

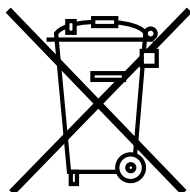
Combo Cooling 6000/900

Service manual

Rev. 1.0

en

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Der tages forbehold for trykfejl og ændringer

Dantherm can accept no responsibility for possible errors and changes

Irrtümer und Änderungen vorbehalten

Dantherm n'assume aucune responsabilité pour erreurs et modifications éventuelles

Dantherm no asume ninguna responsabilidad sobre posibles errores o modificaciones

Introduction

Overview

Introduction

This is the service manual for the Dantherm Combo Cooling series.
Please see the below table of content for further information about the sections.

Manual

Part number of this service manual is 367506 and covers units with serial numbers from 1404112107452

Target group

The target group for this service manual are the technicians who install and maintain the Combo Cooling , as well as the users of the unit

Copyright

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Reservations

Dantherm reserves the right to make changes and improvements to the product and the service manual at any time without prior notice or obligation.

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Warning

Introduction

This installation manual and the product use various displays and labels to ensure safe use. Ignoring these displays and labels and incorrectly using the product could have results as classified below. Please read the following warning symbol information before reading the rest of this section, and be sure to strictly observe all instructions.



Warning

Not following these instructions could result in death or serious injury



Caution

Not following these instructions could result in injury or property damage.



This symbol means something that should NOT be done

Project safety is your responsibility!

Follow the instructions in this manual regarding the installation method and installation orientation. Not following these instructions could result in injury, death, or damage to equipment. All work should be performed by qualified personal using safe work practices.

All proper personal protective equipment should be used. PPE required for this installation includes, but is not limited to:

- Safety glasses
- Hard hat
- Safety shoes
- Hearing protection
- Cut resistant gloves
- Face shield
- Proper work attire (long sleeve shirt and long pants)

Please strictly observe the following: Special Skill is required to install the Dantherm products. Non-qualified personnel should not attempt any of the actions shown in this installation guide. Dantherm shall not be responsible for improper installation or any accidents, damage, or injury resulting from improper installation.

Product description

Overall description

Introduction

This section describes the overall product, and its functionality


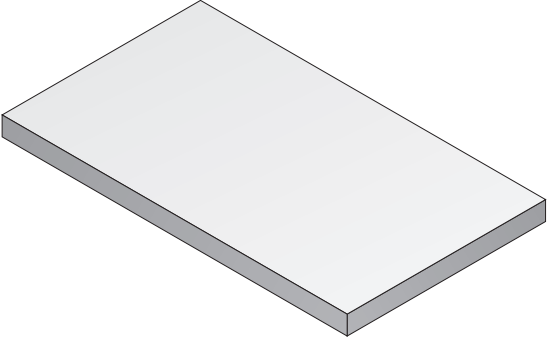
The Combo Cooling series is designed to control the internal temperature of an outdoor enclosure. Combo Cooling series removes dissipated heat from electronic equipment and it's designed to maintain correct temperature for electronic equipment.

Important

Dantherm recommends that the cooling system should be running continuously!

Available accessories

This table shows the accessories available from supplier

Description	Illustration	Order no.
ModBus external display		075210
Filter G4		219304

Overall description, continued

Outdoor view

This illustrates the units outdoor view:

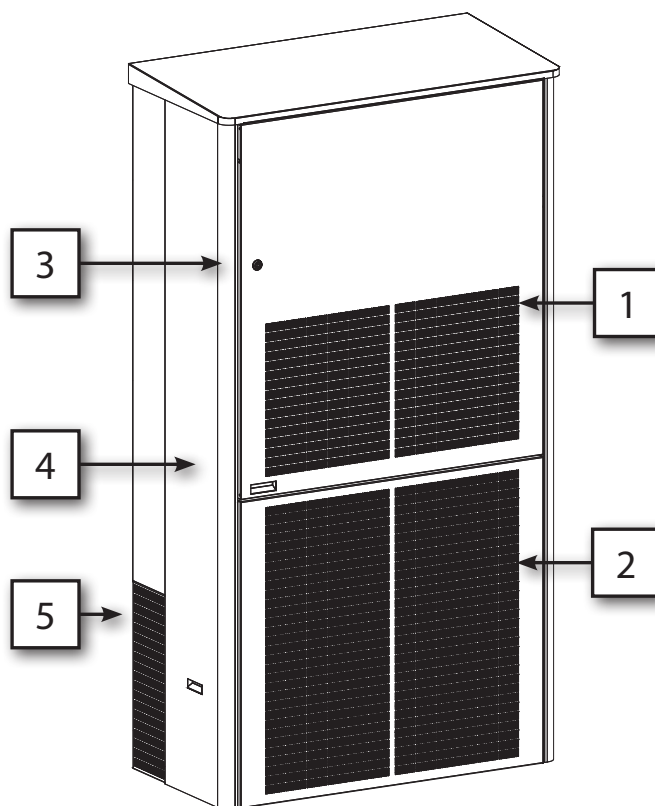


Fig. 1

Description Outdoor parts

This table refers to the outdoor view above

Pos.	Description
1	Free cooling air inlet
2	Condenser cooling air output
3	Front door with lock
4	Removable side cover for service access.
5	Condenser air inlet.

Overall description, continued

Indoor view

This illustrates the units indoor view:

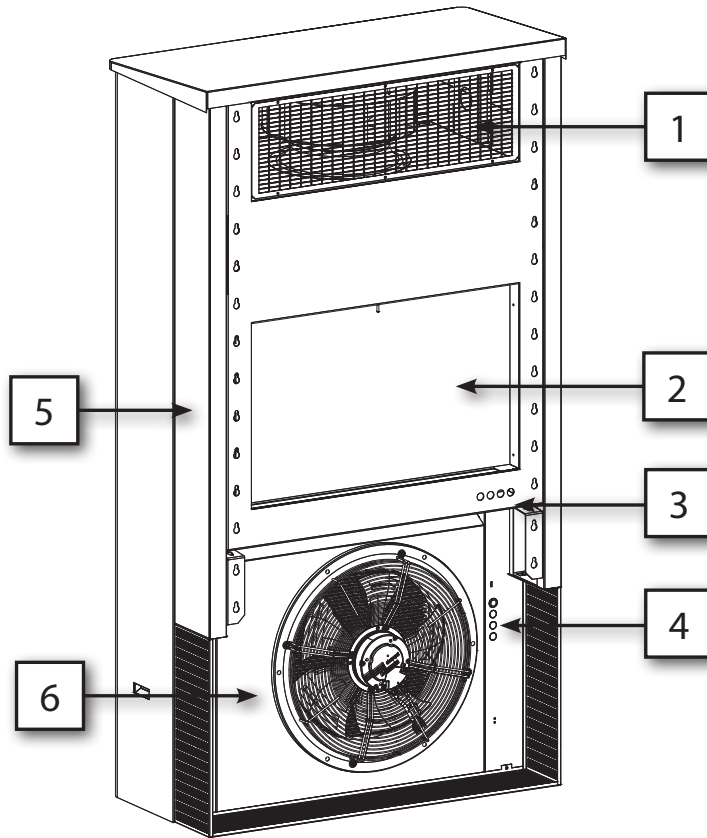


Fig. 2

Description Indoor parts

This table refers to the outdoor view above

Pos.	Description
1	Free cooling supply air inlet
2	Return air
3	Cable routing, option 1
4	Cable routing, option 2
5	Removable installation bracket
6	Condenser fan

Overall description, continued

Exploded view

This illustrates the units key components:

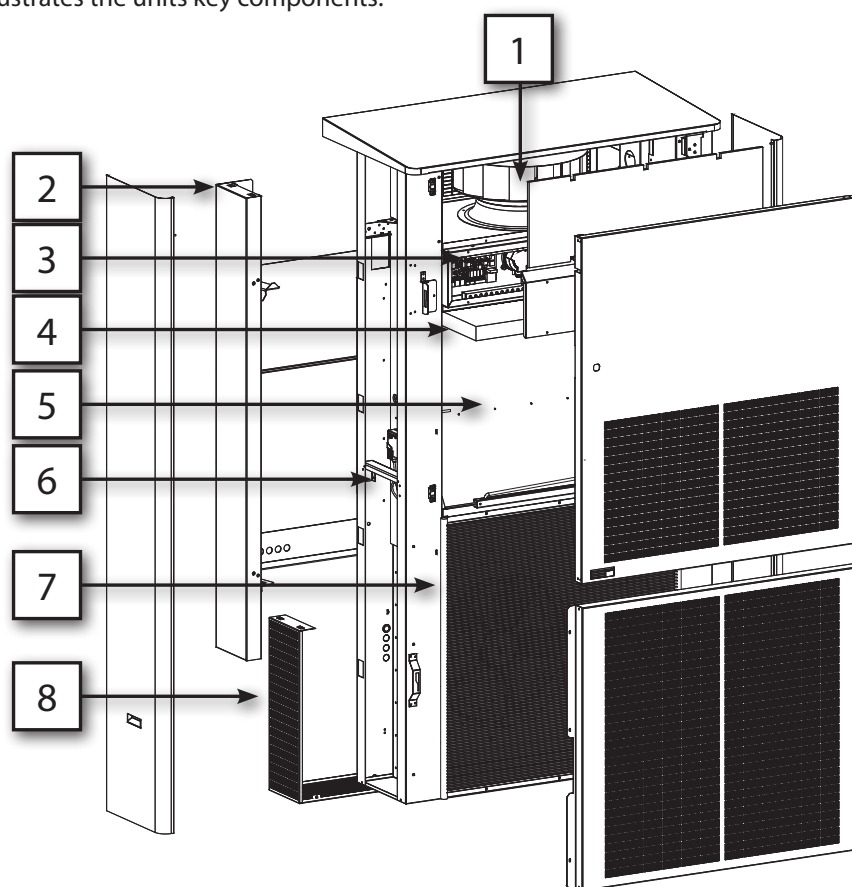


Fig. 3

Description exploded parts

This table refers to the parts view above

Pos.	Descriptions
1	Free cooling fan
2	Wall bracket frame
3	Embedded controller, type CC4
4	Free cooling filter
5	AC/free cooling operation shift damper
6	Cable routing path
7	AC condenser
8	Removable condenser grill

Overall description, continued

Cooling functionality

The illustration and table below show the airflows of Combo Cooling.

The unit is combining free cooling and active cooling, to obtain the target temperature inside the shelter application with lowest possible energy consumption.

The different cooling modes are:

1. Free cooling mode – Fresh outdoor air is used to cool
2. Active cooling mode – Air conditioner is used in a closed loop.
3. Circulation mode – Internal air is recycled (closed loop) without cooling

Air paths:

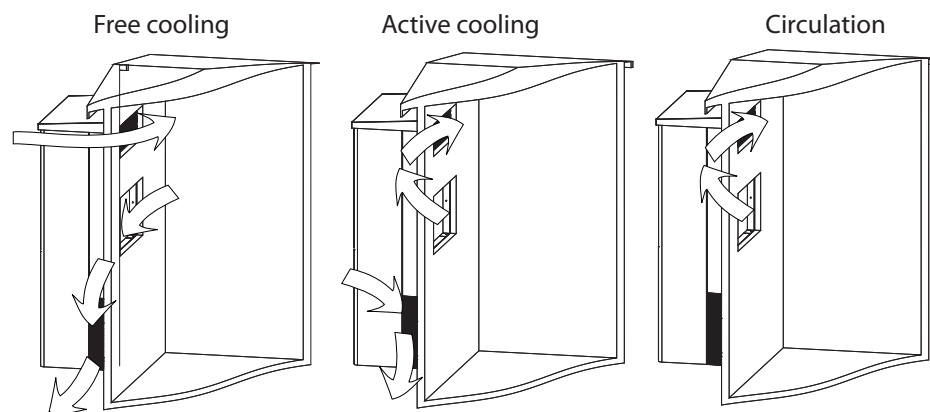


Fig. 4

Internal airflow

Warm, internal air is drawn into the unit by the internal evaporator fan, at the evaporator opening, through the evaporator and the evaporator fan, and then released into the enclosure through the evaporator fan opening.

External airflow

Cold, external air is drawn into the unit by the condenser fan, and routed through the condenser, where it is cooling down the condenser. After passing through the condenser the air is returned to the external environment through the two condenser fans.

Electronic control strategy

Introduction

This section describes the key functionality of the embedded CC4 controller. For a complete description, Dantherm issues upon request, an extended manual for the controller.

WARNING



Never carry out any installation, maintenance or service, without disconnecting the power supply (please notice that this units has dual power source AC & DC), by means of the external power supply disconnecting devices.

Overall

The embedded controller, type: CC4, is designed to control the internal temperature of an outdoor enclosure used for telecom equipment. Cooling units with embedded CC4 controllers, removes dissipated heat from electronic equipment and it's designed to maintain correct and steady temperature for the electronic radio equipment. The ComboCooler has both free cooling as well as AC cooling, thus still having connection for additional external AC units. The controller offers a wide range of external connections. See more at page 17

Control strategy

This below shown the overall cooling control strategy:

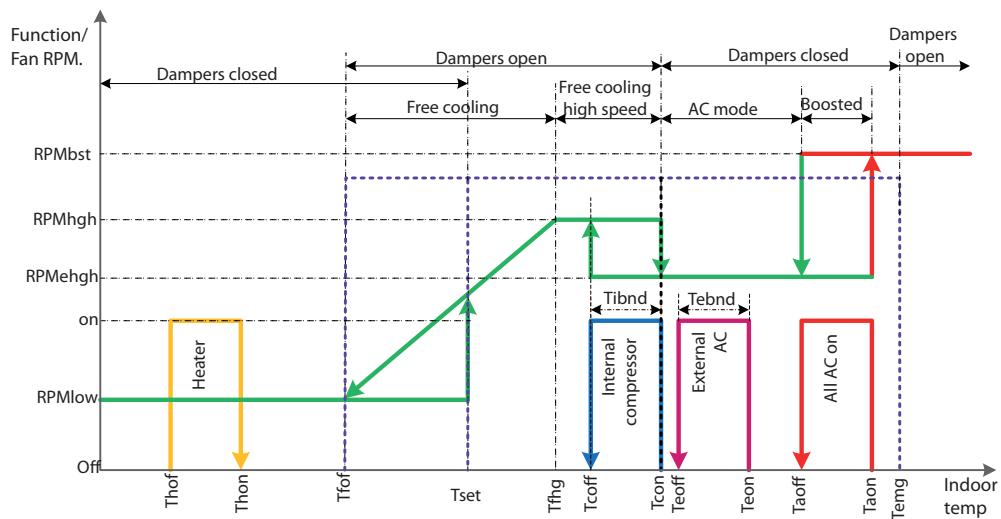


Fig. 5

If the outside temperature isn't 3°C (default) lower than setpoint, the freecooling option will be overruled, and the AC will take over.

User guide

Main interface options

The ComboCooler is designed with several option for operating the unit.

Interface	Usage
RS485 ModBus	Connect the universal and compatible Dantherm display unit, and gain access to the main function immediately.
SD card interface	Insert an empty SD card and the controller downloads a configuration and a logging file, OR insert an SD card with a config file, and this config file will be automatically uploaded and initiated on the fly.

Display unit (accessory)

Dantherm **STRONGLY** recommends to use the Dantherm RS485 external display. This has a intuitive and easy to use basic operation controls which includes:

- Change master cooling mode.
- Change setpoint cooling
- Enable / disable shelter comfort mode, which is 21°C in shelter and low fan speed/noise.
- Change setpoint heater
- AC1 & AC2 enable/disable
- AC1 & AC2 Lead/lag enable/disable. This function will swop set points on AC1 & AC2 every second time the AC are operated
- Diagnostics mode, which checks every component connected. See more in unit manual
- Alarm status which indicates which component is faulty. Each number inform which component is faulty. Error numbers are product specific. See more in unit manual.

Follow the display leaflet for guidance for usage of the display.

SD card

The controller has an integrated SD card reader that can exchange parameters for information and editing.

The SD card will overall do two operations:

- 1.Store operation logging data**, if an SD card is present. By default the ComboCooler will log a complete set of operation data once each minut.
If suspecting an operation error, place the SD card into the ComboCoolers SD slot, wait some minutes, and move the SD card to a computer, where the file can be read with wordpad or similar.
- 2.Changing parameters**. Place an empty SD card in the reader, and the controller stores the parameter configuration immediately on the card (cc4_cfg.txt)
 - A.Remove the SD card, place it in a computer, and open the file with wordpad or similar.
 - B.Edit the parameter needed, without changing any amount of empty spaces. End by saving the file with the exact same file name.
 - C.Place the SD card in the combo, and the new configuration will be loaded and initiated on the fly. No need to reboot.

For a complete guide on changing parameters via SD card, please obtain the advanced CC4 manual, available by request.

Installation

Introduction

The ComboCooler unit needs proper installation in order to operate flawless for many years. Please follow this section for installation

WARNING



- Never carry out any installation, maintenance or service, without disconnecting the power supply (please notice that this units has dual power source AC & DC), by means of the external power supply disconnecting devices.
- NEVER lift the unit by hands- use only forklift or similar hoisting device

Preparation

Unpack and prepare unit for mounting:

Step	Action	Illustration
1	Remove both side panels 1. Lift side 2. Pull outwards 3. Pull out in lower part 4. Pull sideways down	
2	Remove lower air grill 1. Push both sides 2. Pull downwards	
3	1. Remove mounting frame 2. Remove the two M10 bolts each side of the unit.	

Installation, continued

Pre-installation considerations

Please reserve exempted space for service as shown below.

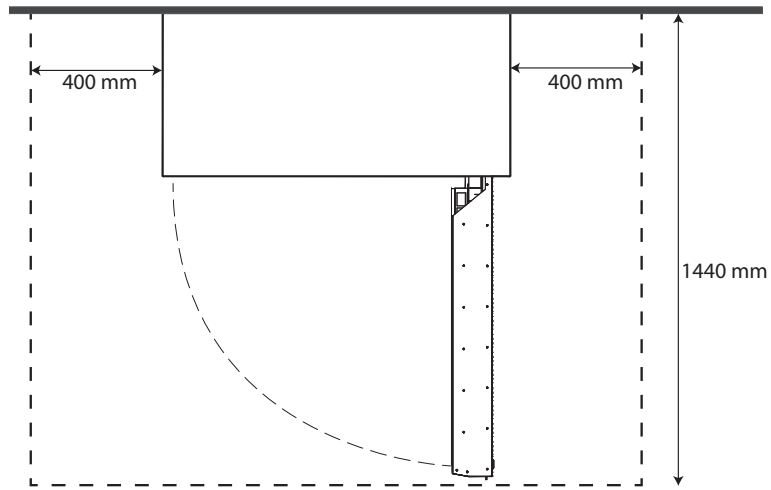


Fig. 6

Please make sure, that one of the two shown cable run options is achievable.

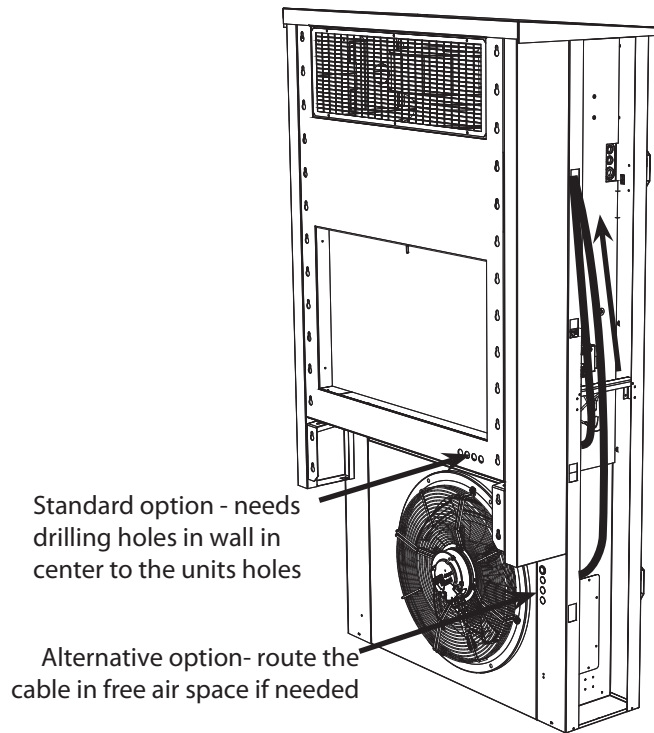


Fig. 7

Installation, continued

Cut-out



Cut two rectangular holes with appropriate tools, according these below measures
Please consider drilling the correct amount of cable inlets.

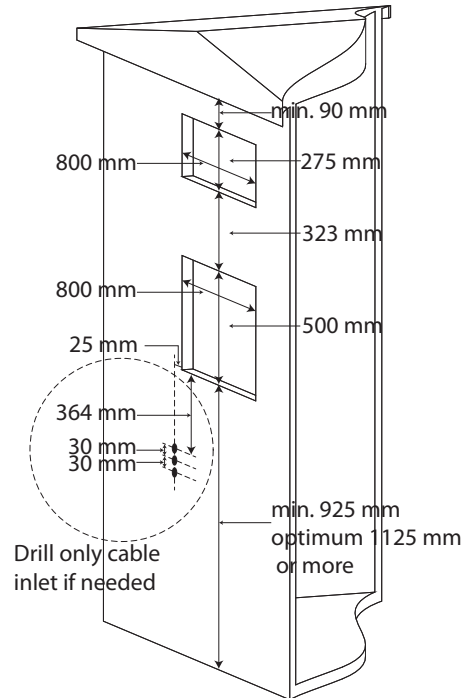


Fig. 8

Mount bracket

Fasten the frame to the wall, with minimum 8 pcs. appropriate screws

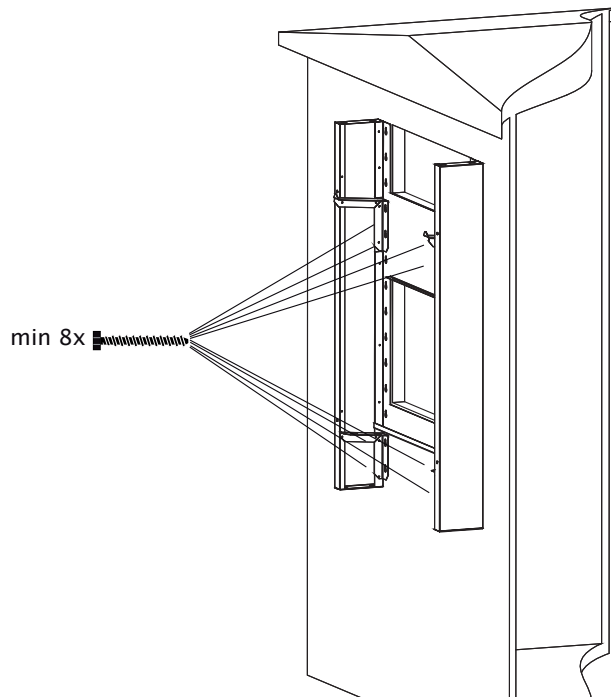


Fig. 9

Installation, continued

Mounting unit onto bracket Place the unit onto the bracket by means of a forklift or similar lifting device.

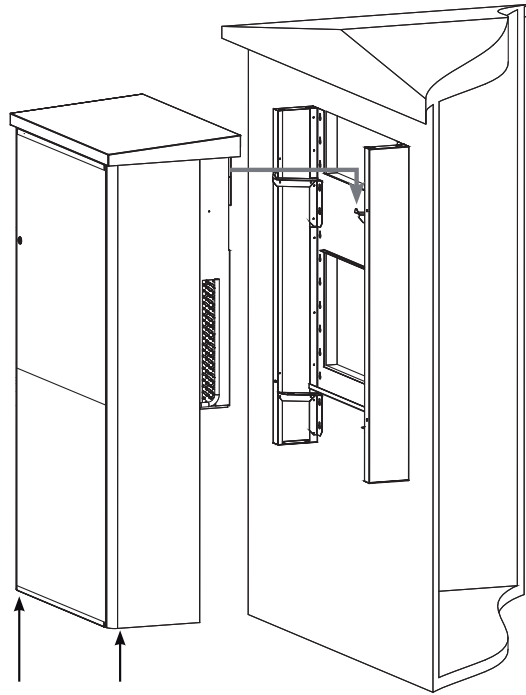


Fig. 10

Secure and seal Mount the four bolts, securing the unit to the frame, and seal the edges between unit and wall according illustration

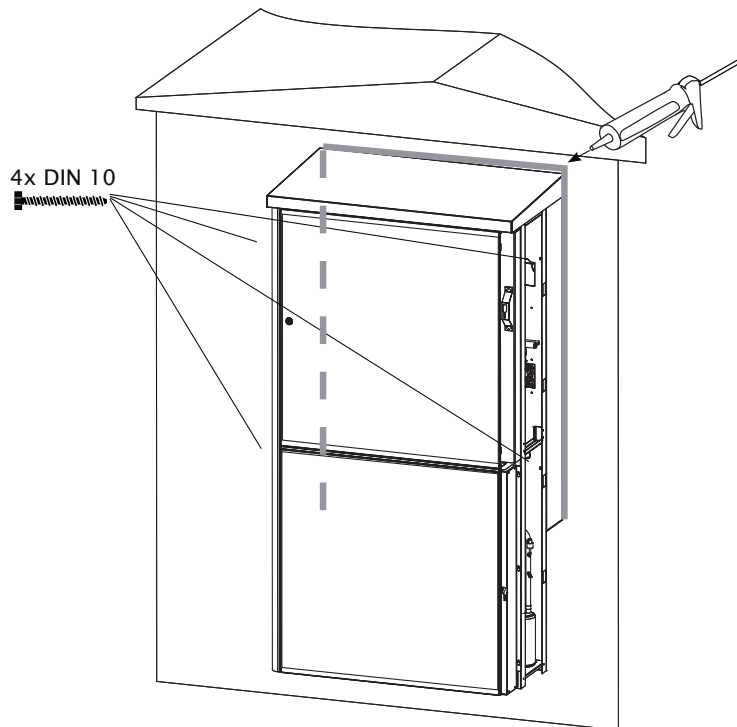


Fig. 11

Installation, continued

Indoor sensor

Route the room sensor to an indoor location, where the temperature wants to be controlled. Please make sure the sensor isn't blocked or touching any metal, and isn't placed in the air stream coming from the ComboCooler.

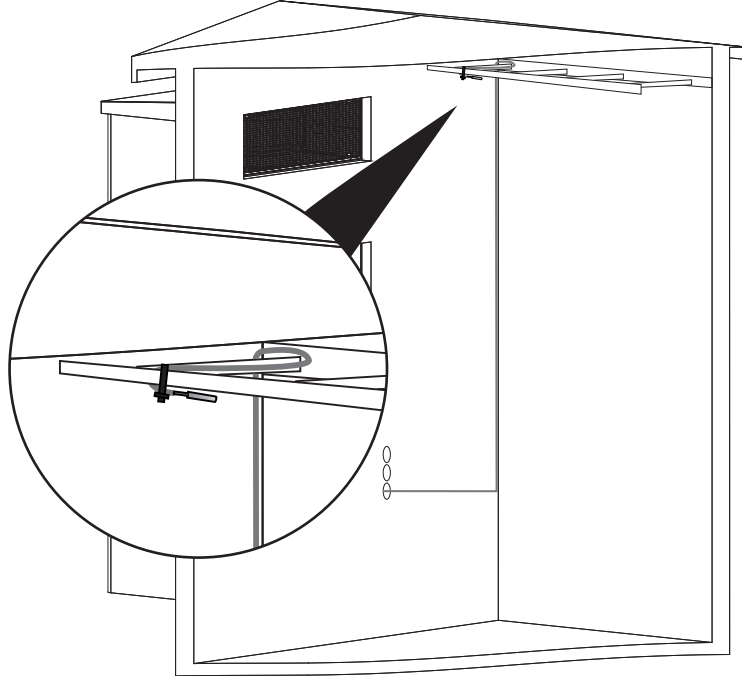


Fig. 12

Route and secure cables

Please pull cables from inside, through wall opening, and following the path shown.

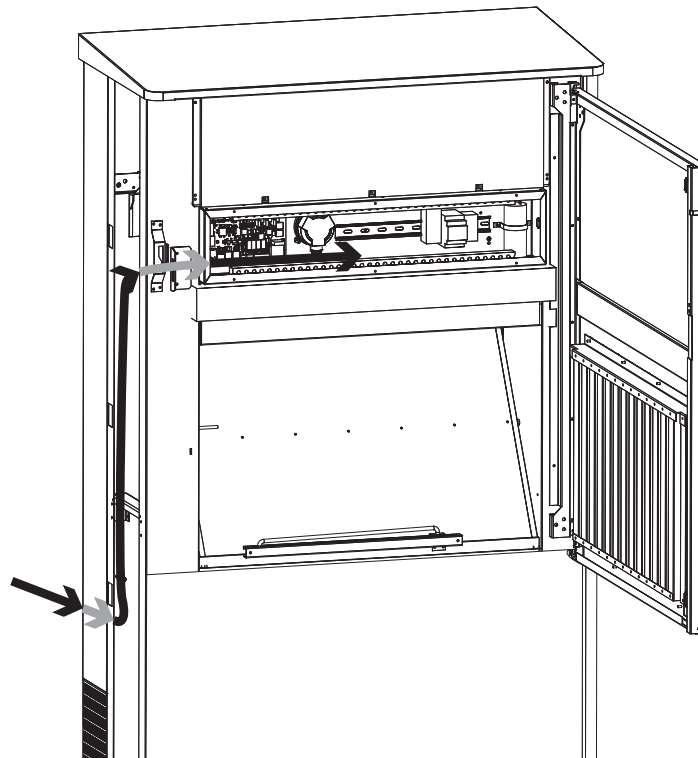


Fig. 13

Electrical connections

External connections

This below illustration shows the pin assignment for connections:

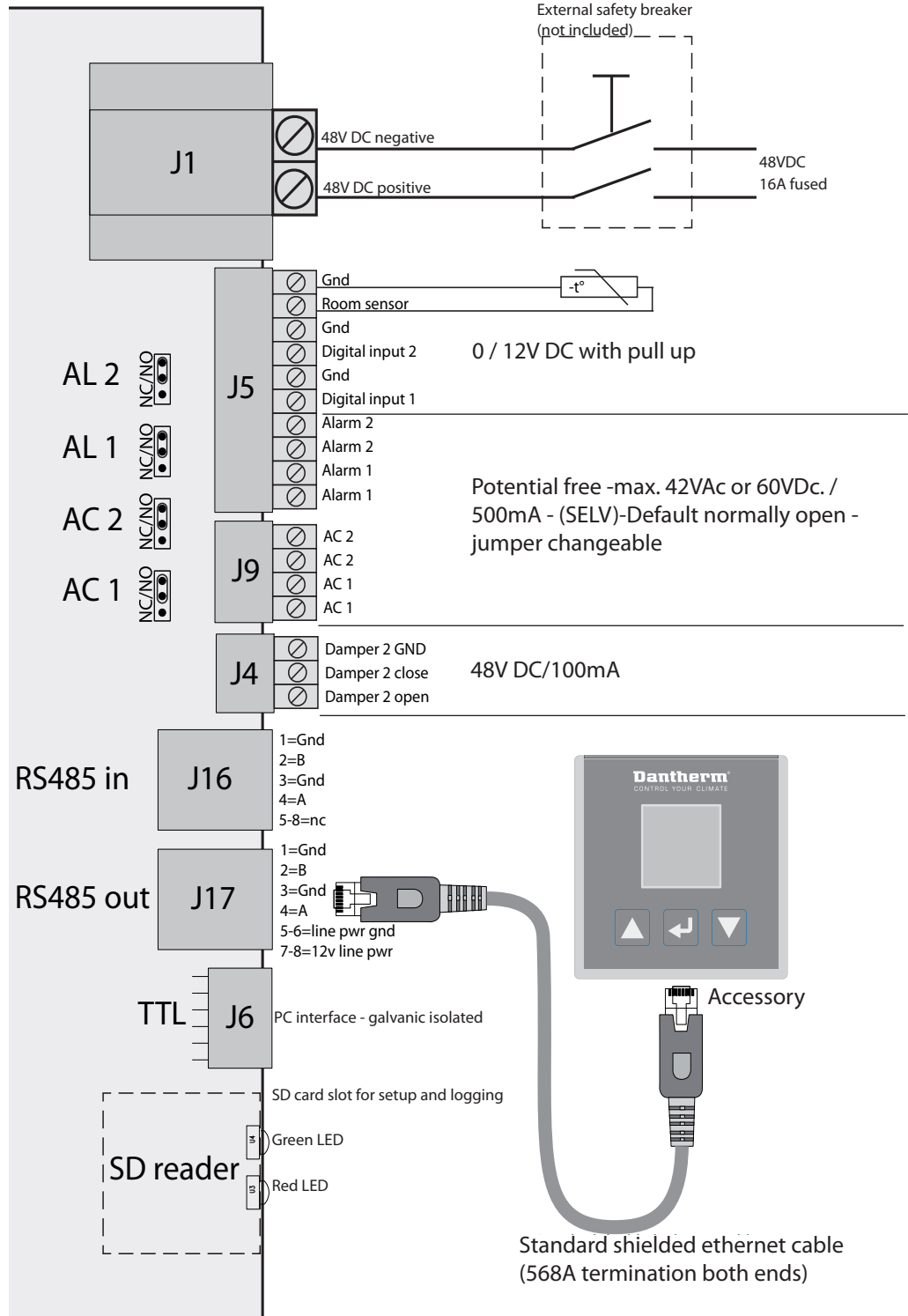


Fig. 14

Electrical connections, continued

Connection description

This below table describes in details the connections on "Fig. 14" on page 17, used when connecting external items.

Input	Description
J1 –power input	The power supply input accepts 40-60V DC and has an isolated potential to earth (cabinet parts). This means that the input even accepts -48V DC. Just connect positive to positive, and negative to negative. The input needs external connected 16A circuit breaker. If input is below 40V DC the unit stops operation, and goes into power save mode, in order to prioritize power to the telecom services. Power save mode can activate an alarm.
J5 -room sensor	Temperature sensor input supporting NTC resister type: Vishay NT-CLE100E3272GB0. Resistance: 8790Ω @ 0°C. / 3372Ω @ +20°C. / 1439Ω @ +40°C.
J5- digital input	For use with external dry contacts (max.10mA @ 12V). Input is configurable to "Normally open" or "Normally closed" by changing parameters. This input can force a specific operation, for instance shutting down the cooling system, and close the damper in case of a fire.
J5- alarm 1 / 2 outputs	Dry contact, rated 0,5A@60Vdc – "Normally Open" or "Normally closed" jumper changeable. Operation alarms can be routed in the SW parameters list, to either output 1 or 2.
J5 – AC 1 / 2	Dry contact, rated 0,5A@60Vdc – "Normally Open" or "Normally closed" jumper changeable for connecting external air conditioners Examples of usage, see
J15 – HEAT	J15 is located on the rear edge of the PCB. Toggles from 0Vdc to 40-60Vdc / 300mA max
J4 - damper 2	The damper output feeds the damper motor with 40-60Vdc/ max. 100mA
J16 / 17 - RS 485	RS485 – RTU Modbus. J17 can supply the Dantherm display unit with power. Communication data: baud rate - 9600 data bits - 8 parity - none stop bits - 1 flow control - none The MODBUS device ID can be set in the parameter list.
J6 – TTL	TTL to PC interface. Used to change parameters in real time Communication data: baud rate - 9600 data bits - 8 parity - none stop bits - 1 flow control - none
SD card reader	For uploading new parameter set. Supports up to 32GB SD card

Alarm out

Introduction

In order to create the correct functionality on any hardwired alarm/digital in connections, the corresponding parameter, needs to be set up correct.

Alarm out routing

After connecting the wires to the output terminals, please enter the parameter setting through the SD card. See more in section "SD card" on page 1111

Under the system, control configuration menu you will find these settings:

Alarm Mapping	1.Alarm1	2.Alarm2
1.Pwr Save Mode [PSM] [0/1]:	1	0
2.Room Temp H/L [THL] [0/1]:	1	0
3.Fan 1 [F1] [0/1]:	1	0
4.Fan 2 [F2] [0/1]:	0	0
5.Fan 3 [F3] [0/1]:	0	0
6.Onbrd. Sens [OS] [0/1]:	0	0
7.Room Sens [RS] [0/1]:	1	0
8.Amb. Sens [AS] [0/1]:	1	0
9.Supp. Sens [SS] [0/1]:	0	0
10.Cond. Sens [CS] [0/1]:	0	0
11.Digi.1 I/P [FIL] [0/1]:	0	0
12.Digi.2 I/P [FI] [0/1]:	0	0
13.Door Xtch I/P [DI] [0/1]:	0	0
14.Filt Grd I/P [FI] [0/1]:	0	1
15.Phase I/P [FI] [0/1]:	0	0

In these default values above, its shown that:

- The filter guard is routed to activate alarm 2 output
- Selected other alarms are routed to alarm 1 output.

Changing alarm routing

If any of the alarms need to be changed, please follow the for SD card usability guide in section "SD card" on page 11

If the default "normally open" alarm state is to be changed to "normally closed", please locate and change the jumper illustrated in section "External connections" on page 17

Digital inputs

Digital input

After connecting of the wires, to the input terminals, please initiate parameter settings through SD card.

Both digital inputs can control and force a certain operation or request. These are some of the possibilities:

- Shutting down in case of a fire.
- Shutting down in case of service inside the shelter.
- Route other alarms from external equipment (FX AC unit) through the digital input to the controllers alarm output
- Force external heat on/off
- Force external AC on/off

In all configuration menu sections, the digital input functionality is controllable.

Cooling Fan Configuration	Fan 1	Fan 2	Fan 3
18.Override - Digi.1	[x/0-100]: 0	:x	:x
19.Override - Digi.2	[x/0-100]: x	:x	:0

In these default values three option exist:

- Parameter X=doesn't change the current operation statew
- Parameter 0=force OFF (e.g. in case of fire)
- Parameter 1-100 =force duty cycle to a value between 1-100

The setting for normally open or normally closed for the inputs is set in the "configure system parameter" section in the parameters file as well.

15.Dig.1 NO/NC Type	[Dig1][0/1]: 0
16.Dig.2 NO/NC Type	[Dig2][0/1]: 0

Operation errors

Introduction

To prevent damaging the cooling system, as well as protect the radio equipment installed into the enclosure, the unit has a real time protection system, that runs permanently.

Error handling

Any detected operation error will:

- Flashes the red LED located next to the SD card interface.
- Activate any alarm output, according parameter setting and normally open/close (no/nc) jumper
- Be displayed on any connected RS 485 display
- Be logged on the SD card if available in the SD card reader when alarm is present

Error code list

This table shows the error according the shown "E" code:

Code	Error cause
1	Power save Mode [PSM]
2	Room Temp H/L [THL]
3	Fan 1 [F1]
4	Fan 2 [F2]
5	Fan 3 [F3]
6	On board Sensor [OS]
7	Room Sensor [RS]
8	Ambient sensor [AS]
9	Supply sensor [SS]
10	Condenser sensor [CS]
11	Digital input1 [D1]
12	Digital input2 [D2]
13	Door Xtch I/P [DX]
14	Filt Grd I/P [FI]
15	Phase I/P [FI]

Service Guide

Preventative maintenance

Introduction

Preventive maintenance has to be carried out to:

- Continues operation in specified range
- Avoid malfunctions
- Avoid inefficient operation
- Maximize the unit's lifetime

The factory warranty is only valid if documented preventive maintenance has been carried out, with an time interval of:

- Maximum 6 months when unit is located in normal air quality environment
- Maximum 2 months when unit is located in bad quality air environment

A written log at site is adequate documentation for preventive maintenance.

Caution



- Switch off AC and DC supply before working on the unit
 - Make sure that all work has been performed correctly before switching power back on
-

Scope of maintenance

Any maintenance should always be carried out by a qualified personnel, and the following main points should be checked and carried out.

No.	Description
1	Free cooling filter check/replace
2	Cleaning of AC components
3	Error code readout and correction if needed.
4	Final inspection of selected parts

Cleaning

Free cooling maintenance

Filter should be changed if it shows sign of degeneration or clogging. Please notice that the unit is equipped with a pressure differential switch indicating that the filter has a pressure drop of 150Pa, equal to 2/3 of capacity used.

To change filter please follow below procedure

Step	Action
1	Open upper inspection door (Use the supplied triangular key)
3	Release the filter frame by pulling towards yourself, and the frame will release the filter
4	Exchange the filter, and re-assamble.

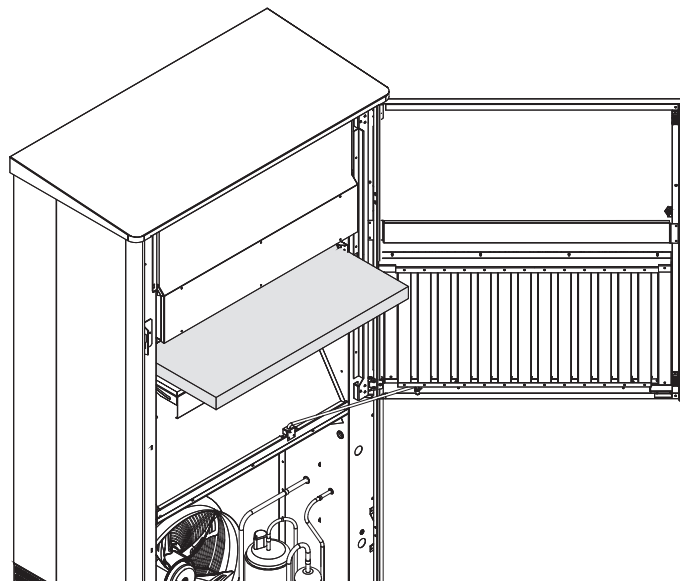


Fig. 15

Cleaning of AC

The unit must be cleaned according to the recommended preventive maintenance plan.

Tools required:

- Vacuum cleaner or compressed air
- Soft brush
- TX20 screwdriver
- AC cleaning agent if it's very dirty

Phase	Description
1	Open the units outdoor doors, both upper and lower, and remove the lower condenser grill.
2	Vacuum the condenser and indoor evaporator coils
3	Vacuum the condenser and evaporator fans
4	IF the coils are still dirty, please apply AC cleaning agent on coil fins, and after 5 minutes rinse gently with water, WITHOUT spraying water on any electrical parts
5	Perform end inspection according list below

Inspection

Inspection

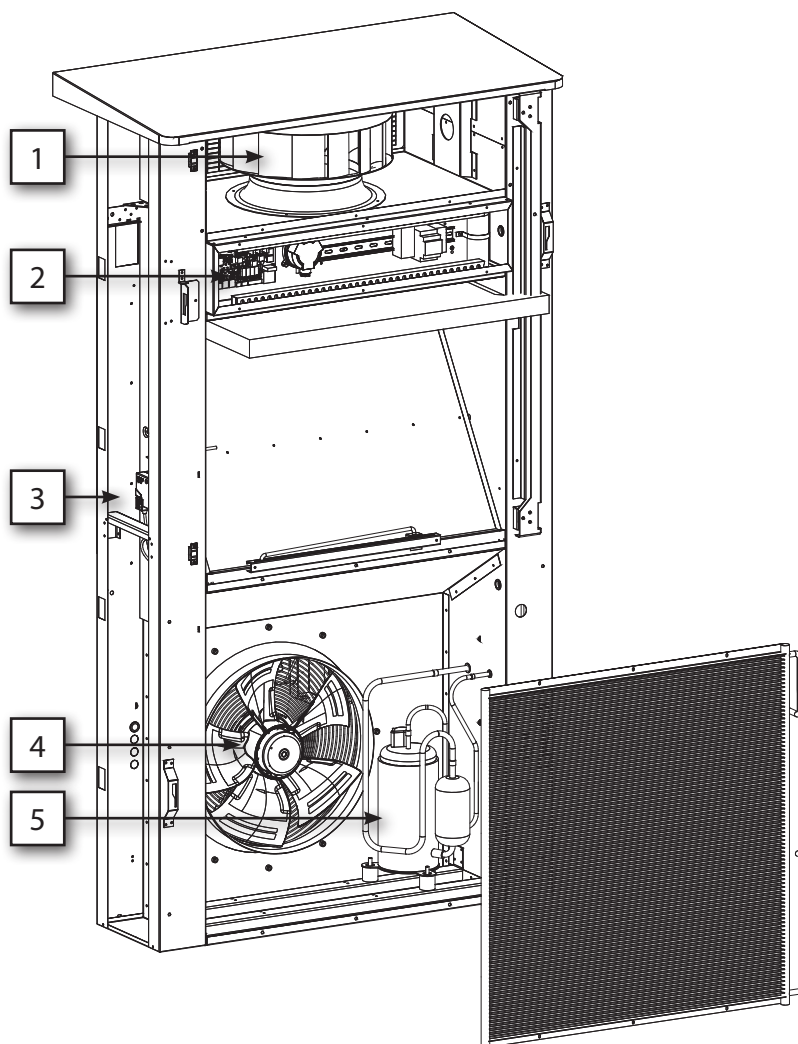
The unit must be inspected prior to any reassemble and put back into service.
Please follow below steps

Phase	Description
1	Are the fans clean and free of any corrosion?
2	Are the coolant pipes free of obstructions, damage, corrosion and show no obvious signs of leakage?
3	Are the coil lamellas clean and undamaged?
4	Are all fan blades free of any obstructions, cracks or missing blades?
5	When rotating the fans with the fingers, do the fans rotate freely, without vibrations and noise?
6	Is all wiring and insulation undamaged?
7	Are all connectors secured properly and in good conditions?
8	Are Damper clean and free of any corrosion
9	Are filter clean and free of obstructions and show no obvious sign of damage?

Spareparts

Illustration

This illustrates all available spareparts.



Spare parts list

Pos.	Description	Order no.
1	Evaporator fan	012848
2	CC4 controller	075255
3	Damper motor 48V DC	075254
4	Condenser fan 230V AC - EC type	075250
5	Compressor 1-phase 230V AC 50Hz	220470
na	RS 485 external display module	075210

Technical data

Overall specification This below table, shows the units main specifications.

Dimensions, weight & mounting		
Unit dimensions (height×width×depth)	mm	1997 x 1072 x 527
Single packing dimensions (height×width×depth) (wooden package)	mm	2180*1145*660
Net weight	kg	200
Single package weight incl. unit	Kg	230
Mounting method		Separate frame
Controller location/interface		RS485 ModBus and USB serial
Environmental protection & performance		
Operational temperature range	°C	-33°C - 55°C
Storage temperature	°C	-40°C – 80°C
Storage relative humidity	RH	0-99
Noise level, outside 2m distance at 27°C internal and 35°C ambient	dB(A)	64
IP rating (EN 60529)	IP Class 2	IP 55
Refrigerant / amount	Kg	R410a /2,3
Expected service life		10 years
Cooling capacity & operational data (230V/50Hz)		
Cooling capacity at 27°C internal and 35°C ambient (sensible)	W	7115
Free cooling capacity (48VDC)	W/K	900
Internal airflow at air conditioning	m ³ /h	800-1840
External airflow at air conditioning	m ³ /h	800-3500
Free cooling airflow	m ³ /h	800-2700
Power consumption at 27°C internal and 35°C am-bient	W	2245
Power consumption, free cooling at 35°C internal and 25°C ambient	W	Max. 450 (48VDC)
Power, frequency & range		
Input voltage range	VAC VDC	230 (197-253) 48 (40-60)
Frequency	Hz	50
Startup current without softstart (compressor LRA)	A	63
Key components		
Compressor		GMCC Rotary
Controller		CC4
Fans		EBM Papst EC/DC
Sheet metal parts		Aluzink
Colour	RAL	7035/7015

Continued overleaf

Technical data, continued

Cable and breaker This table shows the cable and circuit breaker specification

Voltage	230V/50Hz.	48V DC
Circuit Breaker	16A	16A
Wire Size	2,5mm ² /12AWG	2,5mm ² /12AWG

Dimension These illustrations shows the units dimensions in millimetres

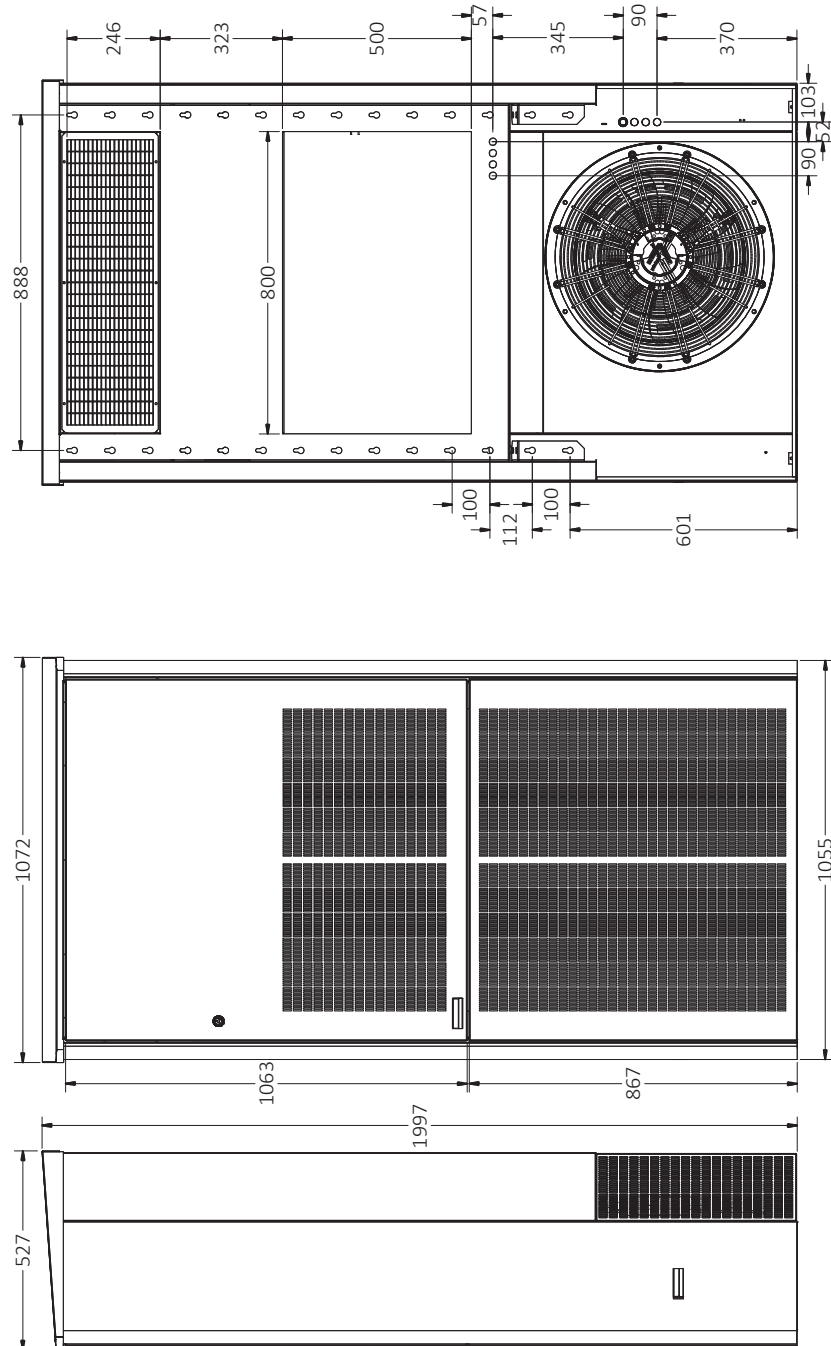


Fig. 16

Technical data, continued

Dimensions in Inch. These illustrations shows the units dimensions in inch.

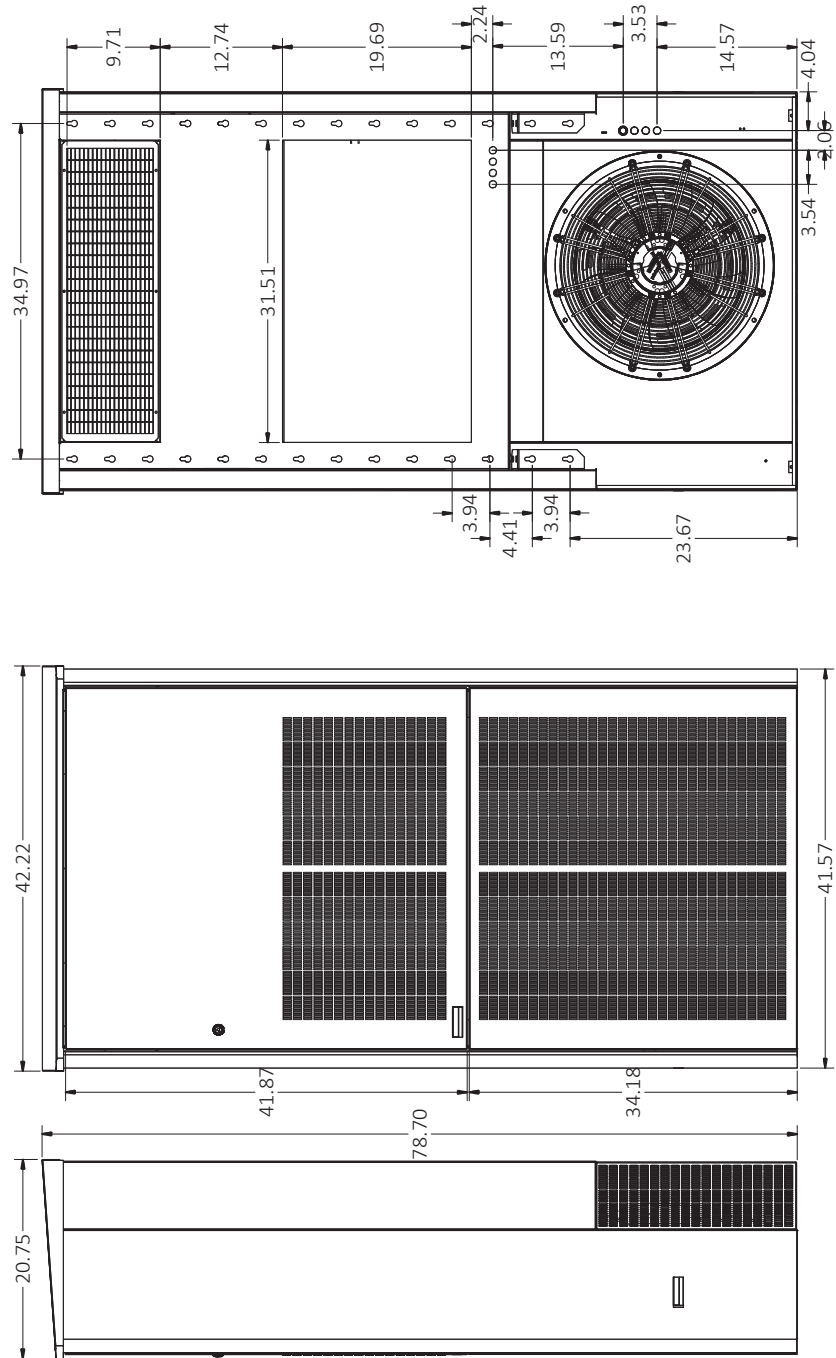


Fig. 17

Declaration of Conformity

**Declaration of
Conformity**



Dantherm hereby, declare that the unit mentioned below:
No.: 367506 Type: ComboCooler 6000/600 complies with the following directives:

2006/42/EC	Directive on the Safety of Machines
2006/95/EC	Low Voltage Directive
2004/108/EC	EU EMC Directive (December 2004)
97/23/EEC	The Pressure Equipment Directive
2004/12/EC	Packing Directive

- and are manufactured in conformity with the following standards:

EN ISO 12100-1	Machine safety
EN 60 950-1	Electrical machinery safety
EN 60 335-1	Low voltage
EN 60 335-2-40	Low voltage particular requirements for electrical heat pumps, air-conditioners and dehumidifiers
EN 61000-6-2	Immunity(industrial environments)
EN 61000-6-3	Emission (residential, commercial and light-industrial environments)
EN 50 106	Safety for electrical machinery (Particular rules for routine tests)
IEC 60529	IP Rating According to IEC
ETSI EN 300-019-1-2	Transportation shock
ETSI EN 300-019-1-4	Operation shock

Skive, 02.12.2014

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