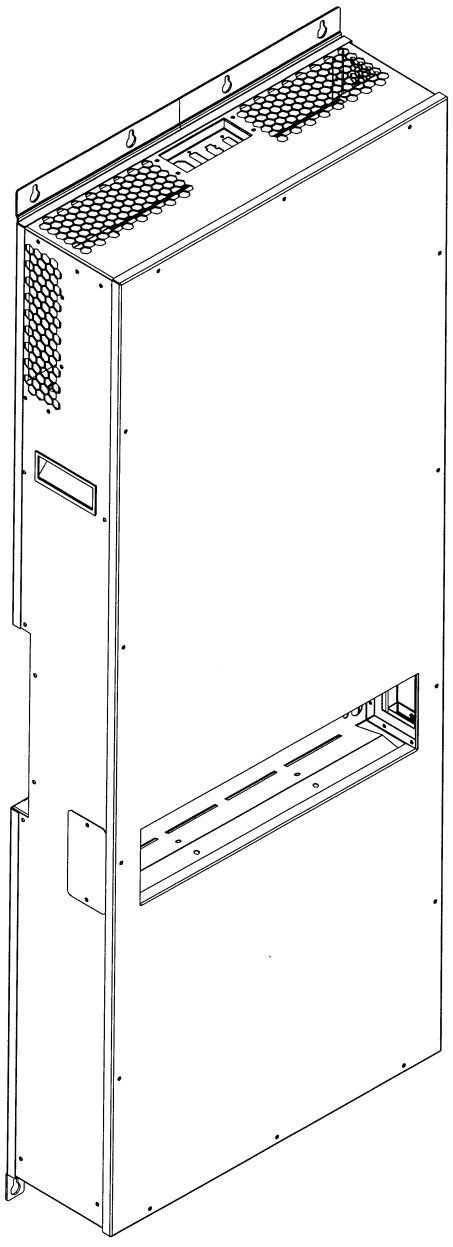
Service Manual
MEAC 1100



Dantherm HMS A/S

Service Manual for MEAC 1100

Overview

Introduction

The target group for this Service Manual are the engineers who install and maintain the MEAC 1100 unit. The manual covers a functional description, replacement of parts as well as how to carry out preventive maintenance. The manual covers all of the Danline versions.

Usage

The MEAC 1100 unit is especially designed for cooling of electronic equipment and for door installation. The unit requires access to ambient air through slots on the unit. The unit must under no conditions be used for other purposes and should be installed and placed according to the instructions in this manual.

Contents

The manual covers the following topics:

Copyright

Part Number

The part number of this service manual is 016169.

Changes

This manual are subject to changes without notice.

Continued on the next page

Overview, *continued*

Declaration of conformity

This is the declaration of conformity valid for MEAC 1100.

CE

Declaration of Conformity

for Machinery

Dantherm HMS A/S
Marienlystvej 65
DK - 7800 Skive
Tel.: +45 96 14 37 00
Fax: +45 96 14 38 00

Declaration of following product:

Product name: MEAC 1100
Product No.: 352935

The product is 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 is manufactured in conformity with the following harmonised standard:

EN 292	Machine safety
EN 60 335-1	Low Voltage
EN 60 335-2	Low Voltage
EN 61 000-2	Immunity
EN 61 000-3	Emission

Skive 13.06.2003
Place and date

Claus Munkholm
Project manager

Per Albæk
Managing director

Formular QLM 93 rev. F

Functional description

Overview

Introduction

This section describes how the MEAC 1100 unit works as well as the cooling and control strategy.

Content

This section covers the following topics:

General introduction

Description

The air-conditioner, MEAC 1100, is developed and prepared for use in a cabinet mounted on the door of the cabinet. The unit can be installed in both left- and right hand side of the cabinet, which is making the unit very flexible.

The warm air in at the upper region of the cabinet is forced through an evaporator by use of a DC-fan. The cooled air is then supplied back to the cabinet.

The main outlet is at the front of the air-conditioner. The flexible design means that the air-conditioner is prepared for additional supplies at the opening in either left side or the right side.

If installed in a cabinet with 2 doors the side opening towards the centre of the cabinet must always be open and the opening at the hinge side must always be closed with the cover/lid supplied with the air-conditioner.

220-230VAC and 48VDC power the air-conditioner. A minimum heat load of 300W must be present in the cabinet in order to avoid condensation of humid air.

Graphic illustration

Illustration

This illustration shows the function of the unit.

Designation	Temp	[°C]	Up	Down	[°C]	Temp	Designation
Condenser Fan switch on step II (230 VAC)	Cond.	57			57		
		54			54	Cond.	Condenser Fan step I (180 VAC)
		50			50		
High temperature alarm	Return	45			45	Return	High temperature alarm off
Internal fan runs full speed 2800 rpm	Return	42			42	Return	Internal fan ramps down
Condenser fan step I (180 VAC) Compressor start after 1 minute	Return	35			35		
		25			25		Compressor off Condenser fan off 1 minute later
Internal fan ramps up	Return	20			20		Internal fan idle 1600 rpm
Heater off	Return	15			15		
		10			10	Return	Heater on
Internal fan idle 1600 rpm		-20			-20		
Internal fan runs continuously as long as the unit is powered							

Error handling

Introduction

The MEAC 1100 unit is equipped with an alarm relay. The two alarm wires are normally short-circuited. See “Description of connections – External connections” for details on wiring.

Alarm causes

The alarm is activated in case of:

- Low temperature (less than 0°C)
- High temperature (higher than 45°C)
- Compressor fault (no current consumption)
- Internal fan fault (no rotation)
- DC supply missing
- Control board fault

Test facility

Introduction

A test is initiated immediately after switching on the MEAC 1100 unit. This test is divided into steps as described below.

Test table

This table describes the steps in the test.

Step	Action	Duration
1	Unit off.	20 seconds
2	Alarm output active.	10 seconds
3	Internal fan running.	20 seconds
4	Internal fan running and heater active.	20 seconds
5	External fan running at speed 1.	20 seconds
6	External fan running at speed 2.	20 seconds
7	External fan running at speed 1 and compressor active.	30 seconds
8	Unit off.	20 seconds

Communication options

Introduction

The MEAC 1100 is equipped with a RS232 connection in order to communicate with a PC. See “Description of connections – External connections” for details on wiring.

PC interface

A PC test software is developed for the MEAC 1100 unit. This software enables the user to see details during a test.

Description of connections

Overview

Introduction

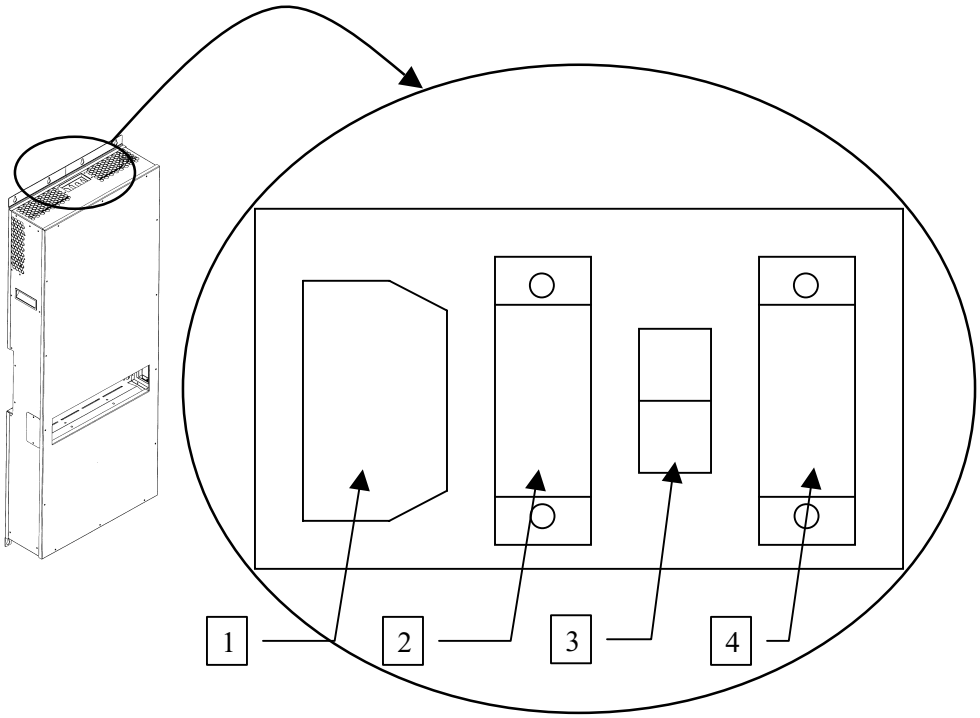
This section describes the functions of the indicators as well as connection points to the control board.

Contents

External connections

Introduction This section describes the external connections to the unit

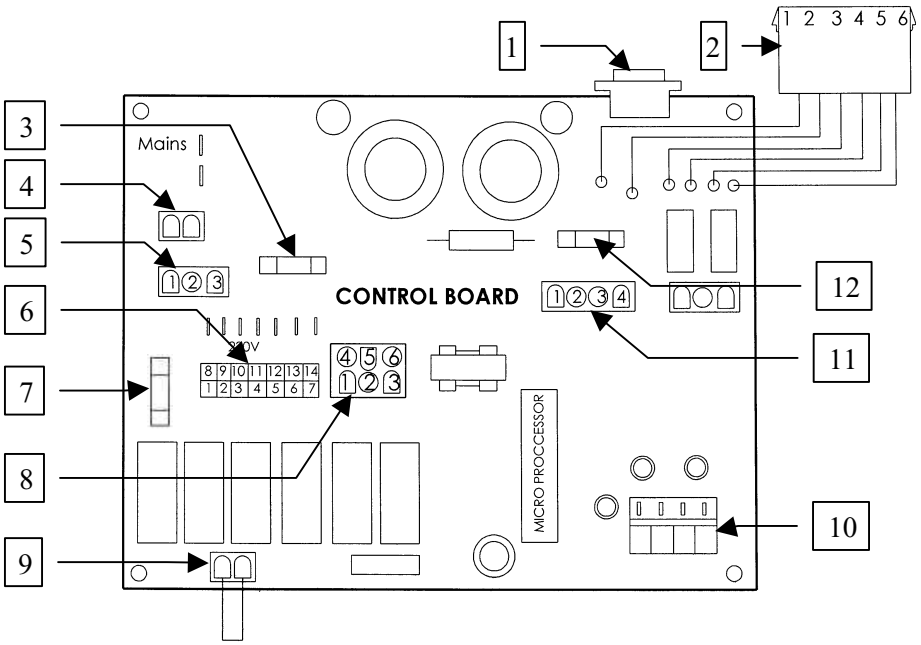
Illustration



Number	Connector type	Usage
1	Male 3 pol IEC	230V AC mains supply
2	Male 3 pol SUB-D	48V DC mains supply
3	Male 2 pol Mate'n lock	Alarm
4	Female 9 pol SUB-D	PC communication

Internal connections and fuses on the control board

Illustration This illustrates the connections and fuses on the control board.



Number	Description
1	Connector for communication with PC.
2	Connector for 48V DC, alarms and heater relay.
3	Fuse, 6.3A, for AC main power.
4	Connector for the running capacitor.
5	Connector for the external fan.
6	Connector for the transformer.
7	Fuse, 3.15A, for the external fan.
8	Connector for compressor and HP/LP pressostat.
9	Mandatory interconnection.
10	Terminal row for temperature sensor.
11	Connector for internal fan.
12	Fuse, 6.3A, for internal fan.

Mounting and connecting

Overview

Introduction

This section describes in details how to mount and connect the unit.

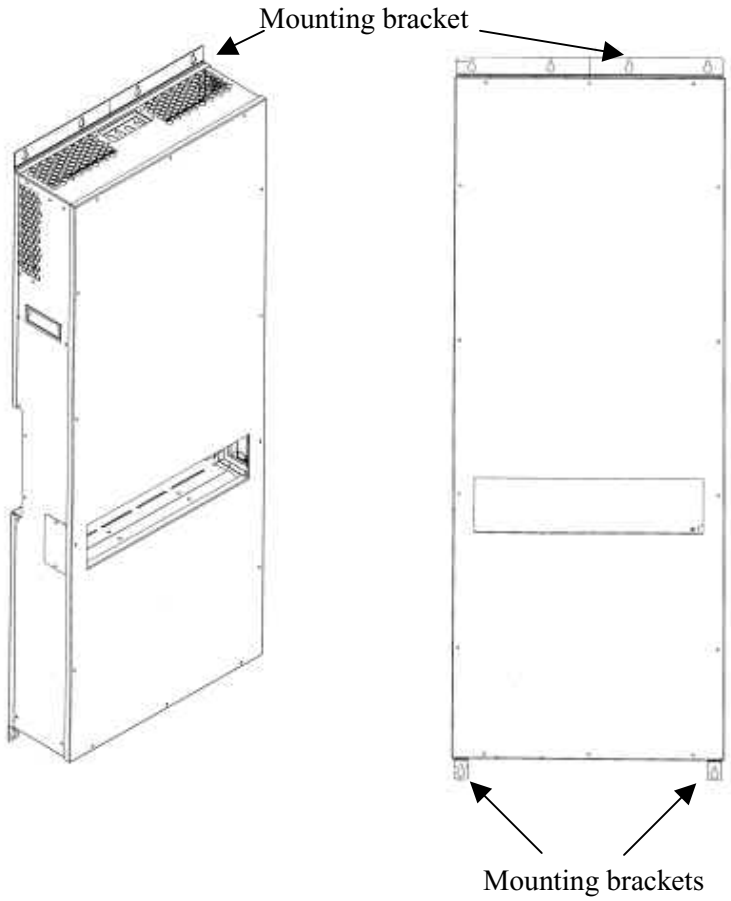
Contents

This section contains the following topics:

How to mount the unit

Introduction This section describes how to mount the unit.

Illustration This illustration shows the unit and mounting brackets



Procedure This procedure describes how to mount the unit

Step	Action
1	Screw in the top screws without tightning them.
2	Hang the unit on the screws using the keyholes on the top mouting bracket. Make sure that the gasket is in place.
3	Srew in the bottom screws without tightning them.
4	Tighten all the screws.

How to connect the unit

Introduction

The MEAC 1100 unit is equipped with connectors for easy installation.

Connection

The connection of the unit is done via the connectors in the top of the unit. Please see “Description of connections – External connections” for details on the connectors.

Preventive maintenance

Overview

Introduction

This section describes how the preventive maintenance must be performed. The reason for performing preventive maintenance is minimising the number of breakdowns and maximise the lifetime of the climate unit and electronic equipment.

Content

This section contains the following topic:

How to perform preventive maintenance

Introduction

The air conditioner contains moving mechanical parts. Also the units are often placed in rough environments, with high temperatures, humidity and dirt. To keep the air conditioner fit to meet the specifications, preventive maintenance has to be carried out.

Caution!

Do not start work on the unit before both the DC and AC supply are safely switched off. Do not switch it on before all the work has been performed and the unit is ready for the computer test.

Necessary tools

When performing preventive maintenance the following tools should be used:

Use a…	To…
Vacuum cleaner or compressed air	Carefully clean the unit
Soft bristle brush	Remove dirt that the vacuum cleaner or compressed air could not remove
Screwdriver and torx	Tighten loose screws

Interval

Like a car the units needs to be maintained at regular intervals to prevent an overheated situation causing the electronic to shut down. The lack of maintenance could also cause pollution to the environment.

The interval between the preventive visits should not exceed 6 month. The planning of the visits should insure that a visit is done before and after the hot season. This will insure that the air conditioner will be ready when the demand for cooling is high.

Condition for warranty

The factory warranty is only valid if documented preventive maintenance has been carried out with an interval of maximum 6 month.

Leaving the site

Before leaving the site, make sure that there are no alarms.

Continued on the next page

How to perform 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 off.
2	Clean the unit carefully: • Air ducts • Fans • Condenser and evaporator. The condenser should be cleaned by means of compressed air from the top and a vacuum cleaner from the bottom.
3	Perform the ”tasks” using the checklist.
4	Switch the unit on again.
5	Make sure that the unit performs corresponding to the start-up test specifications. See “Functional description - Test facility” for details.

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?		

Replacement of parts

Overview

Introduction

This is the parts covered in this manual:

- Internal fan
- External fan
- Control board
- Heater element
- EMC filter
- Running capacitor
- Transformer
- Temperature sensor

Table of contents

This section covers the following topics:

How to replace the internal fan

Introduction

The internal fan is placed behind the front cover of the MEAC 1100. The purpose is to circulate the air inside the cabinet. To achieve the necessary airflow the MEAC 1100 is equipped with a DC driven fan. The spare part is a complete fan box

When to replace

The internal fan only needs to be replaced when they are faulty.

Before you start

Before you start make sure that you have the following available:

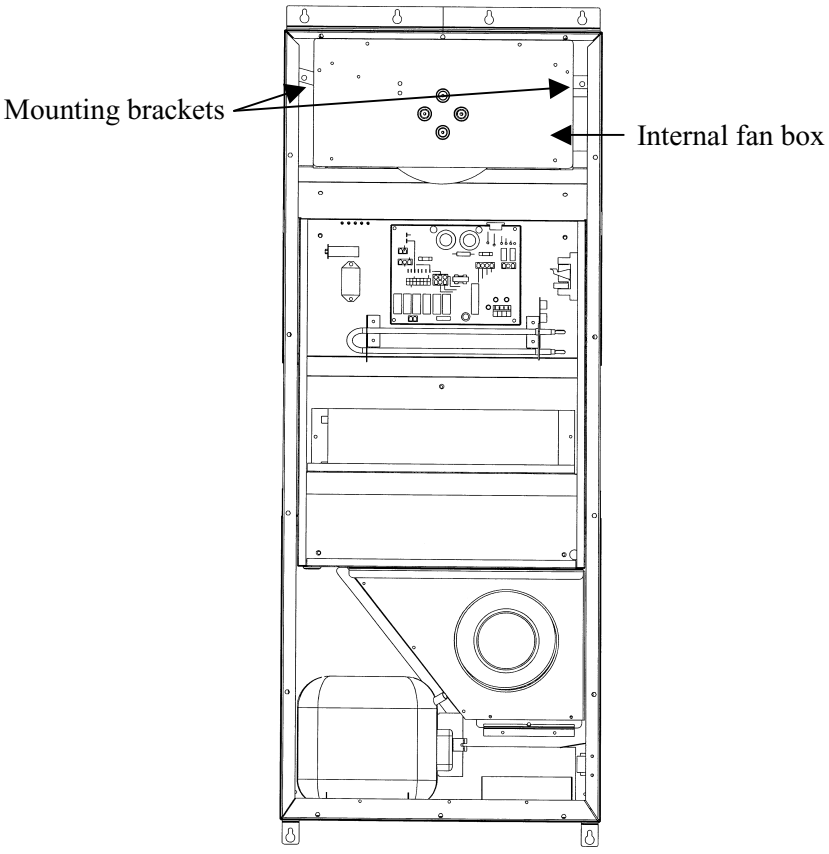
- A torx 20 screwdriver
- A new internal fan box. See “Dantherm spare part number’s” for details.

Caution!

Only trained and certified technicians is allowed to carry out the replacement of parts. Remember that **all power to the unit must be switched OFF or disconnected before starting any service work on the unit.**

Illustration

This illustrates where the fan is located:



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How to replace the internal fan, *continued*

Procedure Follow this procedure to replace the internal fan:

Step	Action
1	Switch off all power to the unit
2	Unscrew the 14 torx 20 screws that holds the front cover in place and remove it.
3	Unplug the fan.
4	Insert the screwdriver in the holes in the mounting brackets and force them upwards.
5	Remove the fan box by pulling it straight out.
6	Mount the new fan box by performing step 2-5 in reverse order. Make sure that the fan is safely mounted in the brackets.
7	Switch on power again.
8	Make sure that the unit performs corresponding to the start-up test specifications. See “Functional description - Test facility” for details.

How to replace the external fan

Introduction

The purpose of the external fan is to remove surplus heat from the condenser during active cooling. To achieve the necessary airflow the MEAC 1100 is equipped with an AC driven fan. The spare part is a complete fan box.

When to replace

The external fan only needs to be replaced when they are faulty.

Before you start

Before you start make sure that you have the following available:

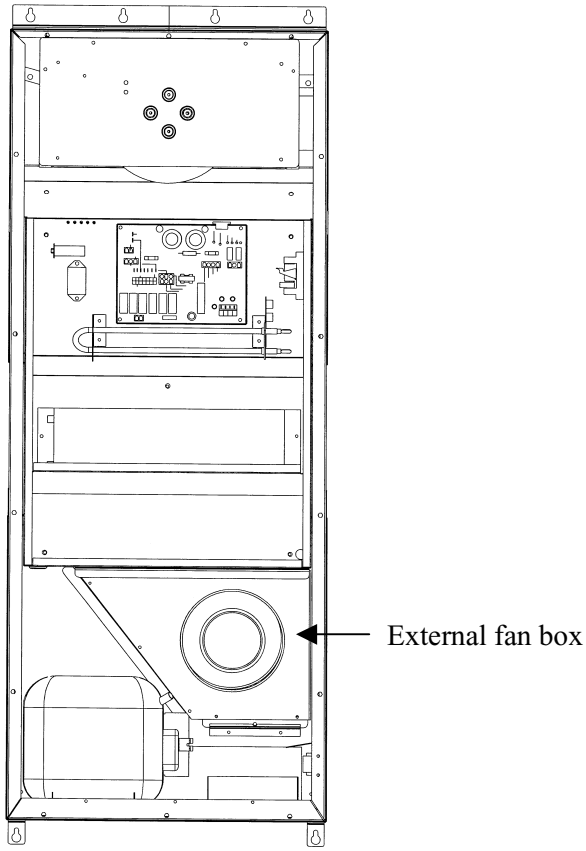
- A torx 20 screwdriver
- A new external fan box. See “Dantherm spare part number’s” for details.

Caution!

Only trained and certified technicians is allowed to carry out the replacement of parts. Remember that **all power to the unit must be switched OFF or disconnected before starting any service work on the unit.**

Illustration

This illustrates where the fan is located:



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How to replace the external fan, *continued*

Procedure Follow this procedure to replace the external fan:

Step	Action
1	Switch off all power to the unit
2	Unscrew the 14 torx 20 screws that holds the front cover in place and remove it.
3	Unplug the fan.
4	Remove the fan box by tilting it forward while pulling outwards.
5	Mount the new fan box by performing step 2-4 in reverse order. Make sure that the fan is safely mounted in the brackets.
6	Switch on power again.
7	Making sure that the unit performs corresponding to the start-up test specifications. See “Functional description - Test facility” for details.

How to replace the control board

Introduction The purpose of the control boards is to control the function of the unit.

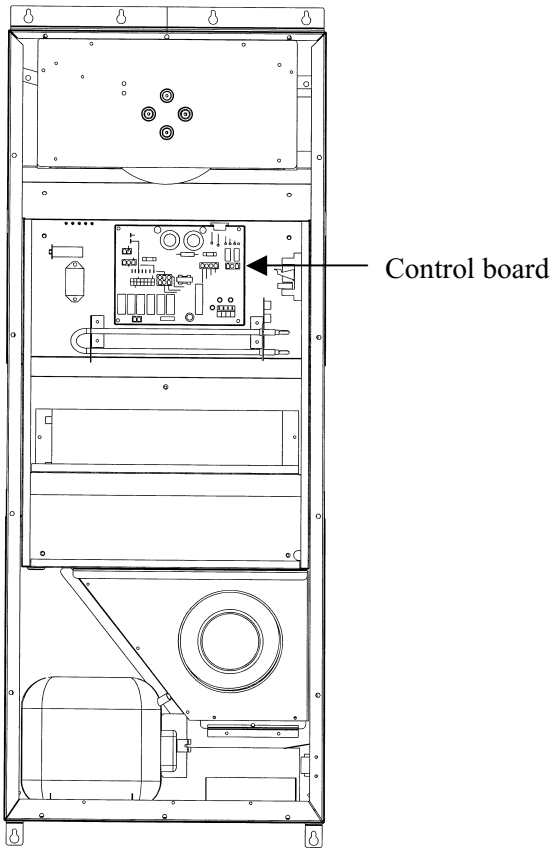
When to replace The control board only needs to be replaced when it is faulty.

Before you start Before you start make sure that you have the following available:

- A torx 20 screwdriver
- A PZ 2 screwdriver
- A small straight-point screwdriver
- A new control board. See “Dantherm spare part number’s” for details.

Caution! Only trained and certified technicians is allowed to carry out the replacement of parts. Remember that **all power to the unit must be switched OFF or disconnected before starting any service work on the unit.**

Illustration This illustrates where the control board is located:



Continued on the next page

How to replace the control board, *continued*

Procedure Follow this procedure to replace the control board:

Step	Action
1	Switch off all power to the unit
2	Unscrew the 14 torx 20 screws that holds the front cover in place and remove it.
3	Unplug the connectors to the Control board. All of the connectors are unique.
4	Unscrew the 2 wires connected to the screw terminal row on the bottom left side of the control board.
5	Remove the control board by unscrewing the 4 PZ2 screws.
6	Mount the new fan box by performing step 2-4 in reverse order. Make sure that the fan is safely mounted in the brackets.
7	Switch on power again.
8	Making sure that the unit performs corresponding to the start-up test specifications. See “Functional description - Test facility” for details.

How to replace the heater element

Introduction The purpose of the heater elements is to keep the temperature on an adequate level at low ambient temperatures.

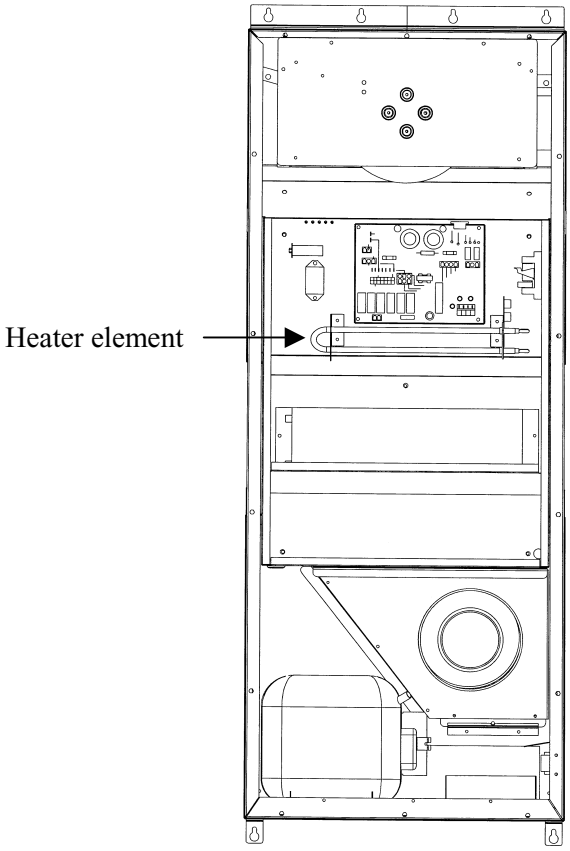
When to replace The heater element only needs to be replaced when it is faulty.

Before you start Before you start make sure that you have the following available:

- A torx 20 screwdriver
- A PZ 2 screwdriver
- A new heater element. See “Dantherm spare part number’s” for details.

Caution! Only trained and certified technicians is allowed to carry out the replacement of parts. Remember that **all power to the unit must be switched OFF or disconnected before starting any service work on the unit.**

Illustration This illustrates where the heater element is located:



Continued on the next page

How to replace the heater element, *continued*

Procedure Follow this procedure to replace the heater element:

Step	Action
1	Switch off all power to the unit
2	Unscrew the 14 torx 20 screws that holds the front cover in place and remove it.
3	Unplug the connectors to the heater element.
4	Unscrew the PZ2 screw holding the heater element in place.
5	Remove the heater element.
6	Mount the new heater element by performing step 2-4 in reverse order.
7	Switch on power again.
8	Make sure that the unit performs corresponding to the start-up test specifications. See “Functional description - Test facility” for details.

How to replace the EMC filter

Introduction The purpose of the EMC filter is to avoid EMC related interference.

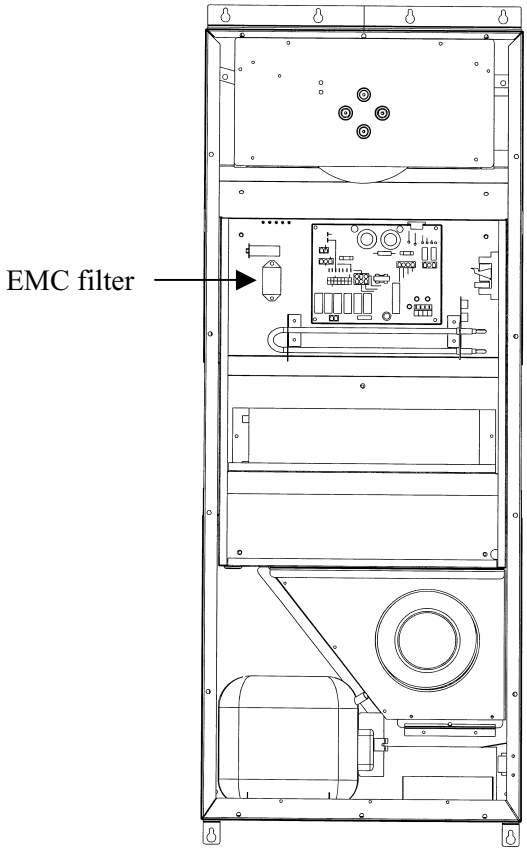
When to replace The EMC filter only needs to be replaced when it is faulty.

Before you start Before you start make sure that you have the following available:

- A torx 20 screwdriver
- A PZ 2 screwdriver
- A new EMC filter. See “Dantherm spare part number’s” for details.

Caution! Only trained and certified technicians is allowed to carry out the replacement of parts. Remember that **all power to the unit must be switched OFF or disconnected before starting any service work on the unit.**

Illustration This illustrates where the EMC filter is located:



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How to replace the EMC filter, *continued*

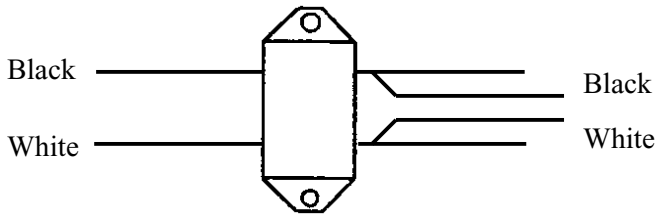
Procedure

Follow this procedure to replace the EMC filter:

Step	Action
1	Switch off all power to the unit
2	Unscrew the 14 torx 20 screws that holds the front cover in place and remove it.
3	Unplug the connectors to the EMC filter.
4	Unscrew the 2 PZ2 screws holding the EMC filter in place.
5	Remove the EMC filter.
6	Mount the new EMC filter by performing step 2-4 in reverse order.
7	Switch on power again.
8	Make sure that the unit performs corresponding to the start-up test specifications. See “Functional description - Test facility” for details.

Wiring

This illustrates the wiring of the EMC filter.



How to replace the running capacitor

Introduction The purpose of the running capacitor is to enable the compressor to run while using a single phase power supply.

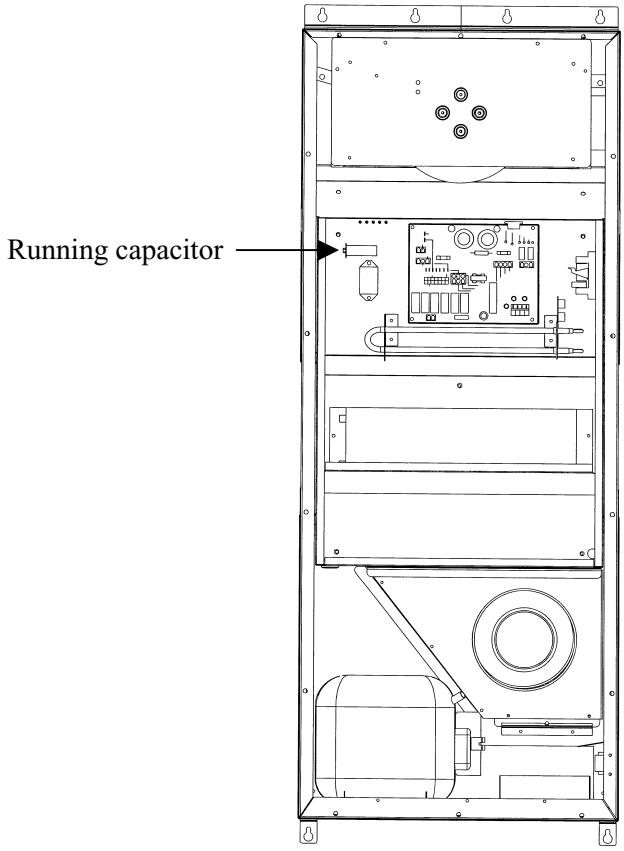
When to replace The running capacitor only needs to be replaced when it is faulty.

Before you start Before you start make sure that you have the following available:

- A torx 20 screwdriver
- A 13 mm spanner or an adjustable spanner.
- A new EMC filter. See “Dantherm spare part number’s” for details.

Caution! Only trained and certified technicians is allowed to carry out the replacement of parts. Remember that **all power to the unit must be switched OFF or disconnected before starting any service work on the unit.**

Illustration This illustrates where the running capacitor is located:



Continued on the next page

How to replace the running capacitor, *continued*

Procedure Follow this procedure to replace the running capacitor:

Step	Action
1	Switch off all power to the unit
2	Unscrew the 14 torx 20 screws that holds the front cover in place and remove it.
3	Unplug the connectors to the running capacitor.
4	Unscrew the 13 mm nut holding the running capacitor in place.
5	Remove the running capacitor.
6	Mount the new running capacitor by performing step 2-4 in reverse order.
7	Switch on power again.
8	Make sure that the unit performs corresponding to the start-up test specifications. See “Functional description - Test facility” for details.

How to replace the transformer

Introduction The purpose of the transformer is to supply the external fan.

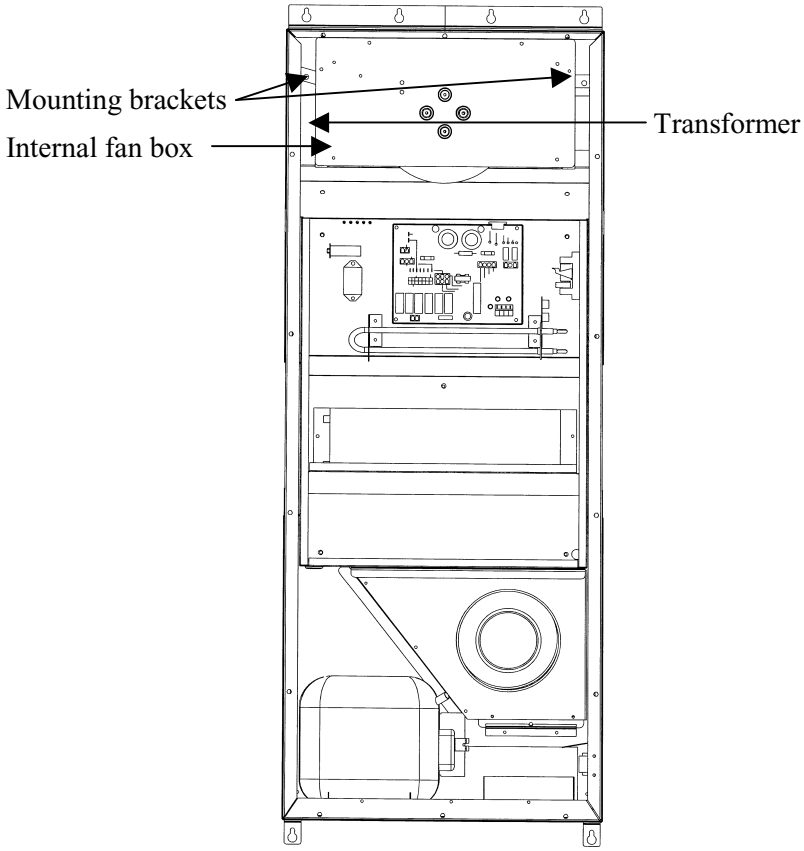
When to replace The transformer only needs to be replaced when it is faulty.

Before you start Before you start make sure that you have the following available:

- A torx 20 screwdriver
- A PZ2 screwdriver.
- A new EMC filter. See “Dantherm spare part number’s” for details.

Caution! Only trained and certified technicians is allowed to carry out the replacement of parts. Remember that **all power to the unit must be switched OFF or disconnected before starting any service work on the unit.**

Illustration This illustrates where the running transformer is located:



Continued on the next page

How to replace the transformer, *continued*

Procedure Follow this procedure to replace the transformer:

Step	Action
1	Switch off all power to the unit.
2	Unscrew the 14 torx 20 screws that holds the front cover in place and remove it.
3	Unplug the fan.
4	Insert the screwdriver in the holes in the mounting brackets and force them upwards.
5	Remove the fan box by pulling it straight out.
6	Unplug the connector to the transformer.
7	Unscrew the PZ2 screw holding the transformer in place.
8	Remove the transformer.
9	Mount the new transformer by performing step 6-8 in reverse order.
10	Mount the internal fan by performing 3-5 in reverse order.
11	Switch on power again.
12	Make sure that the unit performs corresponding to the start-up test specifications. See “Functional description - Test facility” for details.

How to replace the temperature sensor

Introduction

Two temperature sensors are present: A temperature sensor for supply air and one for the refrigerant in the condenser. The supply air temperature sensor is located on the control board, meaning that only the condenser temperature sensor is replaceable.

When to replace

The temperature sensor only needs to be replaced when it is faulty.

Before you start

Before you start make sure that you have the following available:

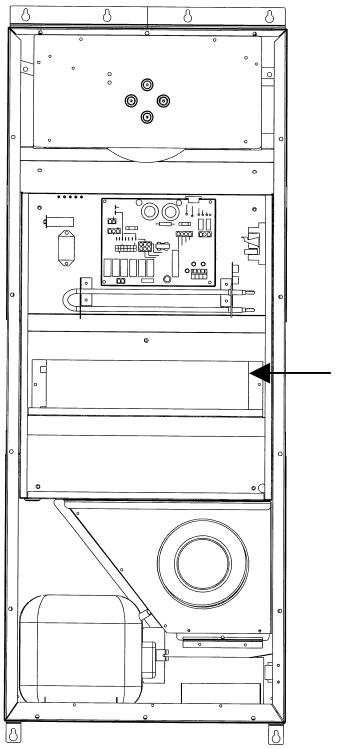
- A torx 20 screwdriver
- A small straight-point screwdriver.
- A new temperature sensor. See “Dantherm spare part number’s” for details.

Caution!

Only trained and certified technicians is allowed to carry out the replacement of parts. Remember that **all power to the unit must be switched OFF or disconnected before starting any service work on the unit.**

Illustration

This illustrates where the temperature sensor is located:



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How to replace the temperature sensor, *continued*

Procedure Follow this procedure to replace the temperature sensor:

Step	Action
1	Switch off all power to the unit.
2	Unscrew the 14 torx 20 screws that holds the front cover in place and remove it.
3	Dismount the wires on the control board. See “Connections – Internal connections and fuses on the control board” for details.
4	Remove the temperature sensor.
5	Mount the new temperature sensor by performing step 2-4 in reverse order.
6	Switch on power again.
7	Make sure that the unit performs corresponding to the start-up test specifications. See “Functional description - Test facility” for details.

Specifications

Overview

Introduction

This section contains the specifications of the MEAC 1100 unit.

Content

This section is divided in the following topics.

Technical data for MEAC 1100

Introduction

The technical data for MEAC 1100 is described in this section. Further details can be obtained be contacting Dantherm HMS A/S.

Performance

This table shows the performance of MEAC 1100 unit.

Specification	Data
Active cooling	1100 W
Internal flow	475 m^3/h
External flow	350 m^3/h
Heater	1000 W

Electrical

This table shows the electrical characteristics for the MEAC 1100 unit. The circuit breaker and cable dimensions is the recommended from Dantherm HMS A/S. Local rules may override this recommendation.

Specification		Data
Maximum power consumption	AC	1000 W
	DC	100 W
Circuit breaker	AC	13 A
	DC	6 A
Cable dimension	AC	3x1.5 mm^2
	DC	2x1.5 mm^2

Cabinet

This table shows the data of the cabinet.

Specification		Data
Dimensions of the unit only	Width	600 mm
	Depth	160 mm
	Height	1250 mm
Weight	Unit	48,5

Continued on the next page

Technical data for MEAC 1100, *continued*

Refrigerant This table shows the type and charge of refrigerant.

Specification		Data
Refrigirant	Type	R134a
	Charge	0,5 Kg

Operating range This table shows the operating range of the MEAC 1100 unit.

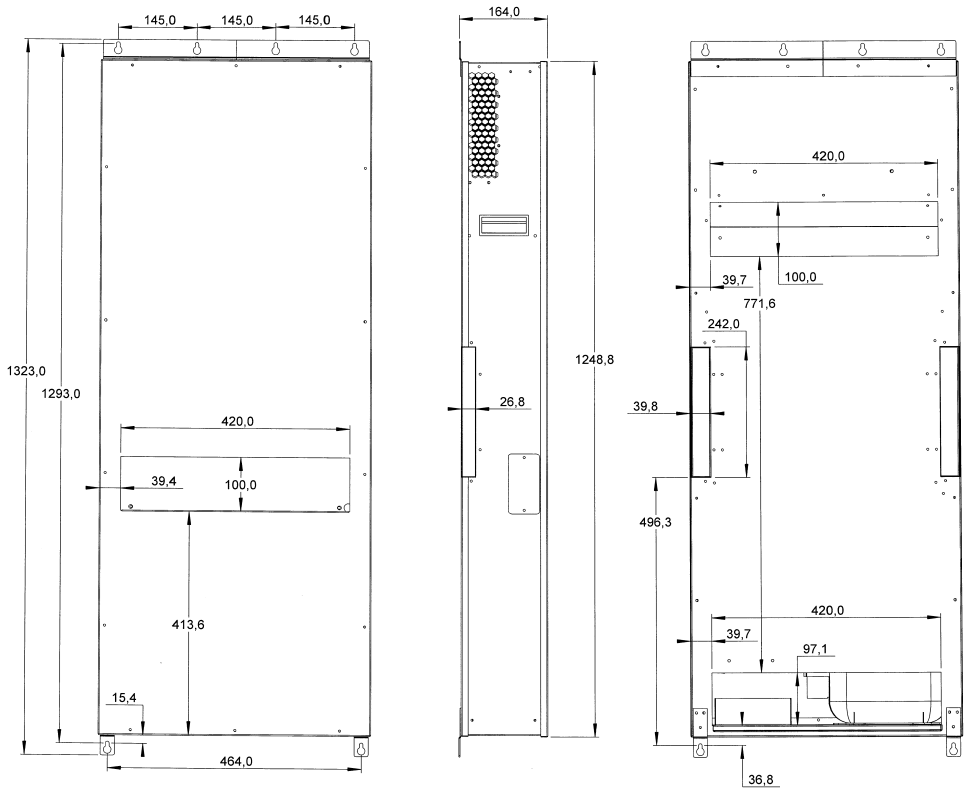
Specification		Data
Pressure		< 1400 m. altitude
Temperature	Minimum	-20°C
	Maximum	+45°C
Humidity	Minimum	20 %RH
	Maximum	95 %RH

Storage If the unit is stored in a warehouse the following conditions apply:

- Temperature range between - 30ºC to +45ºC.
- Relative humidity max. 80%

Dimensions

Drawing



Resistance of temperature sensors

Resistance table

The table shows the resistance of the sensor at a given temperature.

Temperature in Celsius	Resistance in Ohm	Temperature in Celsius	Resistance in Ohm	Temperature in Celsius	Resistance in Ohm
-40	90061	-8	13391	24	2821
-39	84325	-7	12694	25	2700
-38	78988	-6	12037	26	2584
-37	74021	-5	11418	27	2474
-36	69397	-4	10835	28	2369
-35	65089	-3	10284	29	2270
-34	61074	-2	9765	30	2175
-33	57331	-1	9275	31	2084
-32	53840	0	8812	32	1998
-31	50583	1	8375	33	1916
-30	47542	2	7963	34	1837
-29	44701	3	7572	35	1763
-28	42046	4	7204	36	1691
-27	39568	5	6855	37	1623
-26	37249	6	6525	38	1558
-25	35079	7	6213	39	1496
-24	33049	8	5918	40	1437
-23	31149	9	5638	41	1381
-22	29369	10	5375	42	1327
-21	27701	11	5122	43	1275
-20	26138	12	4884	44	1226
-19	24672	13	4659	45	1179
-18	23297	14	4445	46	1133
-17	22007	15	4242	47	1090
-16	20795	16	4050	48	1049
-15	19656	17	3867	49	1009
-14	18589	18	3694	50	972
-13	17585	19	3529	51	936
-12	16641	20	3373	52	901
-11	15753	21	3224	53	868
-10	14916	22	3083	54	836
-9	14132	23	2949	55	805

Recycling of the unit

Overview

Introduction This section was made in order to insure that the unit is recycled the right manner.

Contents

How to recycle the unit

Introduction

The air conditioner, heat exchanger or free cooling unit is designed to last for a number of years. When the time comes for the unit to be recycled, the following precautions should be taken to protect our environment.

Please note that the guidelines are general – local rules and procedures may overrule these guidelines and should be observed and followed carefully

Main components

The main components of the unit are:

- The cooling circuit including the compressor and the refrigerant liquid (only in air conditioners)
- The printed circuit boards (PCB's) with electronic components and connecting wires
- Fans
- Metal parts such as cover and air duct plates

Cooling circuit

When recycling an air conditioner, the **refrigerant** needs to be removed from the unit. Only certified cooling technicians with the necessary equipment may do this. The technicians should then pass the refrigerant to the local authorities for decomposition

The **compressor** contains oil. Precautions must be taken to prevent the oil from polluting our environment. The compressor should together with the **copper tubes** be left for recycling locally.

Printed circuit board (PCB)

It is common that a set of local rules is made for the recycling of **printed circuit boards** as well as connecting wires. Generally it is important to separate the metal parts from the wires and PCB's before recycling.

Fans

The **fan(s)** consist of plastic, metal and an internal PCB. They are subject to recycling and should be left to the local "cap dealer".

Metal parts

The **metal parts** are uncritical to recycle and can be left to local "scrap dealer". A few parts might have a thin visible layer of PVC-foam insulation. The PVC must be separated from the metal and recycled separately.

Dantherm spare part number’s

Overview

Introduction

This section contains the Dantherm spare part number’s to use when ordering replacement spare parts.

Content

Dantherm HMS A/S spare part number list

Spare part number's

Spare part	Order number
Running capacitor	296035
Internal fan box	296036
External fan box	296037
Control board	296038
Transformer	296039
EMC filter	296040
Heater element	296041
Temperature sensor	296027
Pressurestat (LP)	011660
Pressurestat (HP)	011661
Compressor	296043

Wiring diagram

Overview

Introduction This section contains the wiring diagram for MEAC 1100.

Content This section has the following topics.

Wiring diagram for MEAC 1100