
Before you start

Make sure you have the following available before you start the installation:

- Tools for wire connections

Illustration

This drawing shows you the electrical connections:



Procedure

Follow these steps to install the unit:

Step	Action
1	Connect the DC supply according to the above drawing
2	Connect the AC supply according to the above drawing
3	Turn on the power and the unit will start a self-test, and then start performing according to the control strategy

Overview

Introduction

This section only describes how to activate/use the different functions.

Under each of the functions below, you will find relevant references if further information is needed.

Test

You can test all functions in the Silencio by pushing a sharp object against the test button. The unit will then perform a self-test for about 5½ minutes.

See more about the different test points in section “Description of the control board”, page 14.

See more about the test mode in section “Functional description”, page 17.

For fault finding please see section “Fault finding guide”, page 71.

Occupied function

You can force the Silencio in service mode by pushing a sharp object against the occupied button on the control board.

For further description on this mode, please see section “Functional description”, page 17.

Set points

You can with a screwdriver adjust the cooling and heating set points on the dials on the controller.

Limitations in set points: Please notice that the minimum difference between cooling and heating set point must be 10 degrees or more to avoid fighting between active cooling and heating.

For further information about the set points, please see section “Set points”, page 20.

Service guide

Overview

Serial numbers

All requests for information, service or parts should include serial number.

Product model and serial numbers are available from the nameplate, which is located next to the control board.

Dantherm Air Handling model number:

- Silencio, 600 kW 365006
- Silencio, 800 kW 365008
- Silencio, 1000 kW 365010
- Silencio, 1400 kW 365014

Contents

This section covers the following topics:

Preventive maintenance

Introduction

The units need preventive maintenance with specific intervals to avoid breakdown or inefficient operation. It is important to notice that interval between maintenance can vary depending on the specific environment.

Caution

Switch of both the DC and AC supply before working on the unit!

Make sure that all work has been performed before switching on the power again.

Tools

When performing the preventive maintenance:

use a …	to …
vacuum cleaner or compressed air	carefully clean the unit
soft bristle brush	remove dirt that the vacuum cleaner or the compressed air could not remove
screwdriver or torx	tighten loose screws to get into the unit

Interval

Dantherm Air Handling recommend that intervals between preventive maintenance do not exceed 6 months. It is also our recommendation that the site and unit is examined closely during the first preventive maintenance to determine whether the interval is too long. We recommend that preventive maintenance visits are planned to occur before and after the hot seasons. This will ensure best performance during both hot and cold seasons.

Condition for warranty

The factory warranty is only valid if documented preventive maintenance has been carried out with an interval of maximum 6 months. The documentation could be in form of a written log.

Leaving the site

Before leaving the site, make sure there are no alarms!

Continued overleaf

Preventive maintenance, *continued*

Recommended approach

The recommended approach when performing a preventive maintenance visit is:

Step	Action
1	Make sure that the power to the unit is safely switched of
2	Clean the unit carefully: • Air ducts • Fans • Filters • Condenser • Evaporator
3	Perform the tasks using the checklist below
4	Switch on the power again
5	Connect the power Result: The test program runs through all functions. Check that the unit does not come out with an alarm signal. In case of an alarm signal, please see section “Fault finding guide”, page 71

Tasks

The following must be checked when performing the preventive maintenance visit:

Item	Yes	No
Are the fans and the compressor clean and free of corrosion?	☐	☐
Is the fan and compressor mounted securely and free of excessive vibration?	☐	☐
Is the compressor free of excessive noise?	☐	☐
Are the coolant pipes free of obstructions, damage, corrosion and show no obvious signs of leakage?	☐	☐
Are the lamellas on the condenser and the evaporator clean and damage free?	☐	☐
Are all fan blades free of obstruction, cracks, missing blades and in balance?	☐	☐
Do the fans rotate freely and are they free from excessive vibration or noise?	☐	☐
Is all wiring and insulation free of damage?	☐	☐
Are all connectors sealed properly and in good condition?	☐	☐

Accessories

Introduction

This section will give you an overview of the available accessories for Silencio. You will find a list of accessories as well as a short description including part number for ordering.

Additional information is available on each accessory, please contact Dantherm Air Handling A/S.

List

Here is the complete list with drawing, description and part number for all available accessories for Silencio:

Accessory	Illustration	Description	Part no.
Alarm Cable		Male SUB-D 25W connector and 25 free wires supplied with terminal ends. Wire No. 5 and wire No. 12 are connected to each other through a terminal block. See more about the SUB-D-signals in section “Description of parts”, page 11	016356
		Two male SUB-D 25W connector mounted. See more about the SUB-D-signals in section “Description of parts”, page 11	016359
		One male SUB-D 25W connector mounted and a connection box with 23 terminals block. See more about the SUB-D-signals in section “Description of parts”, page 11	016360
Filter guard		Comprises a pressure switch control gauging the air pressure before and after the filter. When the filter gets dirty, the pressure difference will go above the switch setting and activate the alarm lamp on “warning” level. This is to indicate that if not replaced the filter will clog with reduced cooling capacity as a result.	20-200: 013038 50-500: 014568

Continued overleaf

Preventive maintenance, *continued*

Tasks, ***continued***

Accessory	Illustration	Description	Part no.
Hot spot sensor		This is an extra temperature sensor to be placed in the critical spot of the shelter. The operation of the climate unit will then be controlled in accordance with the highest value of either the return air or hot spot sensor.	016364
		Same as the above, inclusive SUB-D connector	016363
Smoke alarm cable		Smoke alarm with two terminal ends for the smoke alarm connected together with a terminal block to establish a normally closed setting for this function. The other end of the cable has a male DUB-D 25W connector mounted.	017275
Smoke alarm cable with hot spot sensor		Hot spot senor and 2 free smoke alarm wires supplied with terminal ends, 10 m. The two terminal ends for the smoke alarm are connected together with a terminal block to establish a normally closed setting for this function. The other end of the cable has a male SUB-D 25W connector mounted.	016895
Smoke detector		The smoke alarm will detect any small amount of smoke in the enclosure air. In case of a smoke alarm the climate unit will close the damper (if fitted) and stop the unit, so that a fire will not be feed by more fresh air.	016362
Humidity controller		Hygrostat with adjustable setting of the maximum allowed % RH to override the free cooling and close the damper.	016361

Continued overleaf

Preventive maintenance, *continued*

List, ***continued***

Accessory	Illustration	Description	Part no.
Interconnection cable		Interconnection cable, 10 m, with two male SUB-D 25W connector mounted for multiple units. When a compressor-cooling request is detected. It will be signaled through the interconnection cable, and one randomly selected unit will start active cooling.	016394
Occupied switch		Remote possibility to enable an activation of the occupied mode, which allows better comfort conditions for personnel.	015779
DanCon test kit		A pc can be connected to the unit to achieve serial communication. The communication takes place through an interface box connected via a cable to the unit RS 485 out.	019203
DanLink		DanLink is a telemonitoring system designed for remote surveillance and change of set points.	Hardware: AC: 012580 DC: 012581 Software: 017499
DanView		The DanView is a display unit for monitoring relevant parameters in connection with the Dantherm Air Handling standard shelter cooling units.	012958

Spare parts

Overview

Introduction

This section gives you a list of all available spare parts and under which number, they should be ordered.

Furthermore the section contains an instruction in replacing the spare part.

Contents

This section contains the following topics:

Spare parts list

List

Here you have the complete list of spare parts with part numbers:

Spare part	Model	Part number
VDI filter	all	296074
Internal fan	all	296076
External fan	all	296077
Control board	all	296084
Recycle timer	all	296093
Dry filter	all	296080
Compressor	600/800 – 1000 – 1400	296079 – 296097 - 296098
Damper motor	all	296020
PPI filter	all	296075
Heater element	all	296083
High pressure sensitive switch	all	296081
Temperature sensor	all	296092
Compressor contactor	all	296055
Heater contactor	all	296055
EPROM	600 – 800/1000/1400	296060 - 296078
Protective motor switch	all	296094
Receiver	all	290026
Low pressure sensitive switch	all	296082
Thermostat for the heating element	all	296096
Expansion valve	600/800 – 1000 – 1400	296086 – 296085 – 296087
Condenser	600/800/1000 – 1400	296088 – 296089
Evaporator	600/800/1000 – 1400	296090 – 296091
Wire set	all	296095

How to replace the VDI filter

Product description

The VDI filter ensures that dirt from the ambient air is not let through to the electronic equipment.

When to replace

The filter only needs to be replaced when it is faulty, very filthy or as a part of the preventive maintenance. Dantherm Air Handling A/S recommends a replacement of the VDI filter in a maximum interval of 6 months.

Part number

The filter can be ordered under part number 296074.

Tools

Make sure you have the following tools available before you start:

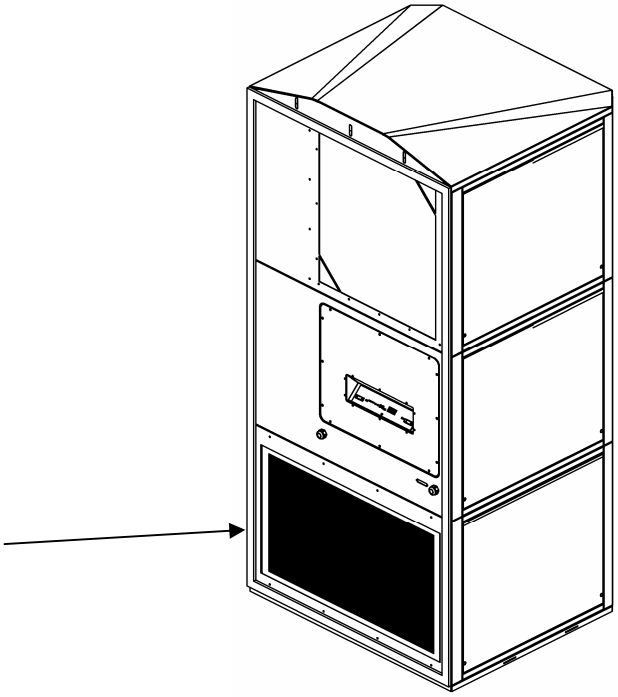
- Torx 25 screw driver – for replacement from the external side

Caution!

- Only trained and certified technicians are allowed to replace parts
- Switch of both the DC and AC supply before working on the unit
- Make sure that all work has been performed before switching on the power again

Illustration

This drawing illustrates the filter and where the filter is placed in the unit.



Continued overleaf

How to replace the VDI filter, *continued*

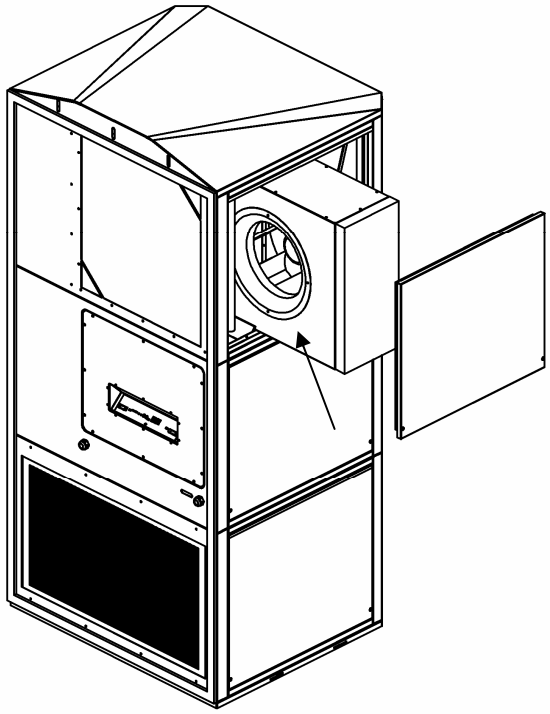
Procedure, internal side

Follow these steps to replace the filter:

Step	Action
1	Switch of all the power to the unit
2	Grip carefully the lamellas with both hands from the inside, (or from the outside after having removed one of the lower side covers – unscrew the two torx 25 screws) and lift up the filter
3	Lead in the filter to the shelter by drawing (or from the outside: pushing) it in first at the bottom, thereafter the whole filter When working from the external side you must now slope the filter and lead it out through the openings
4	Place the new VDI filter by placing the top of the filter in the upper slide bar NB: The VDI filter cannot turn wrong
5	Place the bottom of the VDI filter in the lower slide bar
6	Connect the power Result: The test program runs through all functions. Check that the unit does not come out with an alarm signal. In case of an alarm signal, please see section “Fault finding guide”, page 71

How to replace the internal fan

Product description	The internal fan circulates the indoor air.
When to replace	The internal fan only needs to be replaced when it is faulty or as a part of a long time replacement plan, e.g. after approximately 5 years.
Part number	The internal fan can be ordered under part number 296076.
Tools	Make sure you have the following tools available before you start: • Torx 25 screw driver
Caution!	• Only trained and certified technicians are allowed to replace parts • Switch of both the DC and AC supply before working on the unit • Make sure that all work has been performed before switching on the power again
Illustration	This drawing illustrates the internal fan and where the fan is placed in the unit:



Continued overleaf

How to replace the internal fan, *continued*

Procedure

Follow these steps to replace the internal fan:

Step	Action
1	Switch of all the power to the unit
2	Remove the upper left side cover by unscrewing the two torx 25 screws that hold it in place
3	Disconnect the white 4-poled AMP-plug with a small tug
4	Pull out the defect internal fan box
5	Push in the new internal fan box and connect the 4-poled AMP plug
6	Remount the side cover
7	Connect the power Result: The test program runs through all functions. Check that the unit does not come out with an alarm signal. In case of an alarm signal, please see section “Fault finding guide”, page 71

How to replace one of the external fans

Product description

The external fans remove surplus heat from the condenser when the active cooling mode is active.

When to replace

The external fans only need to be replaced when they are faulty or as a part of a long time replacement plan, e.g. after approximately 5 years.

Part number

The external fans can be ordered under part number 296077.

When ordering 1 × 296077 you receive one external fan box.

Tools

Make sure you have the following tools available before you start:

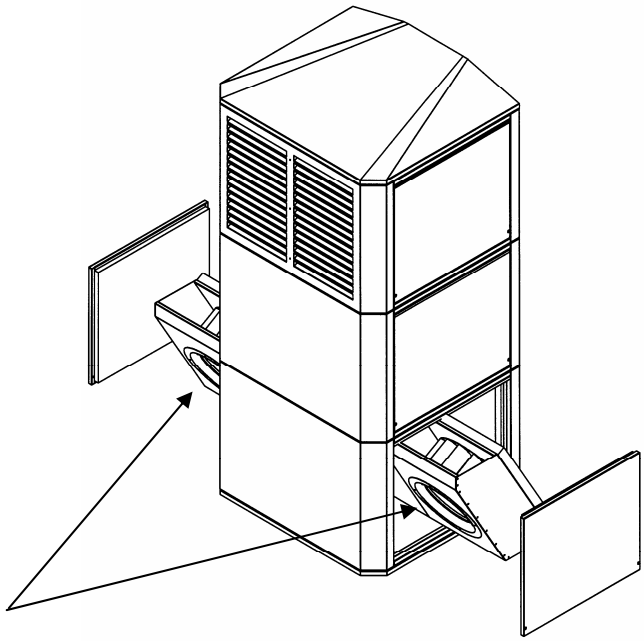
- Torx 25 screwdriver

Caution!

- Only trained and certified technicians are allowed to replace parts
- Switch of both the DC and AC supply before working on the unit
- Make sure that all work has been performed before switching on the power again

Illustration

This drawing illustrates the external fans and where the fans are placed in the unit.



Continued overleaf

How to replace one of the external fans, *continued*

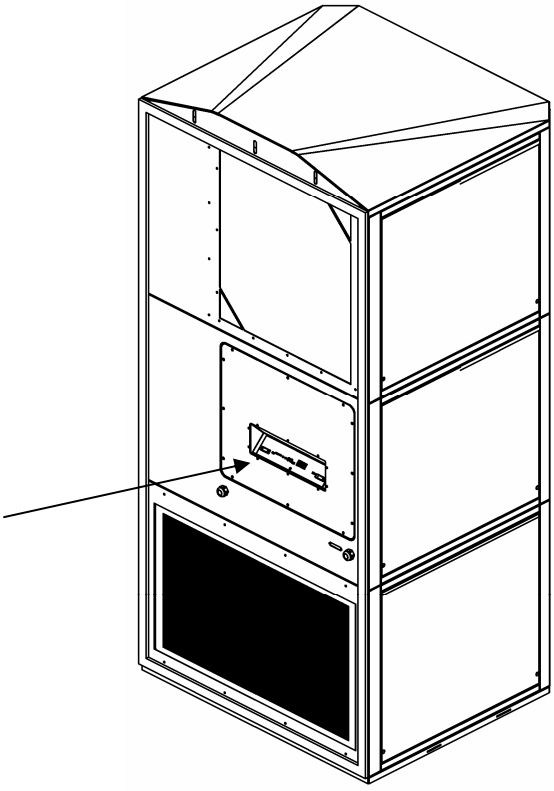
Procedure

Follow these steps to replace the external fan:

Step	Action
1	Switch of all the power to the unit
2	Remove the lower left and/or right side cover by unscrewing the two torx 25 screws that hold it/them in place
3	Disconnect the white 4-poled AMP plug with a small tug
4	Pull out the defect external fan box
5	Push in the new external fan box and connect the 4-poled AMP plug
6	Remount the side cover(s)
7	Connect the power Result: The test program runs through all functions. Check that the unit does not come out with an alarm signal. In case of an alarm signal, please see section “Fault finding guide”, page 71

How to replace the control board

Product description	The control board controls the Silencio based on inputs from the different sensors.
When to replace	The control board only needs to be replaced when it is faulty.
Part number	The control board can be ordered under part number 296084.
Tools	Make sure you have the following tools available before you start: • Cross-point screwdriver • EPROM-tong
Caution!	• Only trained and certified technicians are allowed to replace parts • Switch of both the DC and AC supply before working on the unit • Make sure that all work has been performed before switching on the power again
Illustration	This drawing illustrates the control board and where it is placed in the unit.



Continued overleaf

How to replace the control board, *continued*

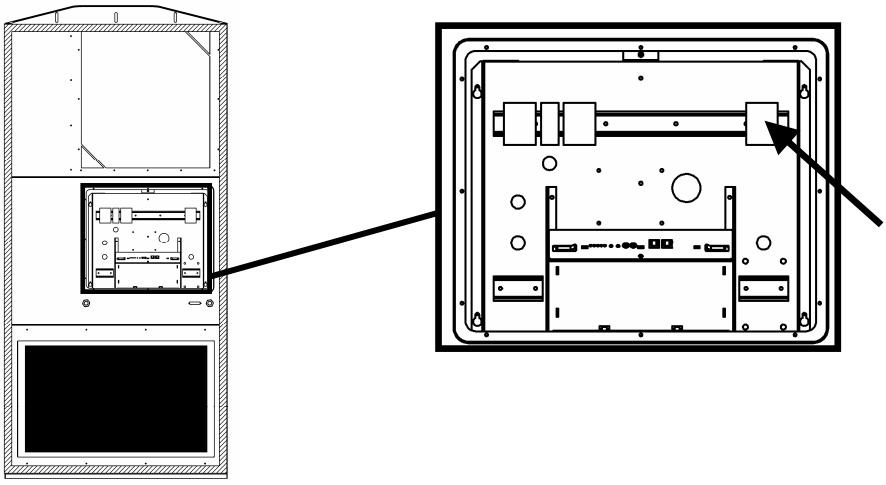
Procedure

Follow these steps to replace the control board:

Step	Action
1	Switch of all the power to the unit
2	Release the control board by unscrewing the screw that hold it in place
3	Release the two locking mechanisms in each side of the control board and carefully pull up the control board
4	Place the control board on an even surface and remove the EPROM with a EPROM tong NB: The EPROM should not be touched, use a tong
5	Mount the EPROM on the new control board. Note the small notch in the one end of the EPROM. This notch must be situated just opposite the equivalent notch in the EPROM-holder on the print
6	Push the control board in place in the holder on the Silencio and lock the two locking mechanisms in each side of the control board.
7	Tighten the control board with the screw
8	Connect the power Result: The test program runs through all functions. Check that the unit does not come out with an alarm signal. In case of an alarm signal, please see section “Fault finding guide”, page 71

How to replace the recycle timer for the external fans

Product description	The recycle timer fault monitors the two external fans.
When to replace	The timer only needs to be replaced when it is faulty.
Part number	The timer can be ordered under part number 296093.
Tools	Make sure you have the following tools available before you start: • Torx 25 screw driver
Caution!	• Only trained and certified technicians are allowed to replace parts. • Switch of both the DC and AC supply before working on the unit. • Make sure that all work has been performed before switching on the power again.
Illustration	This drawing illustrates the recycle timer and where it is placed in the unit.



Continued overleaf

How to replace the recycle timer for the external fans, *continued*

Procedure

Follow these steps to replace the recycle timer:

Step	Action
1	Switch of all the power to the unit
2	Release the control board by unscrewing the screw that hold it in place
3	Release the two locking mechanisms in each side of the control board and carefully pull up the control board
4	Remove the internal front cover at the control board by unscrewing the 12 torx 25 screws
5	Remove the recycle timer by carefully working it loose
6	Mount the new recycle timer
7	Remount the front cover
8	Place the control board in the holder by pushing the control board in place in the holder on the Silencio and lock the two locking mechanisms in each side of the control board, and finally tighten the screw that holds it in place
9	Connect the power Result: The test program runs through all functions. Check that the unit does not come out with an alarm signal. In case of an alarm signal, please see section “Fault finding guide”, page 71

How to replace the damper motor

Introduction

The damper motor opens and closes the damper as determined by the control board.

When to replace

The damper motor only needs to be replaced when it is faulty.

Part number

The damper motor can be ordered under part number 296020.

Tools

Make sure you have the following tools available before you start:

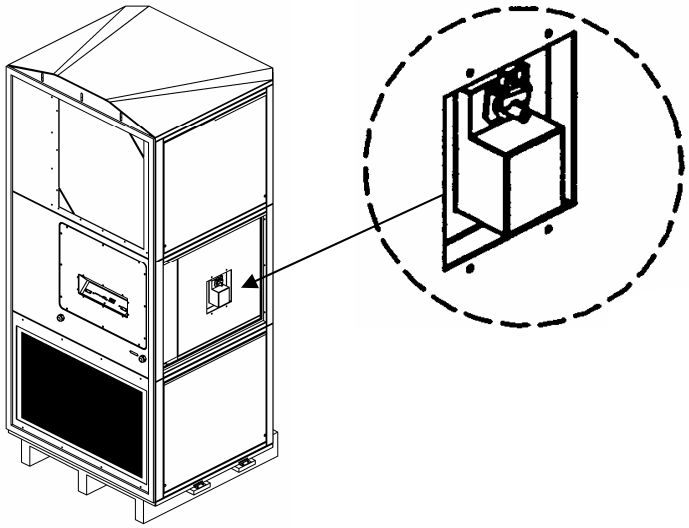
- Torx 25 screw driver
- M8 mm open-ended spanner

Caution!

- Only trained and certified technicians are allowed to replace parts.
- Switch of both the DC and AC supply before working on the unit.
- Make sure that all work has been performed before switching on the power again.

Illustration

This drawing illustrates the damper motor and where it is placed in the unit.



Continued overleaf

How to replace the damper motor, *continued*

Procedure

Follow these steps to replace the damper motor:

Step	Action
1	Switch of all the power to the unit
2	Remove the middle left side cover by unscrewing the two torx 25 screws that hold it in place
3	Disconnect the white 3-poled AMP-plug with a small tug
4	Remove all cable binders
5	Loosen the 2 nuts (do not unscrew them) and take of the damper motor
6	Adjust the two stops on the new damper motor, so they are placed exactly as the stops one the defect damper motor, which you have just removed.
7	Mount the new damper motor so it fits in the fittings
8	Remove the upper left side cover and adjust the damper in vertical position
9	Push the clamp on the damper motor towards the right stop on the damper motor NB: Check that the damper is still in vertical position
10	Tighten the two M8 nuts and connect the 3-poled AMP-plug
11	Remount the two side covers
12	Connect the power Result: The test program runs through all functions. Check that the unit does not come out with an alarm signal. In case of an alarm signal, please see section “Fault finding guide”, page 71

How to replace the PPI filter

Introduction

The PPI filters prevent dirt, dust from the ambient air entering the Silencio, and thereby prevent it entering the shelter/cabinet.

When to replace

The PPI filters only need to be replaced when they are faulty or as a part of the preventive maintenance. Dantherm Air Handling A/S recommends a replacement of the PPI filters in a maximum interval of 6 months.

Part number

The PPI filters can be ordered under part number 018925.

Tools

Make sure you have the following tools available before you start:

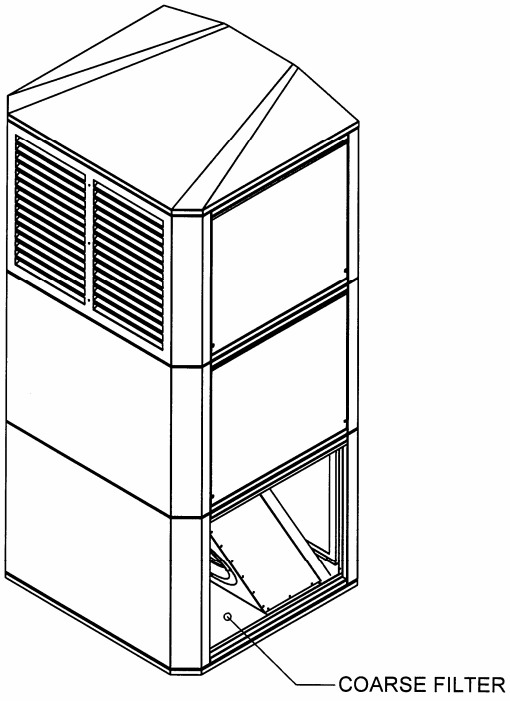
- Torx 25 screw driver

Caution!

- Only trained and certified technicians are allowed to replace parts
- Switch of both the DC and AC supply before working on the unit
- Make sure that all work has been performed before switching on the power again

Illustration

This drawing illustrates the PPI filters and where they are placed in the unit:



Continued overleaf

How to replace the PPI filter, *continued*

Procedure

Follow these steps to replace the PPI filters:

Step	Action
1	Switch off all the power to the unit
2	Remove both lower side cover by unscrewing the two torx 25 screws that hold them in place
3	Remove the filter net in both sides of the unit
4	Replace the PPI filters in both sides of the unit
5	Remount the filter net
6	Remount the side covers
7	Connect the power Result: The test program runs through all functions. Check that the unit does not come out with an alarm signal. In case of an alarm signal, please see section “Fault finding guide”, page 71

How to replace the heater element

Introduction

The heater element keeps the internal temperature at an adequate level at low ambient temperature.

When to replace

The heater element only needs to be replaced when it is faulty.

Part number

The heater element can be ordered under part number 296083.

Tools

Make sure you have the following tools available before you start:

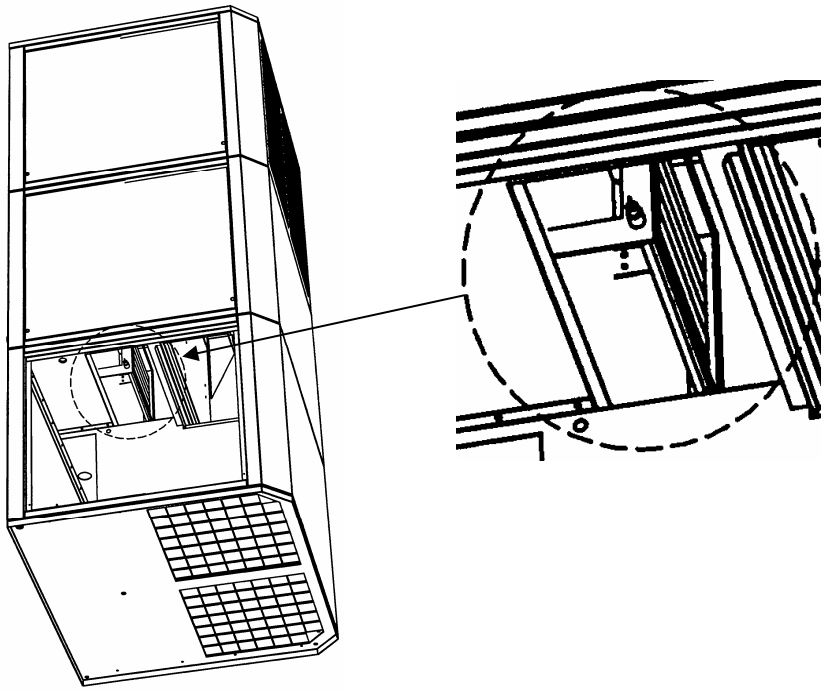
- Torx 25 screw driver
- 19 mm spanner

Caution!

- Only trained and certified technicians are allowed to replace parts
- Switch of both the DC and AC supply before working on the unit
- Make sure that all work has been performed before switching on the power again

Illustration

This drawing illustrates the heater element and where it is placed in the unit.



Continued overleaf

How to replace the heater element, *continued*

Procedure

Follow these steps to replace the heater element:

Step	Action
1	Switch of all the power to the unit
2	Remove the lower right side cover by unscrewing the two torx 25 screws that hold it in place
3	Remove if necessary the fan box by disconnecting its plug and pulling it carefully out
4	Dismount the 2 cable logs on the heating element by pulling them carefully of
5	Unscrew the two M19 nuts
6	Pull out the heating element by leading it backwards and to the left side to get them free of the Silencio
7	Mount the new heating element Make sure that the two enclosed fiber washer are in place. The must be placed between the heating element and the holder
8	Remount the side cover
9	Connect the power Result: The test program runs through all functions. Check that the unit does not come out with an alarm signal. In case of an alarm signal, please see section “Fault finding guide”, page 71

How to replace the temperature sensors

Product description

The temperature sensors measure the temperature in different places and thereafter send these measurements to the control board.

When to replace

The temperature sensors only need to be replaced when they are faulty.

Part number

The temperature sensors can be ordered under part number 296092.

When ordering no. 296092 you receive one temperature sensor.

Tools

Make sure you have the following tools available before you start:

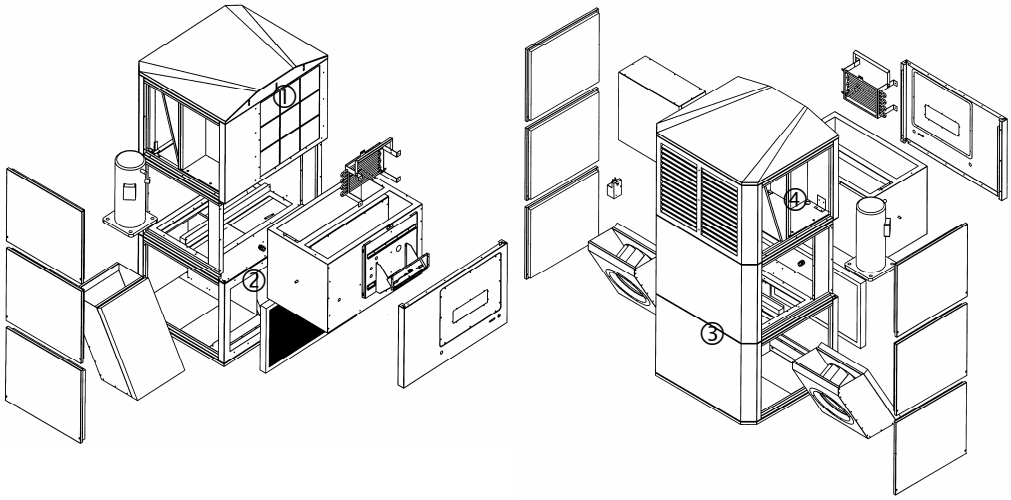
- Torx 25 screwdriver
- Adhesive tape or the like

Caution!

- Only trained and certified technicians are allowed to replace parts
- Switch of both the DC and AC supply before working on the unit
- Make sure that all work has been performed before switching on the power again

Illustration

This drawing illustrates where the temperature sensors are placed in the unit.



① Return sensor
② Supply sensor
③ Ambient sensor
④ Condenser sensor

Continued overleaf

How to replace the temperature sensors, *continued*

Procedure, return sensor

Follow these steps to replace the return temperature sensor:

Step	Action
1	Switch of all the power to the unit
2	Release the control board by unscrewing the screw that hold it in place
3	Release the two locking mechanisms in each side of the control board and carefully pull up the control board
4	Remove the internal front cover at the control board by unscrewing the 12 torx 25 screws
5	Remove the upper left side cover by unscrewing the two torx 25 screws that hold it in place
6	Remove all cable binders on the faulty sensor
7	Join the sensor head on the faulty sensor with the wires from the new sensor with adhesive tape or the like
8	Release the wires in terminal 7 and 8 in module X17
9	Draw carefully from inside and thereby lead the wires in place
10	Connect the wires from the new sensor in terminal 7 and 8 in module X17
11	Remount the front and side covers
12	Place the control board in the holder by pushing the control board in place. Lock the two locking mechanisms in each side of the control board, and finally tighten the screw that holds it in place
13	Connect the power Result: The test program runs through all functions. Check that the unit does not come out with an alarm signal. In case of an alarm signal, please see section “Fault finding guide”, page 71

Procedure, supply sensor

Follow these steps to replace the supply temperature sensor:

Step	Action
1	Switch of all the power to the unit
2	Release the control board by unscrewing the screw that hold it in place
3	Release the two locking mechanisms in each side of the control board and carefully pull up the control board
4	Remove the internal front cover at the control board by unscrewing the 12 torx 25 screws
5	Remove the VDI filter from internal side by gripping the lamellas carefully with both hands from the inside, (or from the outside after having removed one of the lower side covers – unscrew the two torx 25 screws) and lift up the filter
6	Remove all cable binders on the faulty sensor

Continued overleaf

How to replace the temperature sensors, *continued*

Procedure, supply sensor, ***continued***

Step	Action
7	Join the sensor head on the faulty sensor with the wires from the new sensor with adhesive tape or the like
8	Release the wires from the faulty sensor in terminal 5 and 6 in module X17
9	Draw carefully from inside and thereby lead the wires in place
10	Connect the wires from the new sensor in terminal 5 and 6 in module X17
11	Lead in the filter to the shelter by drawing (or from the outside: pushing) it in first at the bottom, thereafter the whole filter When working from the external side you must now slope the filter and lead it out through the openings
12	Remount the front and side covers
13	Place the control board in the holder by pushing the control board in place in the holder on the Silencio and lock the two locking mechanisms in each side of the control board, and finally tighten the screw that holds it in place
14	Connect the power Result: The test program runs through all functions. Check that the unit does not come out with an alarm signal. In case of an alarm signal, please see section “Fault finding guide”, page 71

Procedure, ambient sensor

Follow these steps to replace the ambient temperature sensor:

Step	Action
1	Switch of all the power to the unit
2	Release the control board by unscrewing the screw that hold it in place
3	Release the two locking mechanisms in each side of the control board and carefully pull up the control board
4	Remove the internal front cover at the control board by unscrewing the 12 torx 25 screws
5	Remove the lower left side cover by unscrewing the two torx 25 screws that hold it/them in place
6	Remove all cable binders on the faulty sensor
7	Join the sensor head on the faulty sensor with the wires from the new sensor with adhesive tape or the like
8	Release the wires from the faulty sensor in terminal 1 and 2 in module X17
9	Draw carefully from inside and thereby lead the wires in place
10	Connect the wires from the new sensor in terminal 1 and 2 in module X17
11	Remount the front and side covers

Continued overleaf

How to replace the temperature sensors, *continued*

Procedure, ambient sensor, ***continued***

Step	Action
12	Place the control board in the holder by pushing the control board in place in the holder on the Silencio and lock the two locking mechanisms in each side of the control board, and finally tighten the screw that holds it in place
13	Connect the power Result: The test program runs through all functions. Check that the unit does not come out with an alarm signal. In case of an alarm signal, please see section “Fault finding guide”, page 71

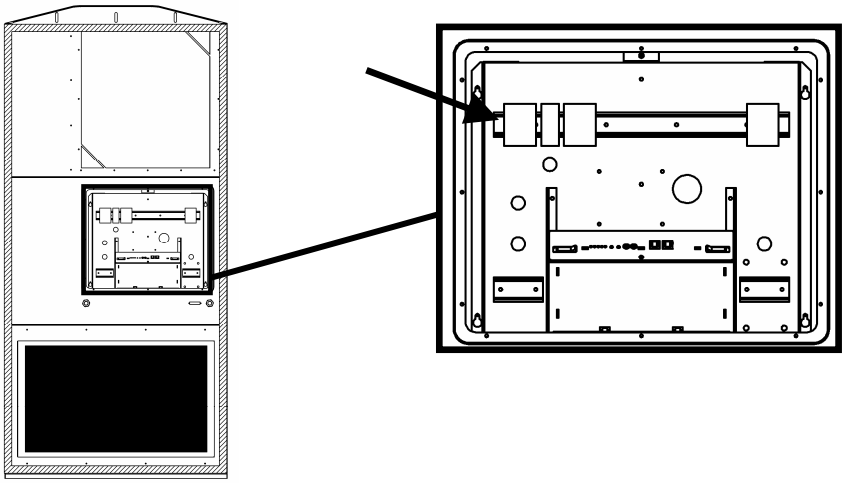
Procedure, condenser sensor

Follow these steps to replace the condenser temperature sensor:

Step	Action
1	Switch of all the power to the unit
2	Release the control board by unscrewing the screw that hold it in place
3	Release the two locking mechanisms in each side of the control board and carefully pull up the control board
4	Remove the internal front cover at the control board by unscrewing the 12 torx 25 screws
5	Remove both upper side covers by unscrewing the two torx 25 screws that hold them in place
6	Remove the lagging and all cable binders on the faulty sensor
7	Join the sensor head on the faulty sensor with the wires from the new sensor with adhesive tape or the like
8	Mount the new sensor on the pipe. Be careful about the lagging around the sensor
9	Release the wires from the faulty sensor in terminal 3 and 4 in module X17
10	Draw carefully from inside and thereby lead the wires in place
11	Connect the wires from the new sensor in terminal 3 and 4 in module X17
12	Remount the front and side covers
13	Place the control board in the holder by pushing the control board in place in the holder on the Silencio and lock the two locking mechanisms in each side of the control board, and finally tighten the screw that holds it in place
14	Connect the power Result: The test program runs through all functions. Check that the unit does not come out with an alarm signal. In case of an alarm signal, please see section “Fault finding guide”, page 71

How to replace the compressor contactor

Product description	The compressor contactor supplies power to the compressor, so the compressor can run.
When to replace	The compressor contactor only needs to be replaced when it is faulty.
Part number	The compressor contactor can be ordered under part number 296055.
Tools	Make sure you have the following tools available before you start: • Torx 25 screwdriver
Caution!	• Only trained and certified technicians are allowed to replace parts. • Switch of both the DC and AC supply before working on the unit. • Make sure that all work has been performed before switching on the power again.
Illustration	This drawing illustrates the compressor contactor and where it is placed in the unit:



Continued overleaf

How to replace the compressor contactor, *continued*

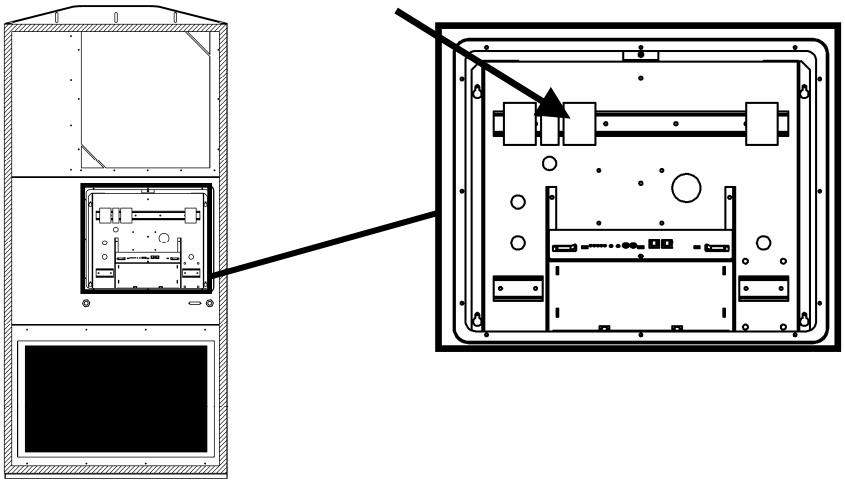
Procedure

Follow these steps to replace the compressor contactor:

Step	Action
1	Switch of all the power to the unit
2	Remove the internal front cover at the control board by unscrewing the 12 torx 25 screws
3	Loosen the 5 lower screws on the contactor
4	Release the 4 wires
5	Place the screwdriver in the hole to the left at the bottom and press down and pull obliquely upwards
6	Hitch on the new contactor – first at the top and push slight at the bottom until it clicks in place
7	Reconnect the 4 wires (see numbers on the wires and the contactor)
8	Tighten all screws
9	Remount the front cover
10	Connect the power Result: The test program runs through all functions. Check that the unit does not come out with an alarm signal. In case of an alarm signal, please see section “Fault finding guide”, page 71

How to replace the heater contactor

Product description	The compressor contactor supplies power to the compressor, so the compressor can run.
When to replace	The compressor contactor only needs to be replaced when it is faulty.
Part number	The compressor contactor can be ordered under part number 296055.
Tools	Make sure you have the following tools available before you start: • Torx 25 screwdriver
Caution!	• Only trained and certified technicians are allowed to replace parts. • Switch of both the DC and AC supply before working on the unit. • Make sure that all work has been performed before switching on the power again.
Illustration	This drawing illustrates the compressor contactor and where it is placed in the unit:



Continued overleaf

How to replace the heater contactor, *continued*

Procedure

Follow these steps to replace the compressor contactor:

Step	Action
1	Switch of all the power to the unit
2	Remove the internal front cover at the control board by unscrewing the 12 torx 25 screws
3	Loosen the 5 lower screws on the contactor
4	Release the 4 wires
5	Place the screwdriver in the hole to the left at the bottom and press down and pull obliquely upwards
6	Hitch on the new contactor – first at the top and push slight at the bottom until it clicks in place
7	Reconnect the 4 wires (see numbers on the wires and the contactor)
8	Tighten all screws
9	Remount the front cover
10	Connect the power Result: The test program runs through all functions. Check that the unit does not come out with an alarm signal. In case of an alarm signal, please see section “Fault finding guide”, page 71

How to replace the EPROM

Introduction

The EPROM contains the program for the controller.

When to replace

The EPROM only needs to be replaced when it is faulty.

Part number

The EPROM can be ordered under part number 296084.

Tools

Make sure you have the following tools available before you start:

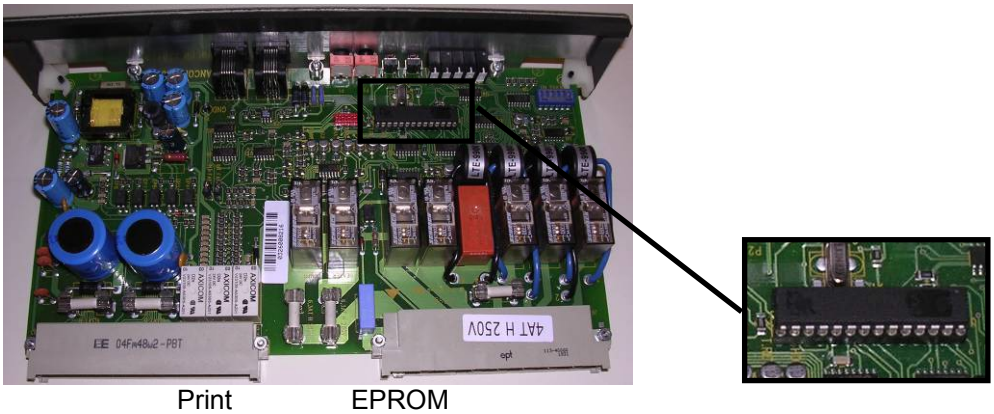
- Cross-point screwdriver
- EPROM-tong

Caution!

- Only trained and certified technicians are allowed to replace parts.
- Switch of both the DC and AC supply before working on the unit.
- Make sure that all work has been performed before switching on the power again.

Illustration

This drawing illustrates the EPROM and where it is placed in the unit:



Print EPROM

Continued overleaf

How to replace the EPROM, *continued*

Procedure

Follow these steps to replace the EPROM:

Step	Action
1	Switch of all the power to the unit
2	Release the control board by unscrewing the screw that hold it in place
3	Release the two locking mechanisms in each side of the control board and carefully pull up the control board
4	Place the control board on an even surface and remove the EPROM with a EPROM tong NB: The EPROM should not be touched, use a tong
5	Mount the new EPROM on the control board. Note the small notch in the one end of the EPROM. This notch must be situated just opposite the equivalent notch in the EPROM-holder on the print
6	Push the control board in place in the holder on the Silencio and lock the two locking mechanisms in each side of the control board.
7	Tighten the control board with the screw
8	Connect the power Result: The test program runs through all functions. Check that the unit does not come out with an alarm signal. In case of an alarm signal, please see section “Fault finding guide”, page 71

How to replace the phase reversal monitor

Introduction

The phase reversal monitor protects the compressor against overload.

When to replace

The phase reversal monitor only needs to be replaced when it is faulty.

Part number

The phase reversal monitor can be ordered under part number 296082.

Tools

Make sure you have the following tools available before you start:

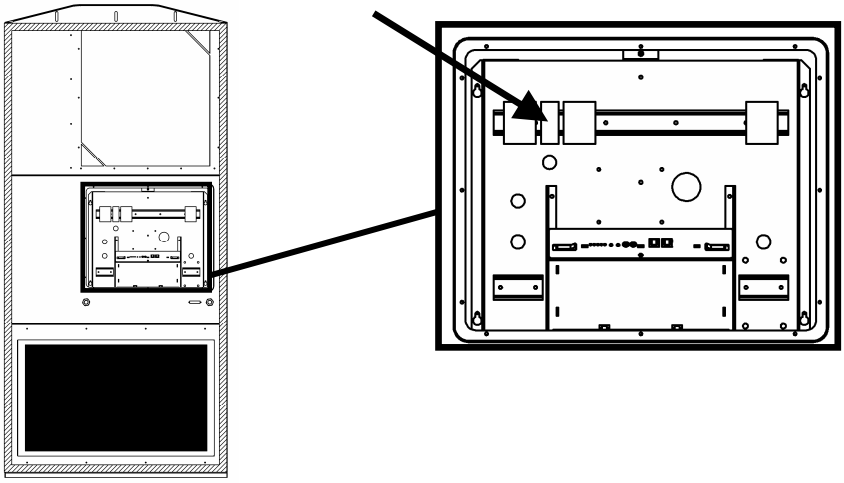
- Cross-point screwdriver
- Torx 25 screwdriver

Caution!

- Only trained and certified technicians are allowed to replace parts.
- Switch of both the DC and AC supply before working on the unit.
- Make sure that all work has been performed before switching on the power again.

Illustration

This drawing illustrates the phase reversal monitor and where it is placed in the unit.



Continued overleaf

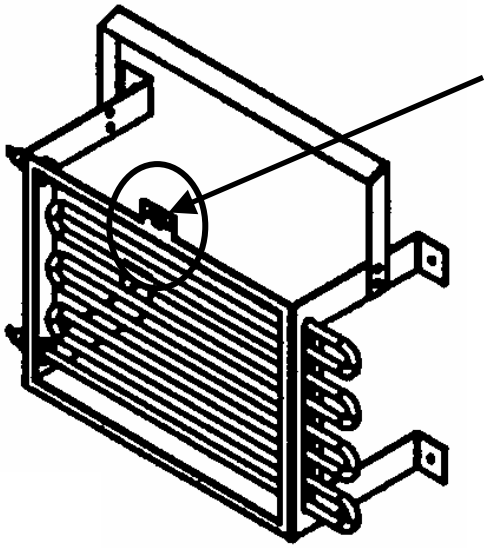
How to replace the phase reversal monitor, *continued*

Procedure

Follow these steps to replace the phase reversal monitor:

Step	Action
1	Switch of all the power to the unit
2	Release the control board by unscrewing the screw that hold it in place
3	Release the two locking mechanisms in each side of the control board and carefully pull up the control board
4	Remove the internal front cover at the control board by unscrewing the 12 torx 25 screws
5	Release all 4 wires by loosening the screws
6	Loosen the 5 screws in the compressor contactor Result: The phase reversal monitor will ”fall down”
7	Adjust the new phase reversal monitor with a slotted screwdriver. It must be adjusted exactly as the faulty phase reversal monitor was adjusted
8	Place the new phase reversal monitor where the faulty one was mounted and tighten the 5 screws on the compressor contactor
9	Reconnect the 4 wires
10	Remount the front cover
11	Place the control board in the holder by pushing the control board in place in the holder on the Silencio and lock the two locking mechanisms in each side of the control board, and finally tighten the screw that holds it in place
12	Connect the power Result: The test program runs through all functions. Check that the unit does not come out with an alarm signal. In case of an alarm signal, please see section “Fault finding guide”, page 71

How to replace the thermostat for the heating element

Product description	The thermostat makes sure that the heater cuts out at a too high temperature.
When to replace	The thermostat only needs to be replaced when it is faulty.
Part number	The thermostat can be ordered under part number 296096.
Tools	Make sure you have the following tools available before you start: • Torx 25 screwdriver • Side-cutting nippers • Pop rivet tongs
Caution!	• Only trained and certified technicians are allowed to replace parts. • Switch of both the DC and AC supply before working on the unit. • Make sure that all work has been performed before switching on the power again.
Illustration	This drawing illustrates where the thermostat is placed on the heater element: 

Continued overleaf

How to replace the thermostat for the heating element, *continued*

Procedure

Follow these steps to replace the thermostat:

Step	Action
1	Switch of all the power to the unit
2	Remove the upper left side cover by unscrewing the two torx 25 screws that hold it/them in place
3	Disconnect the two cable logs by pulling them carefully apart
4	Remove the two aluminum pop rivets with the side-cutting nippers
5	Mount the new thermostat with the two enclosed pop rivets
6	Connect the two cable logs
7	Remount the side cover
8	Connect the power Result: The test program runs through all functions. Check that the unit does not come out with an alarm signal. In case of an alarm signal, please see section “Fault finding guide”, page 71

How to replace parts of the cooling system

Introduction

With a cooling system installed the unit can circulate refrigerated air into the shelter.

When to replace

Parts of the cooling system only need to be replaced when either one of them is faulty.

Furthermore we recommend that the dry filter is replaced whenever the cooling system is broken.

Part number

Parts of the cooling system can be ordered under part number:

- Compressor 296079
- Dry filter 296080
- Receiver 290026
- Expansion valve, Silencio 6/8 kW 296086
- Expansion valve, Silencio 10 kW 296085
- Expansion valve, Silencio 14 kW 296087
- Evaporator, Silencio 6/8/10 kW 296090
- Evaporator, Silencio 14 kW 296091
- Condenser, Silencio 6/8/10 kW 296088
- Condenser, Silencio 14 kW 296089
- High pressure sensitive switch 296081
- Low pressure sensitive switch 296082

Tools

Make sure you have the following tools available before you start:

- Torx 25 screwdriver
- Refrigeration tools for work on cooling systems

Caution!

- Only trained and certified cooling technicians are allowed to replace parts of the cooling system.
- Switch of both the DC and AC supply before working on the unit.
- Make sure that all work has been performed before switching on the power again.

Procedure

Follow these steps to replace parts of the cooling system:

Step	Action
1	Switch of all the power to the unit
2	Remove relevant side covers by unscrewing the two torx 25 screws that hold it/them in place
3	Replace the concerned parts according to general cooling technical regulations.
4	Remount the side cover
5	Connect the power Result: The test program runs through all functions. Check that the unit does not come out with an alarm signal. In case of an alarm signal, please see section “Fault finding guide”, page 71

Fault finding guide

Introduction

This section will give you an instruction in locating the fault, when the fail LED on the control panel is active.

DanLink

Besides fault finding from the LED signals Dantherm Air Handling can provide DanLink as accessory. DanLink can provide you with specific information of where the fault is located.

For further information about DanLink, please see section “Accessories”, page 35.

Fail LEDs

The control board is equipped with three failure or alarm relays.

These three relay’s give alarms depending on the degree of alarm. The alarms are categorized as follows:

Category	Fail LED	When to be cleared…
Warning	Permanently lit	To be cleared when convenient
Fail	Slowly flashing (½ Hz ~once every 2 seconds)	To be cleared soon but not immediately
Alarm	Fast flashing (2 Hz ~ 2 per second)	To be cleared as soon as possible
Fault during test	Flashing (1 Hz ~1 each second) for 30 seconds after the test has ended	After the 30 seconds the LED will act according to the severity of the fault (one of the 3 above), and you should act accordingly

The following gives you a description of each type of alarm.

Warning

A warning is activated on one of the following events:

- The condenser temperature sensor is missing or short circuited
- The hot spot temperature sensor is short circuited
- The return air temperature is 20 °C above the compressor set point. The alarm will be cleared when the temperature again is less than 18 °C above the set point
- The return air temperature is 5 °C below the heater set point. 2 °C above this temperature the alarm will be cleared.
- The condenser temperature has been above 75 °C. This warning will be cleared at condenser temperature again is below 60 °C and have been for at least two minutes
- The filter input is activated
- The unit is working in occupied mode
- Fail on the supply air sensor – open or short circuited

Continued overleaf

Fault finding guide, *continued*

Fail	A fail is activated on one of the following events: • The heater is faulty – doesn't use current. Loss of mains power • Fail on ambient air sensor – short or open circuit • Smoke alarm input activated • One of the external DC fans is stopped – no rotational pulses • The internal DC fan is stopped – no rotational pulses • Mains failure
Alarm	An alarm is activated on one of the following events: • Both the internal DC fans are stopped - no rotational pulses • Both the external DC fans are stopped - no rotational pulses • The compressor doesn't draw current – this due to a dropout in the HP/LP pressure switch, the winding protector or the compressor in general • Fail on the return air sensor – open or short circuited

Service agreement

Introduction

The unit includes mechanical and electrical parts and the unit is often placed in a rough environment where the components are exposed to different climate conditions. Therefore the unit will need preventative maintenance on a regular basis.

Hotline

The After Sales Support Department of Dantherm Air Handling A/S is ready to help you in case of a problem.

To be able to offer quick and efficient help, please have the following information ready when contacting Dantherm Air Handling A/S:

- Name
- Company
- Country
- Phone no.
- Email
- Type (unit)
- Site/location (unit)
- Serial no/order no.
- Description of the problem

Contact Dantherm Air Handling A/S, ask for the After Sales Support department and help will be provided as soon as possible:

Phone: +45 96 14 37 00
Fax: +45 96 14 38 00
Email: service@dantherm.com

Preventive maintenance

Dantherm Air Handling A/S offers to do the preventive maintenance on the units so that they at all times will operate according to factory standards.

Corrective and emergency repair

In case of malfunctions of the product Dantherm Air Handling A/S offers to do emergency repair on the climate units. Agreements will be made with the customer on response time and price.

Setup

Dantherm Air Handling A/S has established a network of service partners to do the preventative maintenance. The partner is trained and certified on the actual climate units. The partner will also carry an adequate number of spare parts – so that any repairs can be made during the same visit.

The agreement will be made with Dantherm Air Handling A/S – and the overall responsibility for the agreement will be Dantherm Air Handling A/S's.

Further information

For further information about a service agreement in your country or region, please contact:

Henrik Hersted
After Sales Support Manager

Dantherm Air Handling A/S

Phone: +45 9614 4767
Mobile: +45 2399 4066
Email: heh@dantherm.com

Technical information

Overview

Contents

This section covers the following topics:

Technical data

Introduction

This section gives you the technical data of the Silencio units.

Where nothing else is stated, the values go for all 4 Silencios – 600, 800, 1000 and 1400!

Note

Service technicians should be able to turn of power to the Silencio in order to perform preventive maintenance without being exposed to danger!

Performance

The table below shows the performance of the Silencio unit:

Specification	Value
Active Cooling[1)]	Silencio 600: KW 6 Silencio 800: KW 8 Silencio 1000: KW 10 Silencio 1400: KW 14
Free cooling	Silencio 600: W/°C 510 Silencio 800/1000/1400: W/°C 800
Sensible cooling capacity	Silencio 600: KW 5.8 Silencio 800: KW 7.5 Silencio 1000: KW 9.3 Silencio 1400: KW 13.0
Internal air volume, max.[2)]	Silencio 600: m^3/h 1400 Silencio 800/1000/1400: m^3/h 3000
External air volume, max.[2)]	Silencio 600: m^3/h 1600 Silencio 800: m^3/h 2300 Silencio 1000: m^3/h 3000 Silencio 1400: m^3/h 2800
Heating capacity at nominal voltage	2 kW

1) Measured at 35 °C ambient temperature, 27 °C room temperature and < 30 % humidity

2) Measured at 35 °C ambient temperature, 27 °C room temperature

Cabinet data

Data and dimensions of the cabinet are shown in the following table:

Specification	Designation	Value
Dimensions	Height × width × depth	1920 × 900 × 790 mm
Weight	Estimated to max.	Silencio 600/800: 245 kg Silencio 1000: 255 kg Silencio 1400: 260 kg
Metal sheet material	Aluzinc	0.9/2.0 mm
Packaging	Height × width × depth	150 × 905 × 945 mm One unit per pallet, always standing
Signage	Type signage and warnings	Labelling will be according to current legislation

Continued overleaf

Accessories, *continued*

Electrical data

The table below shows the most important electrical features of the Silencio. Please note that the relay and the cable dimensions are Dantherm Air Handling recommendations. Local regulations must always be observed.

Attention!
Dantherm Air Handling recommend using 16 Amp circuit breakers for both AC and DC power supply and 2.5 mm^2 cables for Silencio 600. It is recommended using 16 Amp circuit breakers for AC power, and 20 Amp circuit breakers for DC power supply and 2.5 mm^2 cables for Silencio 800, 1000 and 1400.

Specification	Designation	Value
Voltage supply, AC	Three phase +N +Ground	400 V AC ± 10 %
Voltage supply, 48 V DC	+ / -	36-56 V DC
Frequency	Nominal (tolerance ± 2 Hz)	50 Hz
Power input	Compressor at nominal operation (ARI conditions) Ambient 35 °C Return 35 °C	Silencio 600: 2900 W Silencio 800: 3340 W Silencio 1000: 4590 W Silencio 1400: 7020 W
Compressor, maximum	Max. operating current for compressor	AC Silencio 600: 6.0 A Silencio 800: 6.0 A Silencio 1000: 8.0 A Silencio 1400: 12.0 A
Compressor, nominal	Nominal operating current for compressor (ARI conditions)	Silencio 600: 4.2 A Silencio 800: 4.2 A Silencio 1000: 5.9 A Silencio 1400: 7.8 A
Locked rotor	Max. starting current	Silencio 600: 37.5 A Silencio 800: 37.5 A Silencio 1000, AC: 55.0 A Silencio 1400, AC: 73.0 A
Power consumption AC	All fans nominal speed	Silencio 600: 2780 W Silencio 800: 2700 W Silencio 1000: 3750 W Silencio 1400: 6200 W
Power consumption DC	All fans nominal speed	Silencio 600: 120 W Silencio 800: 640 W Silencio 1000: 840 W Silencio 1400: 820 W
Current nominal[1)]	All fans nominal speed	AC / DC Silencio 600 4.2 A / 2.6 A Silencio 800 4.2 A / 13.3 A Silencio 1000 5.9 A / 17.5 A Silencio 1400 7.8 A / 17.5 A

Continued overleaf

Accessories, *continued*

List, continued, ***continued***

Specification	Description	Value	
Max. current	All fans max. speed	AC	DC
		Silencio 600 4.2 A	2.7 A
		Silencio 800 4.2 A	17.5A
		Silencio 1000 12.5 A	17.5 A
		Silencio 1400 12.0 A	17.5 A

[1)] The values apply to 35 °C ambient temperature, 27 °C room temperature and < 30 % humidity.

Working range

The table below shows the working range of the Silencio:

Specification	Value
Pressure	70 – 106 kPa (min./max.)
Temperature, free cooling	÷ 40 °C to 45 °C (ambient temperature)
Humidity	0 – 95 % relative humidity

Refrigerant

The table below shows the type and the quantity of refrigerant

Specification	Value
Type	R407c
Quantity	Silencio 600: 2.9 kg Silencio 800: 2.9 kg Silencio 1000: 2.9 kg Silencio 1400: 3.7 kg

Sound level

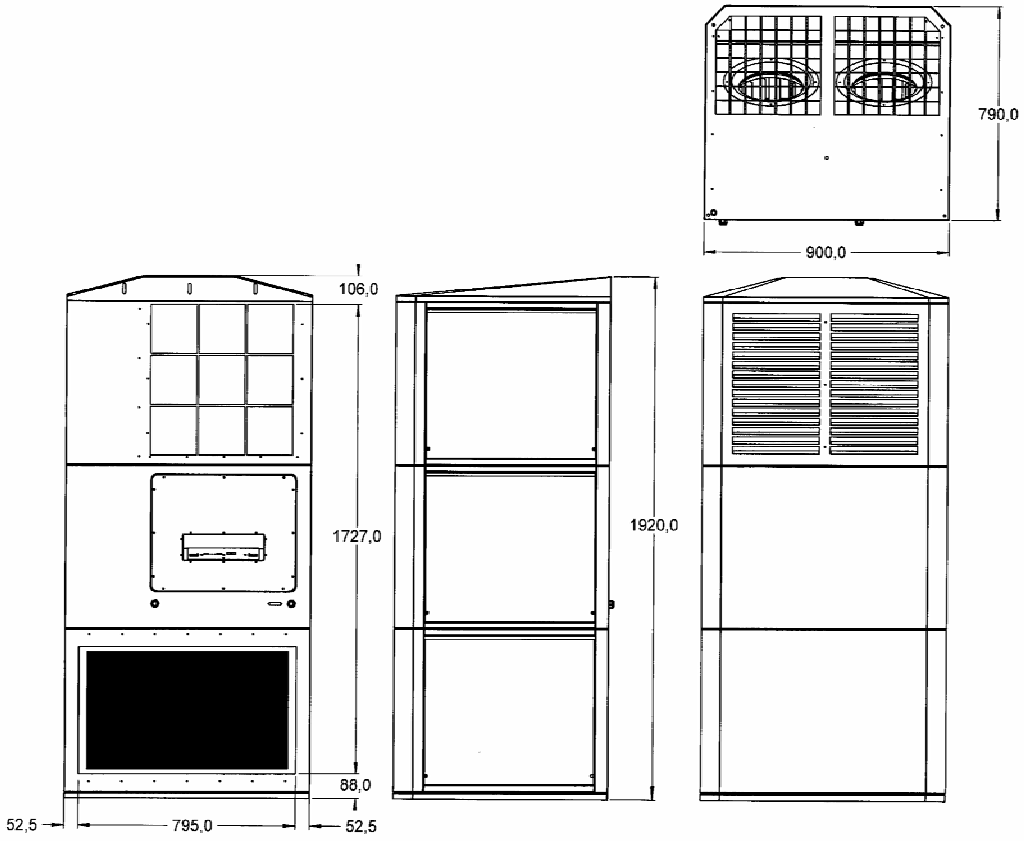
The table below shows the sound level of the Silencio:

Specification	Lw dB (A)			
	600	800	1000	1400
Free cooling, external	56	65	65	65
Active cooling, external, 35 °C ambient	59	68	72	72
Active cooling, external, 3 m free field ambient, 35 °C (pressure level Lp)	39	48	52	52

Dimensions

Illustration

This drawing illustrates the dimensions of the Silencios:



Wiring diagram

Overview

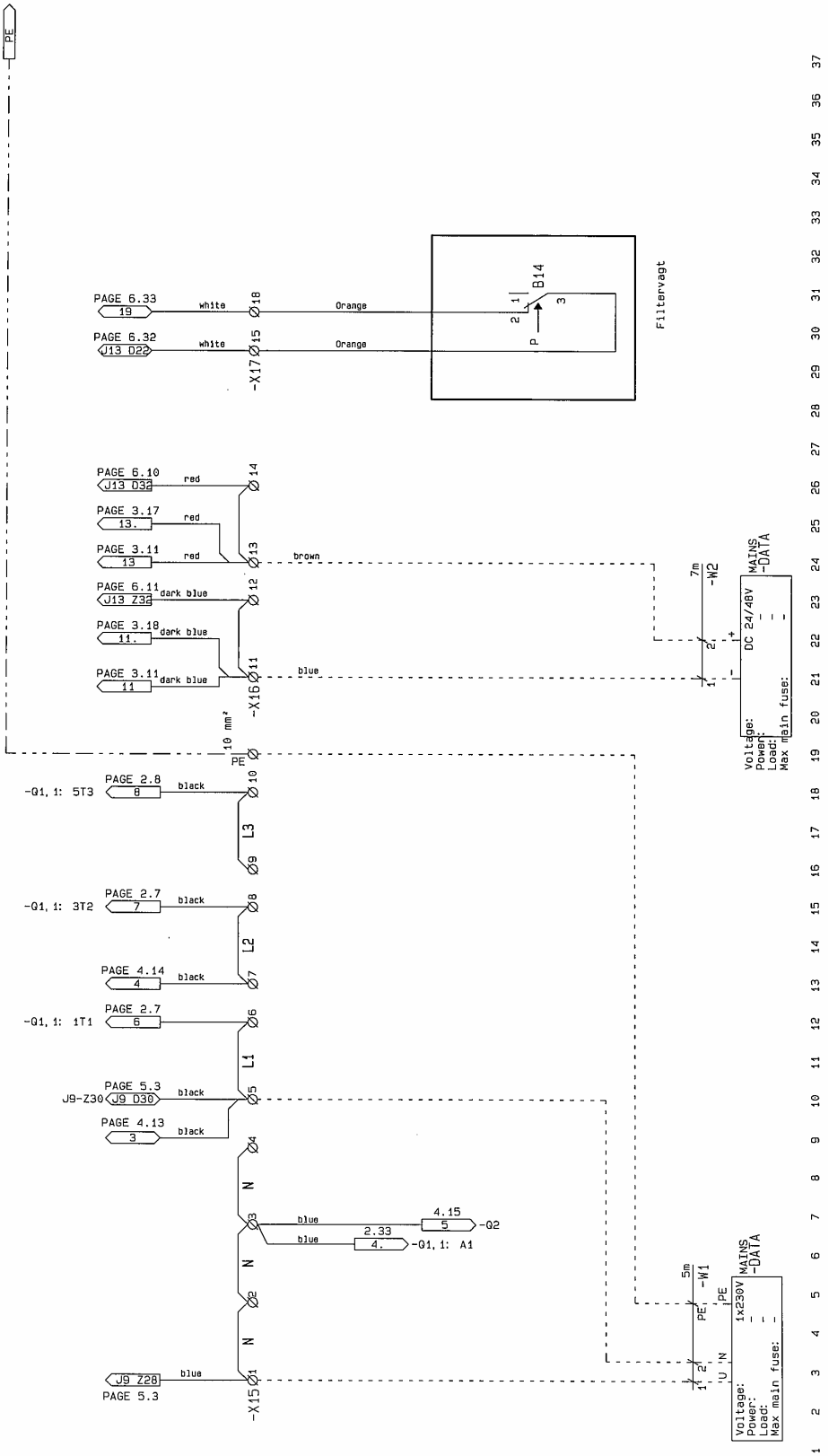
Introduction

This section contains the electrical wiring diagrams for the following main parts:

Mains supply

Wiring diagram, page 1

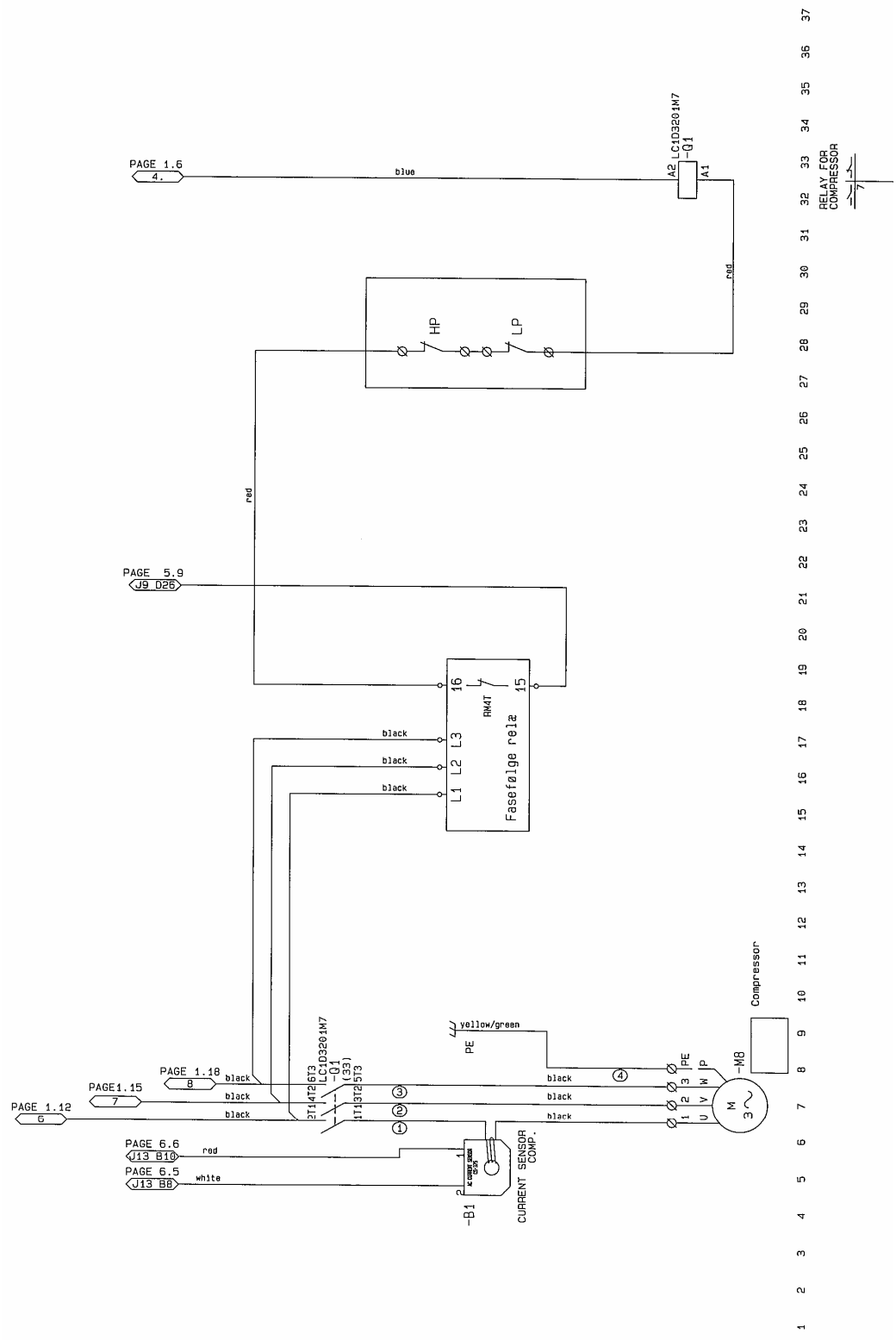
This section contains the electrical wiring diagram for the mains supply:



Compressor control

Wiring diagram, page 2

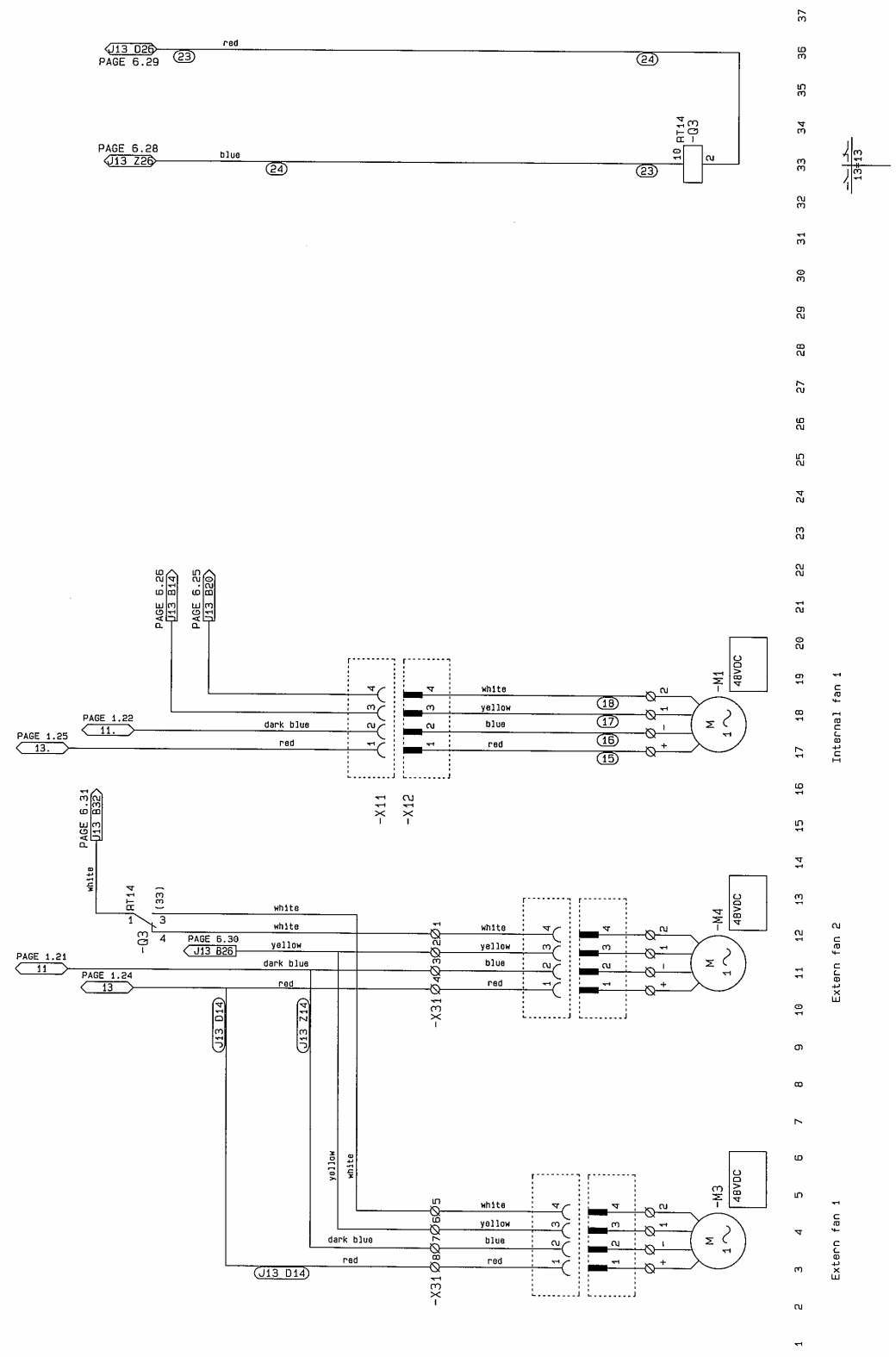
This section contains the electrical wiring diagram for the compressor control:



Fan control

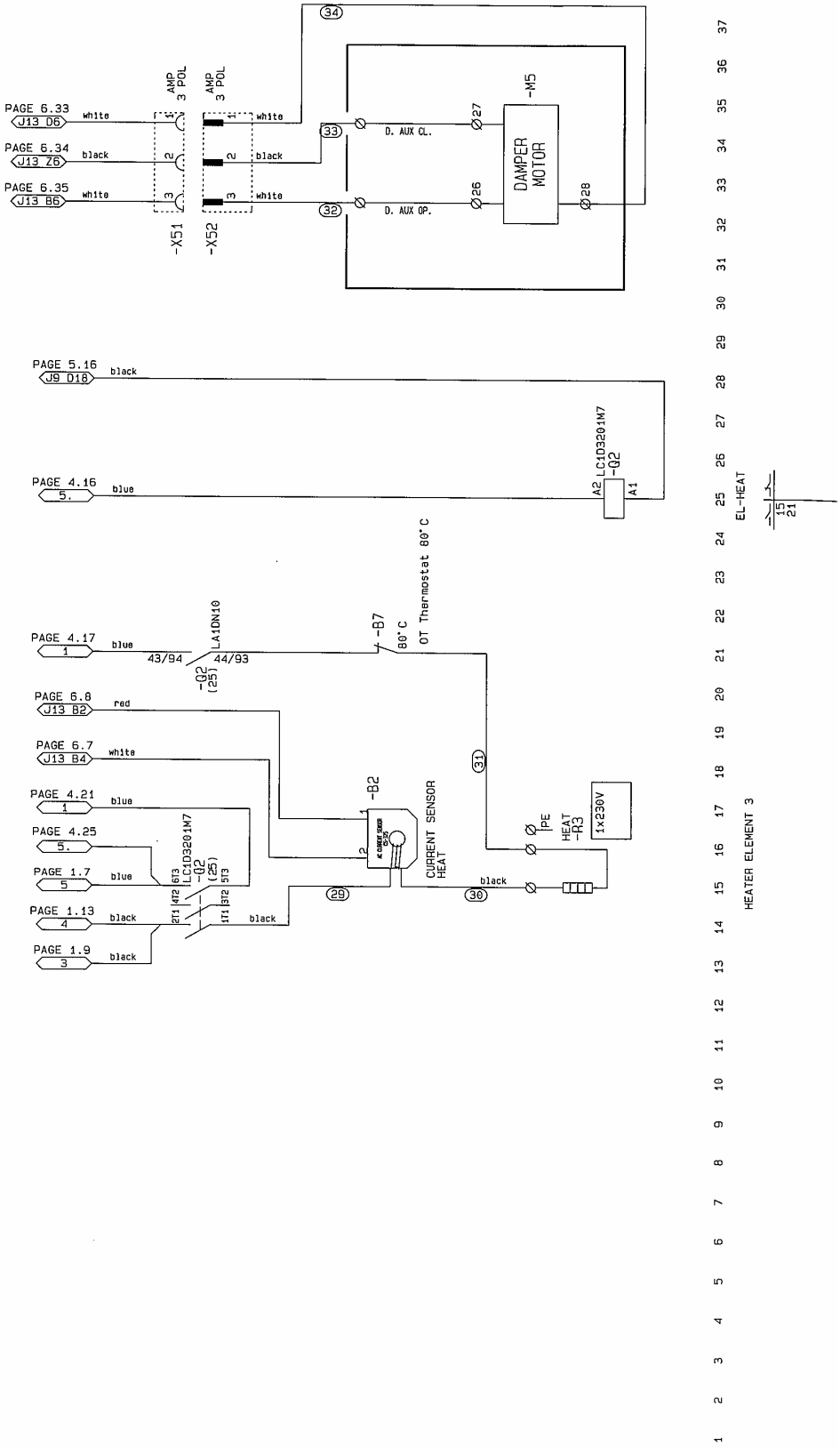
Wiring diagram, page 3

This section contains the electrical wiring diagram for the fan control:



Wiring diagram, page 4

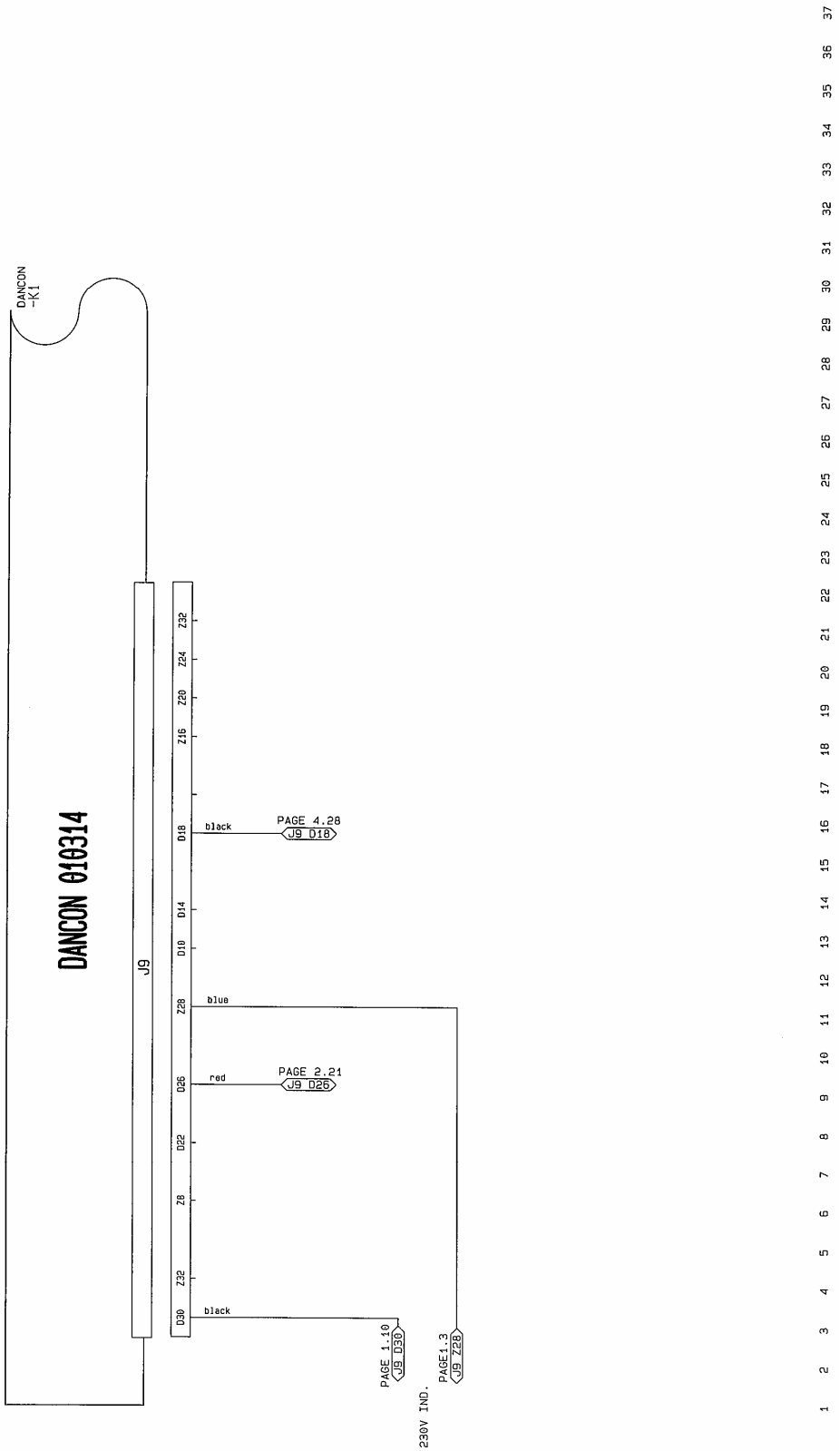
This section contains the electrical wiring diagram for the heating control:



DanCon control board

Wiring diagram, page 5

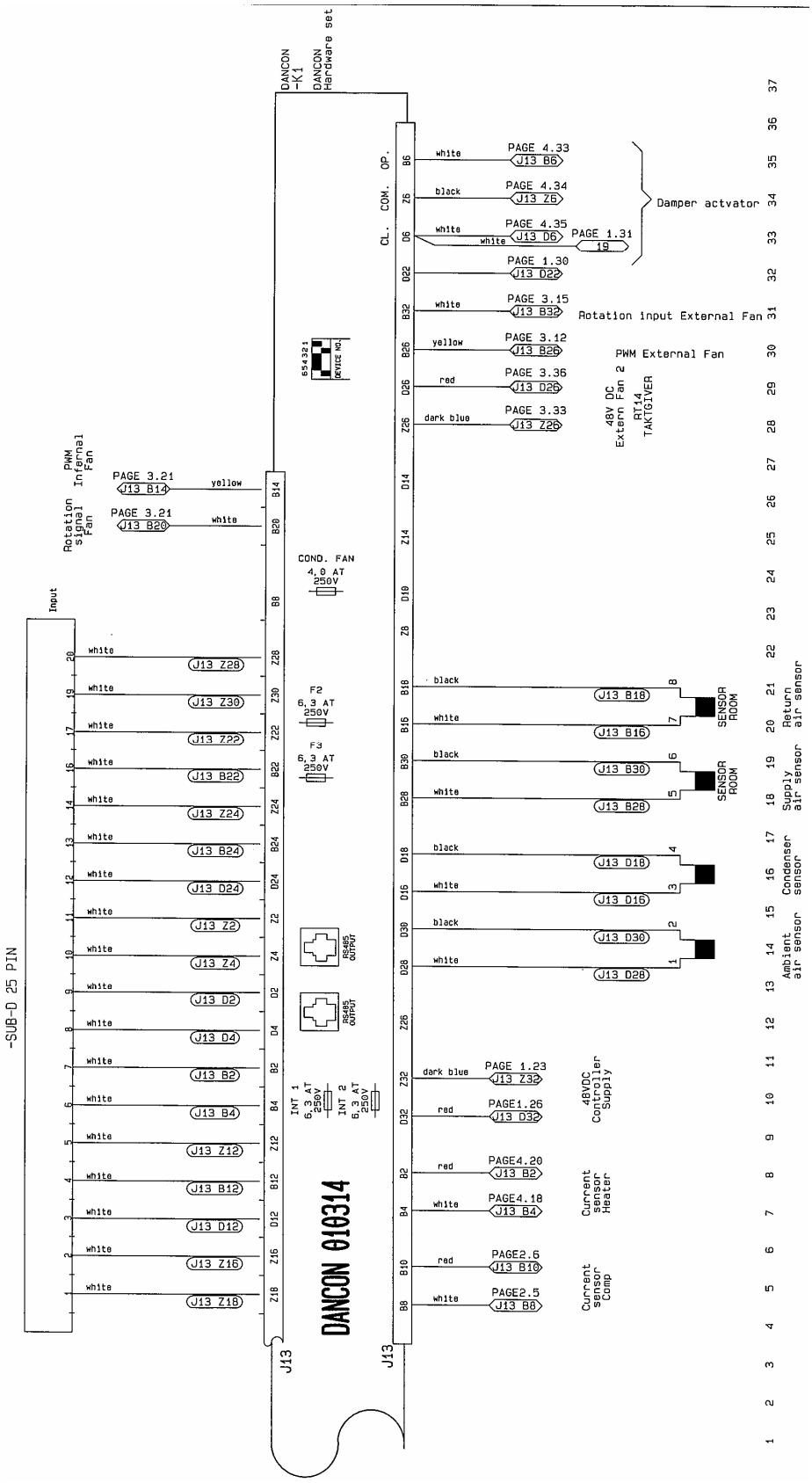
This section contains the electrical wiring diagrams for the DanCon control board:



Continued overleaf

Accessories, *continued*

Wiring diagram, page 6



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