Dantherm®

INSTALLATION MANUAL

for

Dehumidifier Type AF

INSTALLATION MANUAL AF

Contents

1. INTRODUCTION

Each unit in the Dantherm range of swimming pool dehumidifiers type AF consists of between two and six matching sections, depending on the type specified.

In the simplest configuration the system consists of a fan section and a dehumidifier section. The latter contains the compressor(s), evaporator coil, condenser coil, drip tray, filter and components for the control of the refrigeration system. An additional LPHW or electric heating coil can be included in this section, as can a water cooled condenser and fresh air intake damper.

In split systems there are normally six sections, two fan sections, condenser section, evaporator section, and two mixing sections, one with a single damper fitted and one with two dampers fitted. The condenser section can in addition be fitted with a LPHW or electric heating coil, a water cooled condenser and a fresh air filter. The evaporator section can have moisture eliminator plates fitted.

During installation the individual sections are assembled together, using the joining clamps and gaskets provided with the unit.

All sections are of a robust construction, with rigid corner sections and cross-members, allowing the side panels to be removed for ease of servicing, whilst retaining its original rigid strength. Individual components are fixed inside the cabinets on transverse rails, secured to the corner framework of the sections.

All cabinet parts are constructed from hot galvanised steel sheet.

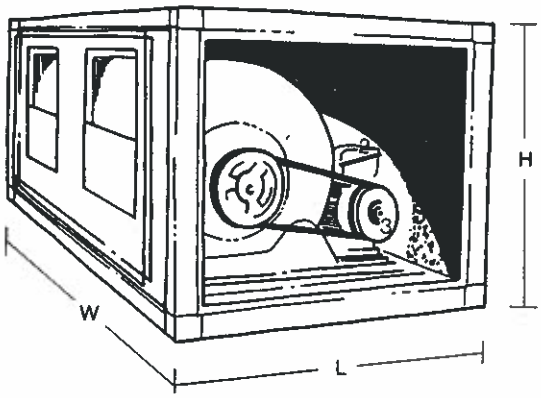
The electrical controls are fitted in a separate control panel which can be situated according to the customer's requirements. During installation electrical connection is made between the control panel and the terminal boxes on the individual sections of the unit.

2. DIMENSIONS & WEIGHTS

Dimensions and weights of the sections are detailed in the following data. All weights for the separate components must be added together to find the total loading weight.

Weights are only approximate as there can be variations to the components fitted. It is advised that a 10% allowance be added to the total weights for structural loading.

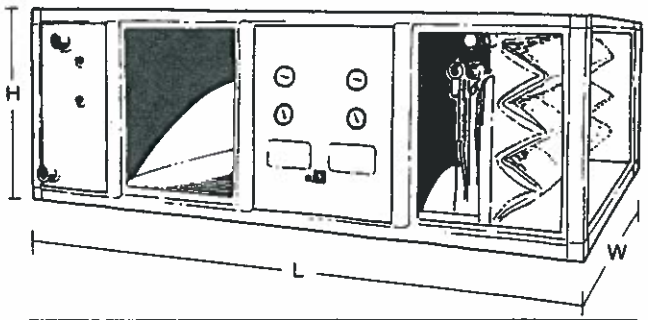
2.01. FAN SECTION



		A	B	C	CS	D	DS	E	ES
Dim.mm	H	660	710	710	710	810	810	1125	1125
	W	710	1125	1750	1750	2020	2020	2280	2280
	L	710	810	810	810	930	930	1125	1125
Weight kg		88	120	207	220	270	289	319	336

The weight shown is with standard single speed motor.

2.02. DEHUMIDIFIER SECTION - STANDARD

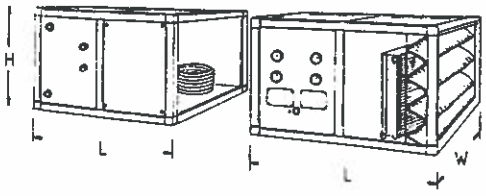


		A	B	C	CS	D	DS	E	ES
Dim.mm	H	660	710	710	710	810	810	1125	1125
	W	710	1125	1750	1750	2020	2020	2280	2280
	L	1915	1915	1915	1915	1915	1915	1915	1915
Weight kg		304	488	613	740	961	1158	1220	1485

The weight shown is for unit without heating coil. See section 2.04 for weight of heating coils.

The length shown is for unit without heating coil - if a heating coil is fitted add 350 mm to length.

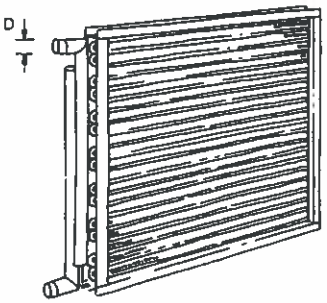
2.03. DEHUMIDIFIER SECTION - SPLIT



		A	B	C	CS	D	DS	E	ES
Dim.mm	H	660	710	710	710	810	810	1125	1125
	W	710	1125	1750	1750	2020	2020	2280	2280
	L	1265	1265	1265	1265	1265	1265	1265	1265
Weight evap. kg.		147	276	349	428	543	672	705	882
Weight cond. kg.		119	232	288	341	457	532	561	657

Weight for condenser section is shown without heating coil.

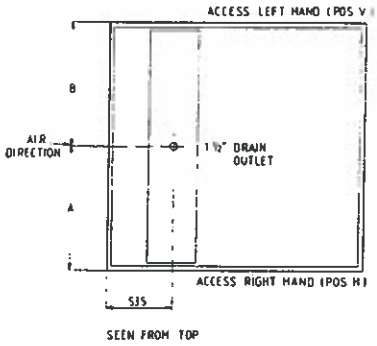
2.04. HEATING COILS



		A	B	C	CS	D	DS	E	ES
1 row	D"	0.50	0.75	1.00	1.00	1.00	1.00	1.25	1.25
	kg	5	9	15	15	21	21	36	36
2 row	D"	0.75	1.00	1.25	1.25	1.25	1.25	2.00	2.00
	kg	7	14	23	23	33	33	58	58
3 row	D"	1.00	1.25	1.50	1.50	2.00	2.00	2.00	2.00
	kg	9	17	29	29	42	42	72	72

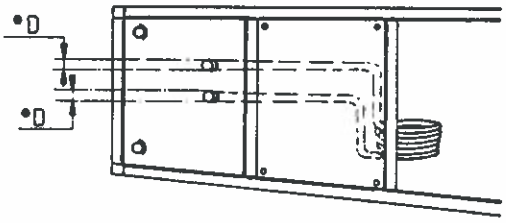
2.05. CONDENSATE DRAIN

The position of the drain connection is on the bottom of the unit, below the evaporator coil.



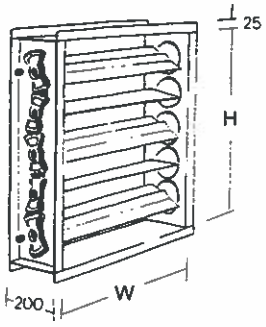
	A	B	C	CS	D	DS	E	ES
A mm	385	590	1000	1000	1125	1125	1290	1290
B mm	335	540	760	760	910	910	1000	1000

2.06. WATER COOLED CONDENSER



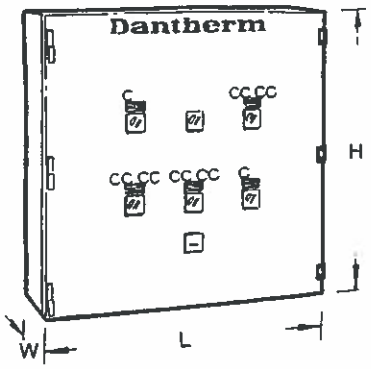
	A	B	C	CS	D	DS	E	ES
Water Conn. inch	.75	.75	.75	1.00	1.00	1.25	1.25	1.50
Weight kg	6	8	8	15	16	29	24	44

2.07. DAMPERS



		A	B	C	CS	D	DS	E	ES
	H	480	480	480	480	480	480	480	480
20% damper	W	530	530	530	530	530	530	530	530
Weight kg		13	13	13	13	13	13	13	13
	H	480	480	480	480	480	480	480	480
100% damper	W	530	945	1570	1570	1840	1840	2100	2100
Weight kg		13	21	34	34	47	47	75	75

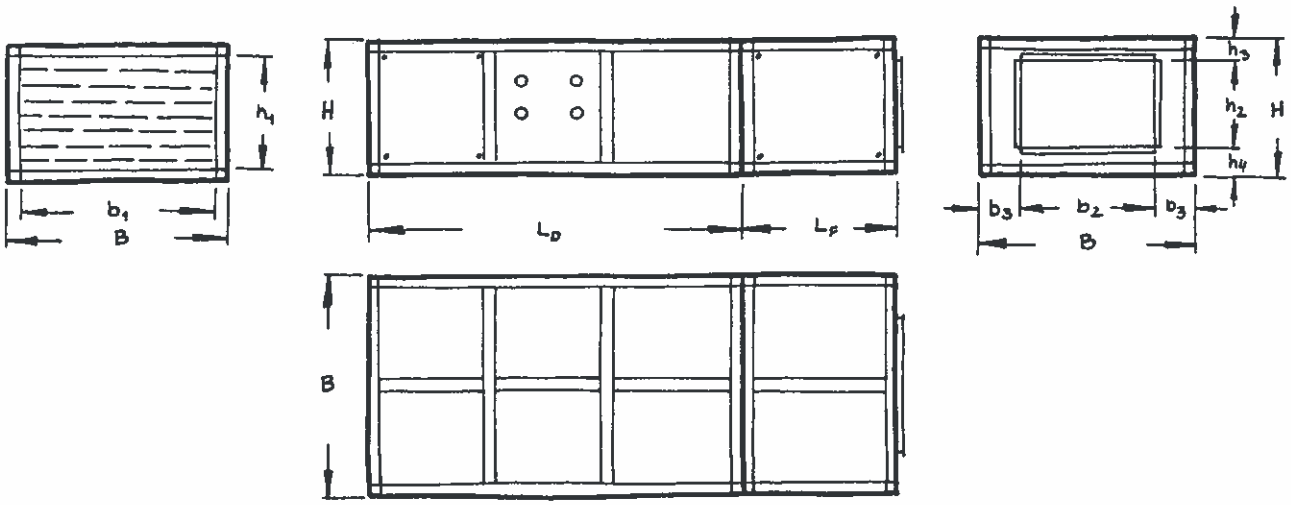
2.08. CONTROL PANEL



		A	B	C	CS	D	DS	E	ES
Dim mm	H	600	600	600	600	800	800	800	800
	W	400	400	400	400	600	600	600	600
	D	205	205	205	205	205	205	205	205
Weight kg		21	21	37	39	40	49	51	62

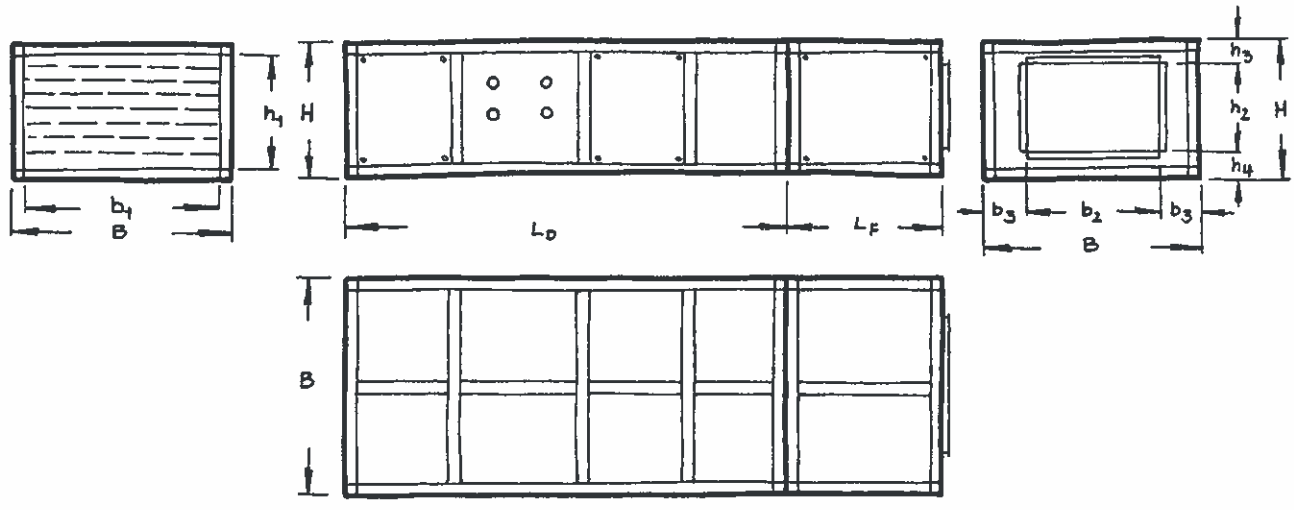
2.09. OVERALL DIMENSIONS

2.09.1. Standard System W/O Heating Coil

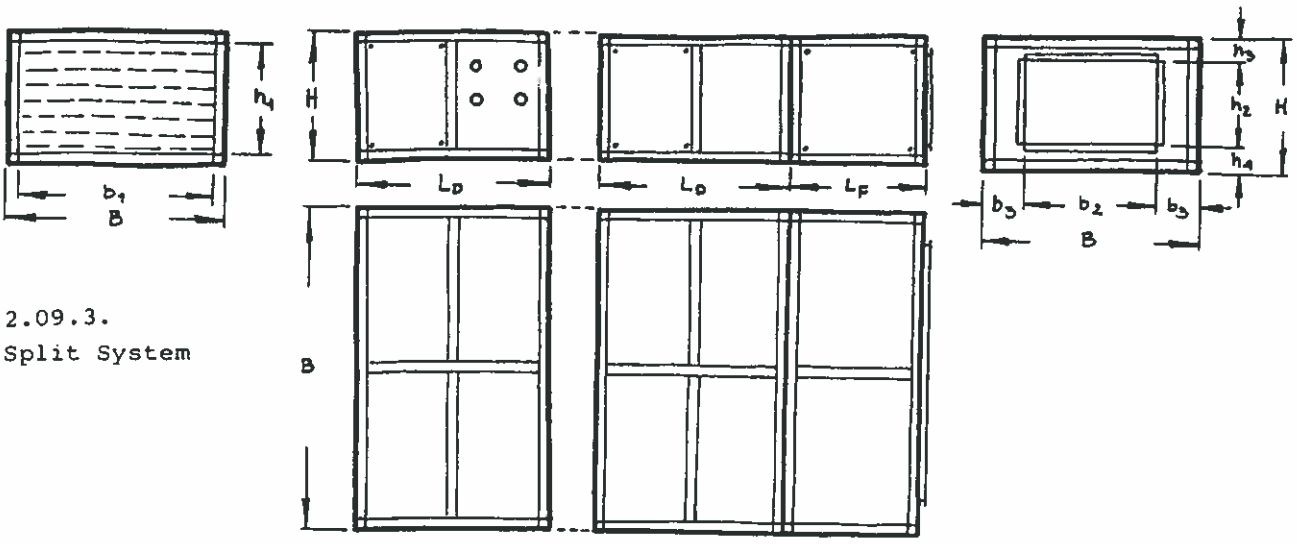


	A	B	C	C-S	D	D-S	E	E-S
L_D	1915	1915	1915	1915	1915	1915	1915	1915
L_F	710	810	810	810	930	930	1125	1125
H	660	710	710	710	810	810	1125	1125
h_1	530	580	580	580	680	680	995	995
h_2	350	450	450	450	600	600	800	800
h_3	135	115	115	115	85	85	145	145
h_4	175	145	145	145	125	125	180	180
B	710	1125	1750	1750	2020	2020	2280	2280
b_1	580	995	1620	1620	1890	1890	2150	2150
b_2	500	700	1500	1500	1600	1600	1800	1800
b_3	105	212	125	125	210	210	240	240

2.09.2. Standard System with Heating Coil

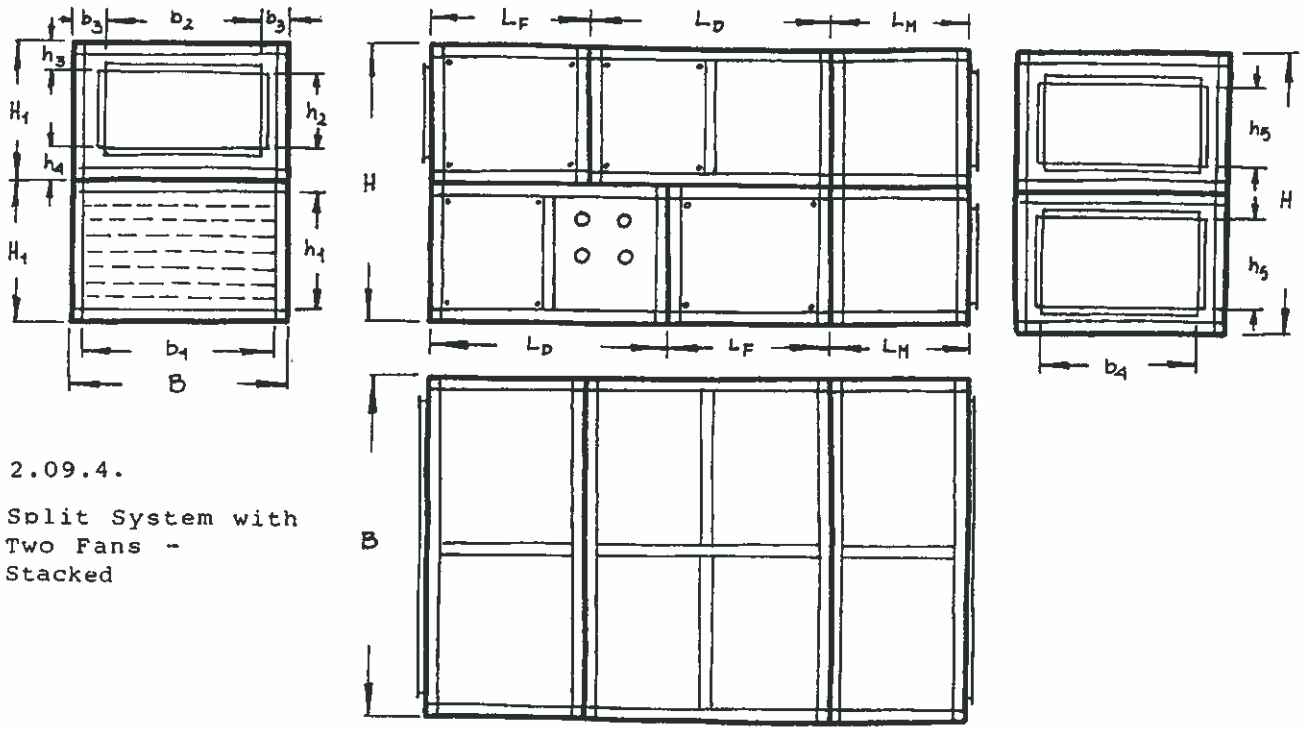


	A	B	C	C-S	D	D-S	E	E-S
L_D	2265	2265	2265	2265	2265	2265	2265	2265
L_F	710	810	810	810	930	930	1125	1125
H	660	710	710	710	810	810	1125	1125
h_1	530	580	580	580	680	680	995	995
h_2	350	450	450	450	600	600	800	800
h_3	135	115	115	115	85	85	145	145
h_4	175	145	145	145	125	125	180	180
B	710	1125	1750	1750	2020	2020	2280	2280
b_1	580	995	1620	1620	1890	1890	2150	2150
b_2	500	700	1500	1500	1600	1600	1800	1800
b_3	105	212	125	125	210	210	240	240



2.09.3.
Split System

	A	B	C	C-S	D	D-S	E	E-S
L_D	1265	1265	1265	1265	1265	1265	1265	1265
L_F	710	810	810	810	930	930	1125	1125
H	660	710	710	710	810	810	1125	1125
h_1	530	580	580	580	680	680	995	995
h_2	350	450	450	450	600	600	800	800
h_3	135	115	115	115	85	85	145	145
h_4	175	145	145	145	125	125	180	180
B	710	1125	1750	1750	2020	2020	2280	2280
b_1	580	995	1620	1620	1890	1890	2150	2150
b_2	500	700	1500	1500	1600	1600	1800	1800
b_3	105	212	125	125	210	210	240	240

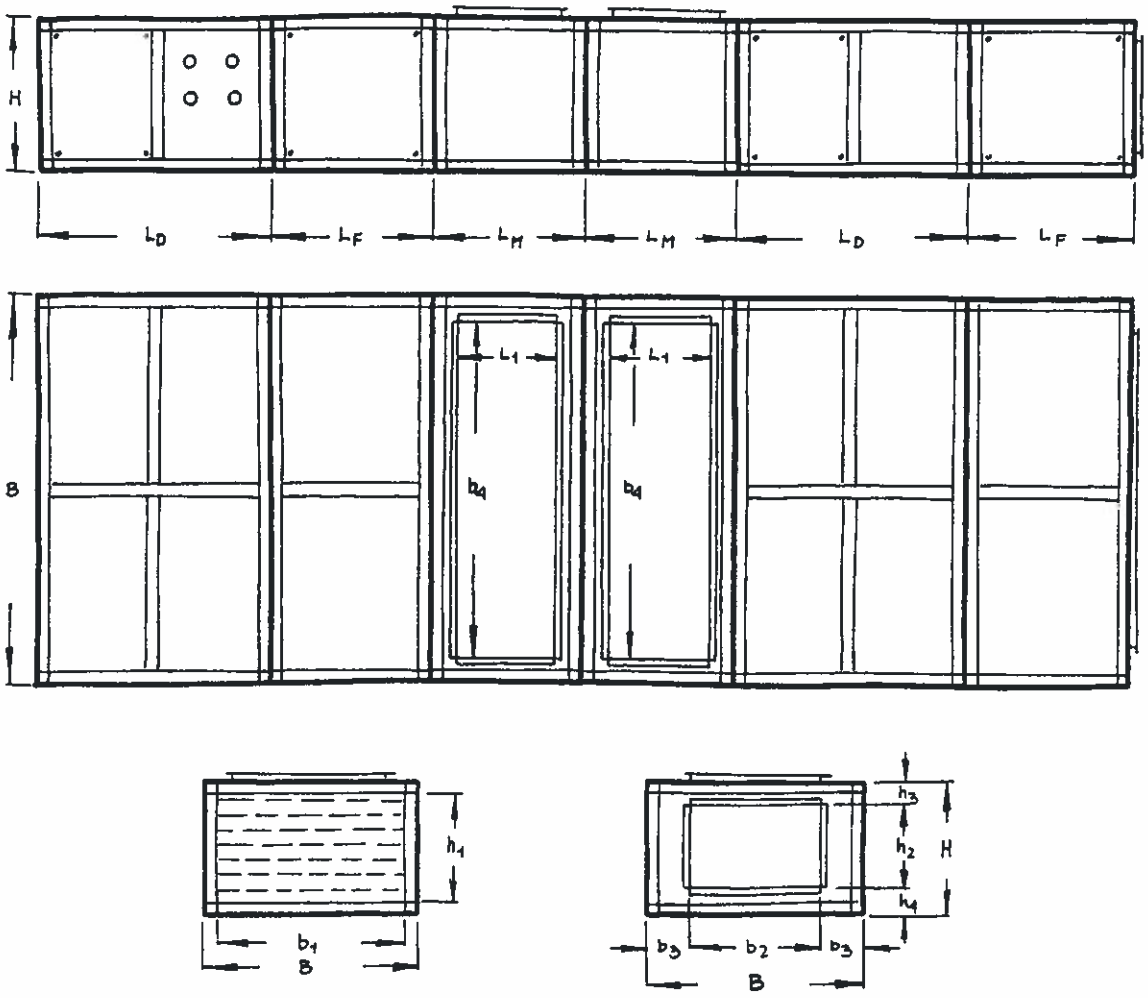


2.09.4.

Split System with Two Fans - Stacked

	A	B	C	C-S	D	D-S	E	E-S
L_D	1265	1265	1265	1265	1265	1265	1265	1265
L_F	710	810	810	810	930	930	1125	1125
L_M	660	710	710	710	810	810	1125	1125
H	1320	1420	1420	1420	1620	1620	2250	2250
H_1	660	710	710	710	810	810	1125	1125
h_1	530	580	580	580	680	680	995	995
h_2	350	450	450	450	600	600	800	800
h_3	135	115	115	115	85	85	145	145
h_4	175	145	145	145	125	125	180	180
h_5	480	530	530	530	630	630	750	750
B	710	1125	1750	1750	2020	2020	2280	2280
b_1	580	995	1620	1620	1890	1890	2150	2150
b_2	500	700	1500	1500	1600	1600	1800	1800
b_3	105	212	125	125	210	210	240	240
b_4	530	945	1570	1570	1840	1840	2100	2100

2.09.5. Split System with Two Fans - In-line



	A	B	C	C-S	D	D-S	E	E-S
L_D	1265	1265	1265	1265	1265	1265	1265	1265
L_F	710	810	810	810	930	930	1125	1125
L_M	660	710	710	710	810	810	1125	1125
L_1	480	530	530	530	630	630	750	750
B	710	1125	1750	1750	2020	2020	2280	2280
b_1	580	995	1620	1620	1890	1890	2150	2150
b_2	500	700	1500	1500	1600	1600	1800	1800
b_3	105	212	125	125	210	210	240	240
b_4	530	945	1570	1570	1840	1840	2100	2100
H	660	710	710	710	810	810	1125	1125
h_1	530	580	580	580	680	680	995	995
h_2	350	450	450	450	600	600	800	800
h_3	135	115	115	115	85	85	145	145
h_4	175	145	145	145	125	125	180	180

3. DELIVERY & INSTALLATION

3.01. GENERAL

The individual sections of the system arrive on site separately, packed on wooden pallets. Protective wrapping held in place by banding will be on each unit. During the handling of the plant to its designated position the wrapping should be left intact to avoid damaging the cabinet's finish and protruding components.

Control panels will be separately packed and should be handled with care and should be stored in a secure, dry place until time of installation.

3.02. UNLOADING

Before unloading the plant ascertain where the units will be joined together and which side the service access is, so that once removed from the transporter the plant can be manoeuvred into position in one operation.

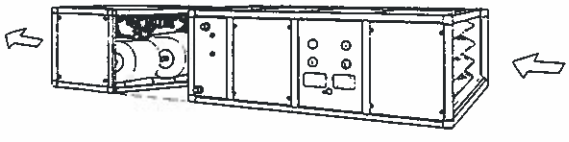
The access side can be determined by:

1. Finger screws in each corner of access panels.
2. HP/LP gauges on dehumidifier /evaporator section.
3. LPHW coil and water cooled condenser pipe connections on dehumidifier/condenser section.

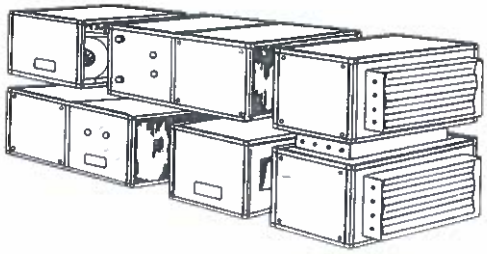
If the units are packed in cardboard boxes cut away a corner of the cardboard to locate finger screws.

The orientation of each section can be determined from the drawings below.

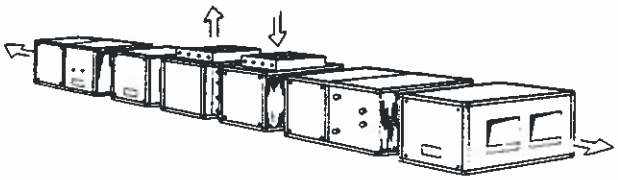
1. Standard system



2. Split system - stacked



3. Split system - in-line



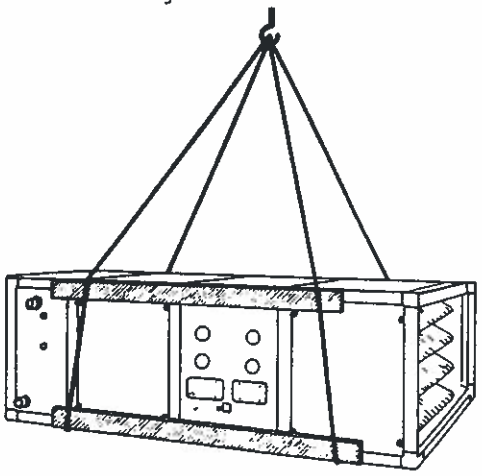
3.03. LIFTING

A fork lift for unloading and manoeuvring the plant into position is the desired procedure. The equipment is delivered on pallets and all stress evenly distributed. When using a fork lift ensure that the forks are long enough to reach to the far side of the unit.

FAILURE TO DO SO WILL RESULT IN DAMAGE TO THE CABINET

If the equipment requires to be lifted by other means, precautions have to be taken to ensure that the plant is not damaged due to side pressure on the hollow cross members of the cabinet.

When chains and ropes are used strengthen the sides of the unit with timber as shown in the drawing.

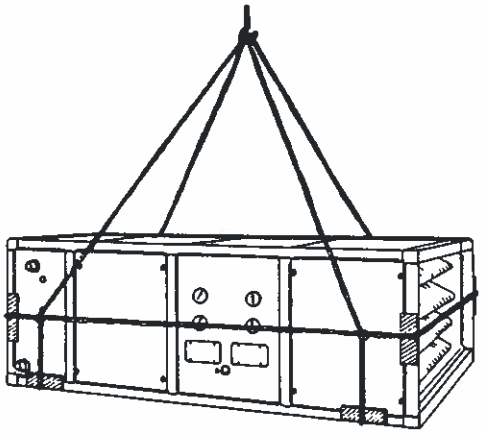


3.04. REMOVAL FROM PALLET

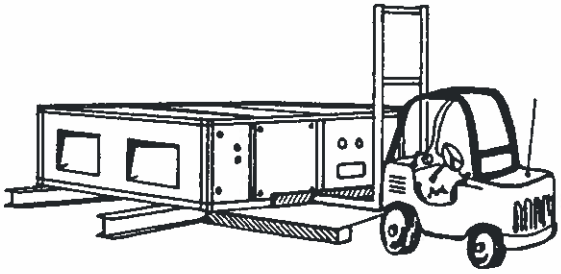
When the plant is in its final position it can then be removed from its transporting pallet.

As site conditions will determine how this operation is carried out, specific instructions cannot be given. However, as the plant is still vulnerable to damage during this manoeuvre attention must be given to the following points:

Ropes and chains must not be placed on the top or bottom cross members, but only at the re-inforced corners.



Fork lifts must not be used for lifting without the pallet in position. The forks must not be used to push the plant without a solid timber board running the full length of the plant, allowing the re-inforced corners to take the pressure.



4. INSTALLATION

The following examples are only a guide to the installation. Make sure that the materials chosen are capable of supporting the weight of the unit.

To minimise resonance transmission a sound dampening material should be placed between the plant and its supports.

Special attention should be given when installing the plant on wooden rafters and extra sound dampening material should be used to minimise wood resonance.

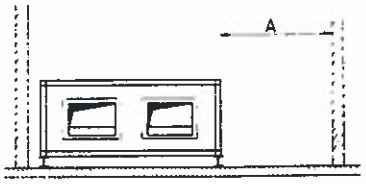
IN ALL CASES A SPACE OF AT LEAST 200 MM MUST BE ALLOWED BELOW THE UNIT TO ALLOW DRAIN CONNECTION TO BE MADE.

4.01. POSITIONING

4.01.1. Service Access

It is important when installing the unit to allow for access for servicing. All service work can be carried out from one side as specified when ordering, i.e. access side in relation to the air flow.

The free space should be not less than that shown below:



	A min mm
AF-A	700
AF-B	1100
AF-C/CS	2000
AF-D/DS	2000
AF-E/ES	2200

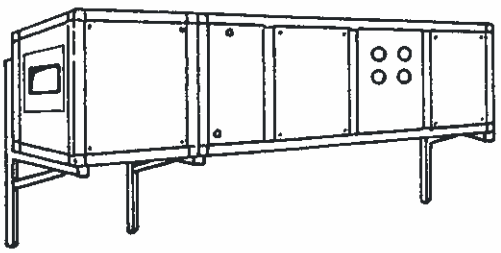
4.01.2. Installation on Floor

The simplest way of installing the unit is on a floor or some other flat surface capable of supporting its weight. In this, as in all other cases, the unit must be raised at least 200 mm over the floor to allow connection of the condensate drain.

To avoid movement of the unit on its platform some form of fixing should be made. For example an angle bracket can be fixed to the platform and the corner of the unit.

4.01.3. Installation on a Wall

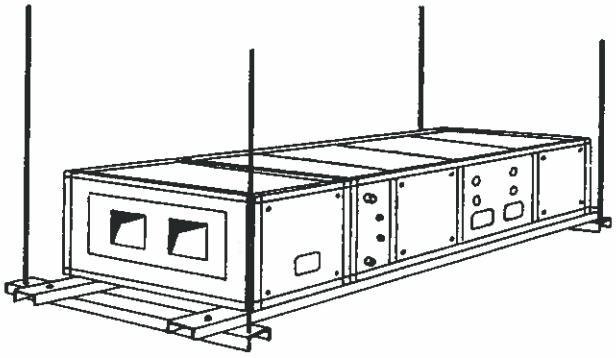
When mounting the unit on a wall, wall brackets alone can be used for AF-A, whereas the other units require additional support either from the roof or from the floor. Use one bracket for each end of the unit, plus one where the fan section joins the recuperator section. For split units use additional brackets under all the section joints.



Longitudinal supports as shown in the illustration under 4.01.4 are required with this installation. They have been omitted for clarity of the wall brackets in the illustration above.

4.01.4. Installation under a Ceiling

This system is the most commonly used if the roof construction is capable of supporting the weight. The support straps should be situated level with the corner profiles, so that there is free access for servicing. This system can be used for sizes up to AF-C. For larger units use an additional support where the fan section joins the dehumidifier section, so that support rods do not obstruct access panels. If possible a service platform should be provided in front of the unit.

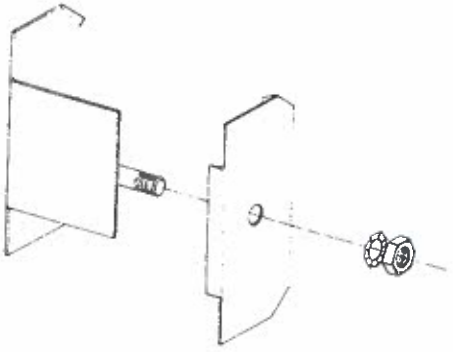


It is advisable to fit a sound dampening material between the unit and the platform to reduce vibration.

4.02. ASSEMBLY OF DEHUMIDIFIER SECTION AND FAN SECTION.

The dehumidifier section and fan section are supplied separately to site. For split units there can be up to six individual sections, which require assembly on site. The description below, for dehumidifier and fan section, applies to the other sections as well.

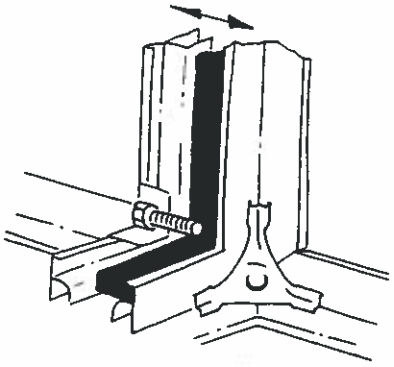
The dehumidifier section being the heaviest, it is most convenient to position this section in its final location first and to push the fan section up against it afterwards.



DO NOT USE THE PROTRUDING HEATING COIL CONNECTIONS TO LIFT THE UNIT

Four joining brackets are supplied for each joint, consisting of one bracket with welded-on bolt, a second bracket and a nut and washer.

Two corners on each bracket are bent back at 90°. These fit into slots on the corner frame of the unit.



By tightening up the nut and bolt the two sections are pulled together to form a tight seal.

Access to the corners is obtained by removing all the cover panels on the fan section.

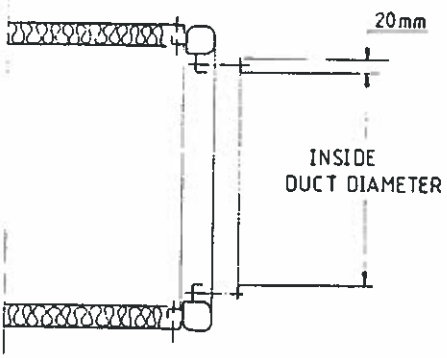
THE CLAMPING ARRANGEMENT DESCRIBED IS ONLY TO BE USED AS A MEANS OF SEALING THE TWO SECTIONS AND IS NOT DESIGNED TO BE LOAD BEARING

4.03. DUCTING

All ductwork and pipework connected to the unit must be self supporting.

4.03.1. Return Air Ducting.

The return air duct from the pool hall is connected to the dehumidifier end of the unit. No duct flange is provided and the ducting must be manufactured to fit the unit corner frame as show below. Alternatively a flexible connection can be made between the unit and the ducting.



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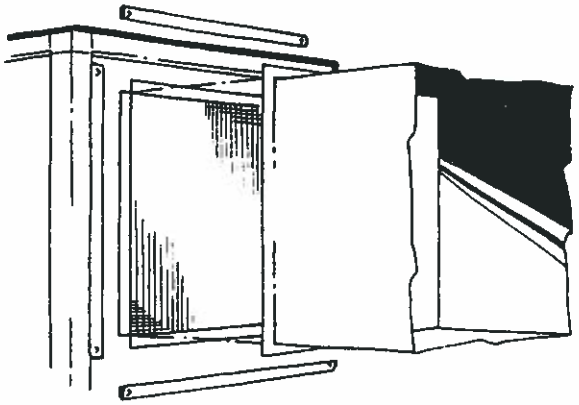
4.03.2. Supply Air Ducting.

The supply air duct from the unit to the pool hall is connected to the duct flange provided. The flange is 25 mm wide and the ducts are normally secured with four U-rails, as shown below. A suitable sealant should be applied to the joint prior to final assembly to ensure that it is air tight. Alternatively a flexible connection can be used to minimise transmission of vibration to the ductwork.



4.03.3. Dampers.

Where dampers are fitted to the unit, whether a single fresh air damper on top or dampers in the mixing section, these are provided with duct flanges, 25 mm wide. Connection of the ductwork is carried out as shown in 4.03.2. above.

4.04. CONDENSATE DRAIN

4.04.1. Standard Unit and Split In-Line Units.

On standard units and split in-line units, the drain connection is through the bottom of the dehumidifier section, under the evaporator coil. The drain connection is a BSP screwed connection size 1.5". As no trap is fitted inside the unit and the air pressure at that point is negative, it is important that a suitably sized external trap is fitted in the drain pipework.

Connections to the drain should be with a flexible section, before the drain pipe return to a rigid pipe, in order to avoid vibration damage to the joints.

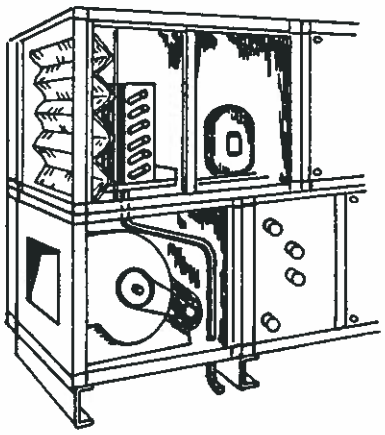
4.04.2. Stacked Split Units

If the evaporator section is positioned below the condenser section the method shown above under 4.04.1. can be used.

If the evaporator section is on top, then a different method of connecting the drain must be employed. This can either be by raising the three sections on top (extract fan, evaporator section and mixing box) a distance of not less than 200 mm above the top of the sections below, with custom built intermediate supports supplied by others.

Alternatively, two holes must be made in the supply air fan section in the bottom tier, to allow a drain pipe to extend from the drain connection, through the top of the fan section and either through one side or through the bottom of the fan section.

A trap must be provided, as described under 4.04.1 above.
sketch



4.05. LPHW COILS

4.05.1. General

BSP tails terminate from the coil to a position outside the cabinet, ready for connection to the hot water supply.

The two tails are offset, allowing the flow and return connections to be determined by relating their position to the direction of the air flows.

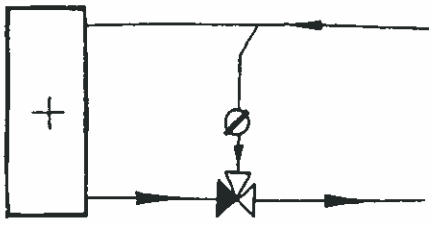
The tails nearest the air inlet (upstream) is the return, with the tail nearest the air outlet (downstream) being the supply.

4.05.2. Controls

Control of the coil operation can be by a motorised valve linked to a duct thermostat, supplied by others.

To obtain a quick response to the demand of the thermostat, a pipe arrangement as shown will avoid a dead leg in the pipework, giving hot water availability at all times.

By-pass system.



Electrical control of this arrangement can be integrated through the control panel's 24 volt operations system by sharing the live, neutral and earth terminals on the terminal strip inside the panel, to energise the valve's 24 volt drive motor (via a thermostat).

A spring return valve actuator will be required if this system is used to close the valve when no power is present.

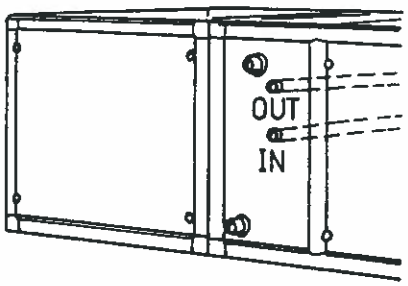
The coil will only give out heat when the plant is in operation using this method of control.

The panel's 24 volt circuit should not be used for additional loads greater than 0.5 Amp in total

4.06. WATER COOLED CONDENSER

In most cases the unit will have one or more water cooled condensers fitted, for dumping surplus heat to the pool water.

The refrigerant side is all factory fitted inside the unit, whereas the pool water side has to be connected by the contractor.



The connections for the pool water are led through the side of the cabinet, usually on the service access side. The pipe connection sizes are shown in sections 2.06.

sketch

The flow and return connections are marked IN and OUT respectively.

Pumps, thermostats and valves are not always supplied by Dantherm. There are two standard ways the output control for the water cooled condenser can be made, 1) with an ON/OFF pump or 2) with a 3-port valve, and continuous running pump.

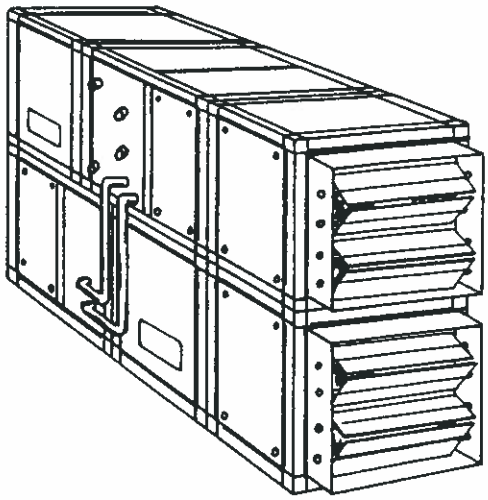
The nominal water flow rates and equivalent hydraulic pressure drops for each size of water cooled condenser are shown in the table below:

Type AF	A	B	C	CS	D	DS	E	ES
Flow rate (l/h)	580	750	1100	1250	2200	2500	3300	3750
Pressure drop (Bar)	0.07	0.10	0.13	0.09	0.13	0.09	0.13	0.09

4.07. REFRIGERATION PIPEWORK - SPLIT UNIT

Whereas for standard draw-through units all the refrigeration pipework is factory fitted and charged, for split units there is a small amount of refrigeration pipework to be fitted on site after final positioning of the unit.

In each of the evaporator section and condenser section the refrigeration pipes are terminated with shut-off valves. These need to be connected with refrigeration pipework, sized as shown in the table below, and the whole system needs charging with R22, quantity also shown below.



Type AF	A	B	C	CS	D	DS	E	ES
Pipe HP	5/8	5/8	3/4	7/8	3/4	7/8	3/4	7/8
size " LP	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
R22 charge kg.	6	7	8	9	2x8	2x9	3x8	3x9

Inter-connecting pipes will normally go through the mixing section.

The refrigeration pipework can be connected in different positions if required, to be specified at the time of order.

5. COMPONENT DESCRIPTION

5.01. ACCESS PANELS

All service covers have a quick release locking arrangement of either a threaded knob or a twin lock that requires the centre chrome knob to be undone to release the tension and the black plastic knob turned 90° to release the retaining lever.

All other side panels are retained by self tapping screws with a plastic spacer on the inside cover to prevent over tightening.

5.02. FANS

The fans used are always of the centrifugal type and they are driven by electric motors through a V-belt drive. The r.p.m. rating of standard fans is 700 to 1500 or 2200 r.p.m., whereas special fans with backward curved blades can go up to 3000 r.p.m. The fans are mounted on two transverse rails resting on anti-vibration dampers fixed to the frame profile construction of the unit. The fan discharge has a flexible connection to the cabinet.

The drive between the fan and the motor is made with a V-belt profile SPA (12.5 x 10 mm), or SPB (16 mm x 13 mm). On systems up to 7.5 kW the motor pulley is adjustable and the fan pulley is fixed.

One, two or three belts are used depending upon motor size.

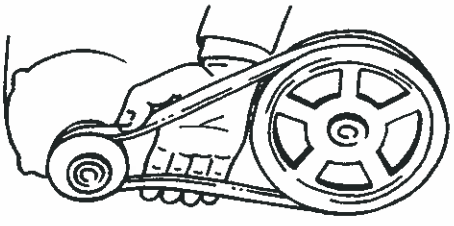
5.03. TRANSMISSION

5.03.1. Fan Belt Tensions

Check the belt drive for correct tension. Incorrect tension of the belt drive from the motor will produce "slap" and vibration through the fan and motor and will shorten the life of the bearings on both components.

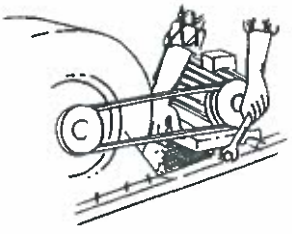
It will also resonate through the cabinet's frame giving annoyance to users.

Check the tension between the fingers to find a maximum deflection of 15 mm on motors over 4 kW and 10/12 mm on motor under 4 kW.



5.03.2. Fan Belt Adjustment

The adjustment of the fan belt tension is obtained by raising the motor bed plate at the edge nearest the fan.



Lift the bed plate until the belts are fully tensioned and retain the tension until the two bolts nearest the fan are re-tightened.

Check the belts again by depressing between the fingers for the correct deflection and if obtained tighten the other two bolts at the rear edge of the bed plate.

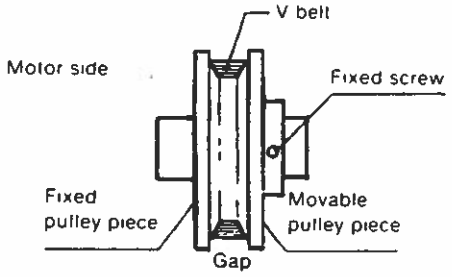
5.03.3. Adjustable Pulley

To allow final on site adjustment of air volumes, each motor of 7.5 kW or smaller are fitted with adjustable pulleys that once set to the required air volume should not be changed.

The construction of the pulleys are as shown below and on single pulleys only one of the outer flanges can be rotated on the centre spigot, while on twin pulleys both outer flanges rotate on the centre spigot with a fixed centre flange.

Each rotating flange is secured to the centre spigot by a metric hexagon grub screw that sits in the groove on the spigot.

Depending on the pulley diameter either two or three grooves are cut into the spigot allowing the pulley to be moved either half a rotation, or a one third rotation.



Check motor drive pulleys for tightness on the shaft and that split flanges are secured to the centre spigot.

On shaft sizes below 24 mm one retaining grub screw is used, whilst on shaft sizes over 24 mm two grub screws are used. These screws lock down on the keyways.

If on commissioning the plant the pulleys need adjustment, special attention must be made on twin pulleys that both flanges are rotated the same number of times, by moving the grub screw through the same number of locking grooves for each flange to avoid unequal tension of the belt drives.

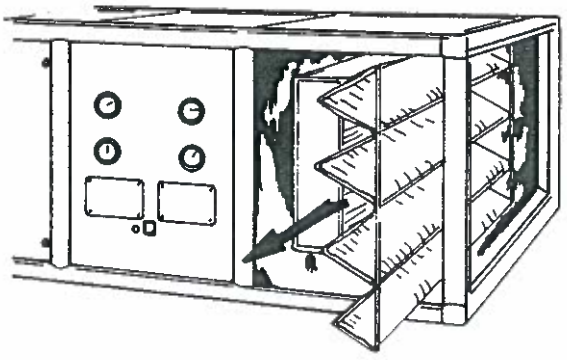
5.04. MOTORS

Normally the fans are driven by a single speed 3 phase motor, standard for each size of dehumidifier. In certain cases it is, however, necessary to fit larger size motors to overcome external duct resistance greater than standard. For certain type of installation two-speed motors are fitted. These, together with the other motor size options are listed in the table below. The X's in bold denote standard motor size.

Motor Output	Frame Size	Motors for fan unit type VE 1400 rpm and 1400/700 rpm								Start	
		A	B	C	CS	D	DS	E	ES	DOL	Y-D
1.1	90S	x								x	
1.5	90L	x								x	
2.2	100L	x	x							x	
3.0	100L		x	x						x	
4.0	112M		x	x	x	x				x	
5.5	132S			x	x	x	x	x			x
7.5	132M				x	x	x	x	x		x
11.0							x	x	x		x
										DOL	Step Start
1.3/0.32	90S	x								x	x
2.5/0.6	100L	x	x							x	x
3.6/0.75	112M		x	x						x	x
4.8/1.1	132S			x	x	x				x	x
6.5/1.5	132M				x	x	x	x		x	x
9.0/1.	160M						x	x	x	x	x
11.5/2.5	160L								x	x	x

5.05. FILTERS

The dehumidifier section is standard supplied with a G85 flat filter, fitted over a Z-frame as shown below.



The filter material is washable and can be withdrawn through the side of the unit, by removing the end-most cover

In split units the condenser section will normally also be supplied with a filter, fitted inside the cabinet similar to the one shown above, to deal with incoming fresh air via the mixing box.

5

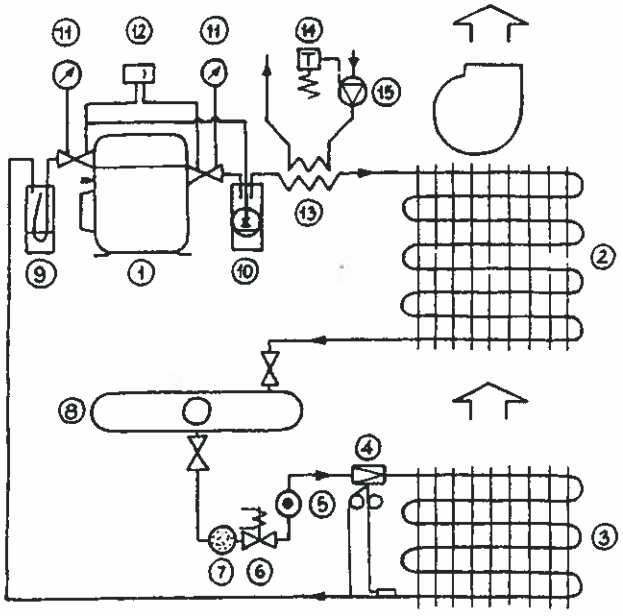
5.06. REFRIGERATION SYSTEM

As the dehumidifier type AF has been specifically designed for use in swimming pools the refrigeration system is relatively uncomplicated, without defrost function.

The minimum operating temperature is 22°C. If the return air temperature falls below this level the compressor will stop. In units with more than one compressor these will be successively switched off as the temperature drops below 22°C.

The entire refrigeration system is factory fitted and charged, except for split units which require connecting up on site (see section 4.07).

The schematic below shows the main components in the system and their connections. One compressor is shown. However, unit sizes D and DS have two compressors, whereas E and ES have three compressors. In these units the evaporator and condenser coils have separate circuits, two and three respectively, each circuit with a separate set of controls, giving completely independent refrigeration circuits.



1. Compressor.
2. Condenser.
3. Evaporator.
4. Expansion valve.
5. Sight Glass.
6. Solenoid Valve.
7. Line Drier.
8. Receiver.
9. Suction Accumulator.
10. Oil Separator.
11. Manometers LP/HP.
12. Pressure Stat.
13. Water cooled condensers (optional).
14. Return air thermostat*
15. Pump. *

* not supplied by Dantherm.

5.07. HEATING COILS

Different sorts of coils are available as optional extras - coils for water, steam or electricity. When placed before the dehumidifier they are defined as pre-heating frost protection and when placed after, as after-heating coils. The coils are situated under the service covers of the corresponding cover panel at the end of the dehumidifier section.

Connections for the coils are led through the front cover panels.

The terminal box for electric heating coils is led to the front cover panel.

5.08. CONDENSATE DRAIN

The water condensed out over the evaporator is collected in a stainless steel tray situated under the evaporator coil.

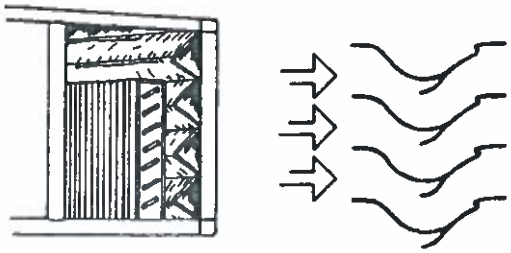
The tray is connected to a BSP drain connection under the unit with a copper pipe. No trap is provided inside the unit.
The position and size of the drain connection is shown in section 2.05. The drain size is 1.5" BSP.

5.09. SEPARATOR PLATES

Under normal circumstances separator plates are not fitted, as the velocity across the evaporator coil is sufficiently low to avoid carry-over of water droplets.

If, however, the relative humidity level is over 70%, the amount of water extracted becomes very high. In such cases separator plates may be fitted. These will be located above the condensate tray, immediately downstream from the evaporator coil.

The separator plates consist of S-shaped extruded aluminium profiles which are assembled in parallel to each other, forming a labyrinth where the water droplets are collected and run off into the condensate tray.



5.10. DAMPERS

The multi-leaf dampers are manufactured from galvanised sheet metal, with stainless steel moving parts, and opposed, profiled blades. Inter-connected linkage rods ensure easy movement of the damper blades, either by hand or by a damper actuator.

The same damper construction is used both for fresh air dampers, 20% or 100%, and for the mixing sections.

5.11. DAMPER MOTORS

Damper motors fitted by Dantherm are type BELIMO SM 24 for 24 volt operation. The damper motors are fitted straight onto the damper spindle, without any levers or gear mechanism. One damper motor is needed for each damper.

The damper motors fitted to 20% dampers are usually ON/OFF, with a fixed 20% setting. For 100% dampers and for dampers in mixing sections, they will usually be a modulating type, activated by a thermostat or a humidistat or both (refer to specification for control system).

6. ELECTRICAL REQUIREMENT

6.01. GENERAL

6.01.1. The basic requirement for electrical supply is for the operation of the fan(s) and the compressor(s) Also for electric reheat coil, if fitted.

6.01.2. All units will be supplied with a separate control panel, which contains all the components required for the operation of the equipment, but does not include any external controls, except to special order. For such systems see separate instructions.

The panels are complete pre-wired and factory tested. All controls are operated from a 24V supply from the built-in transformer.

6.01.3. Cable sizing for the mains to the panel must be adequate to carry the full load current of the equipment, and a fused isolator fitted near the panel, sized to the highest demand, must be used.

* Motor amperage, compressor amperage and heating coil amperage are detailed under their separate headings in section 8. Their total is the full load running current.

6.01.4. Starting currents need not be cumulative, when a Dantherm control panel is used. There is a time delay between start of fans and each compressor. The heating coil, if fitted, will be subject to a further time delay.

6.01.5. Automatic trip fuses are fitted in the Dantherm control panel, as a further protection, should a malfunction of the timer delays of their incorrect timing take place.

These will also trip if the manual operation of the switching on the panel is not carried out in the correct sequence.

6.01.6. Cable connections between the control panel and the equipment can be sized from the charts supplied under the appropriate headings later in this section.

6.02. CONTROL PANELS

6.02.1. General

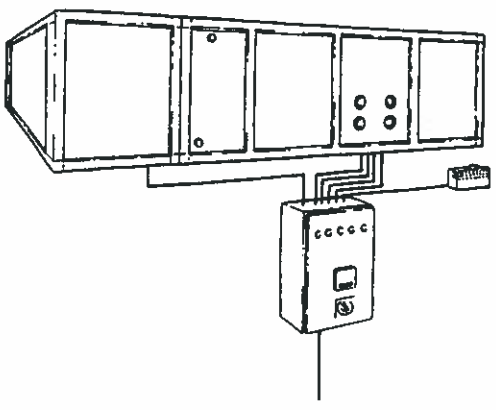
The panels supplied with the equipment will contain all the internal function controls required to operate the plant, but no external controls (thermostats, humidistats, time switch etc.) unless to specific order.

The panel is designed for wall mounting in any convenient position for access, and electrical connections can then be made between the panel and the dehumidifier.

Access to cable entry is through a bottom panel with knock out holes ready made for metric cable glands.

6.02.2. Terminal Strips

Two terminal strips, pre-wired from the function controls, allow the necessary cable connections to be made between the panel and the fan section(s) and the dehumidifier, using the corresponding numbers for easy identification. The external controls can be wired to one terminal strip in accordance with the reference numbers indicated in the wiring diagram supplied with the panel.



6.02.3. **Cable Sizes**

Each panel wiring diagram will state the cable sizes required for the phase connections and the current consumption for quick start, or time delay start, as it applies to the particular equipment being installed, together with the thermal overload settings for each contactor.

6.02.4. **Wiring Diagram**

Each panel is supplied with a wiring diagram specific to the panel supplied.

The wiring diagram consists of a number of separate pages.

* Front page containing general information.
* Legend, describing abbreviations used.
* Circuit diagram, showing the internal wiring of the 24 V control circuitry.
* Terminal connections.
* Mains voltage diagram, one for each fan/compressor.

The following notes will facilitate the understanding of the control circuit, using the panel AF-D as an example. All the other panels follow a similar pattern.

The circuit diagram is shown unenergised.

The first page of the circuit diagram (page D1) shows the transformer, (T1) which supplies 24 V controls voltage. Primary voltage to the transformer is 415 V across two phases (L1 + L2).

The fuses on the primary side are F2.1 and F2.2 and on the secondary side F2.3 (5 Amp, 5 x 20 mm).

P2 is an optional time switch.

Switch S1 is the manual selection switch, shown in the OFF position. There are three positions.

0: OFF.
1: Fan only.
2: Fan and compressor(s).

In position 1 and 2 current flows through the frost stat. B2, the motor thermister B1 and the time switch contact (P2). All of these are optional. If not fitted the corresponding terminals are bridged.

The control current thereafter goes through the service switch (S2) to the fan motor controls, here shown as Y-D start. After going through the thermal overload (F.1.8) the timer delay (D1.6) is energised and contactor K1.8 is drawn together with contactor K1.6.1. The fan motor starts in Star configuration. After a delay (approx, 5 sec.) contactor K1.6.1 is disconnected and contactor K1.6.2 is drawn, switching the fan motor to Delta configuration.

The indicator lights H1 and H1.1 are green, showing service voltage on and fan running. Indicator light H2.1 is red, showing fan failure.

The second page of the circuit diagram (page 22) shows the compressor controls. The central control is the compressor protection module (see description at the end of this section). This is under constant voltage on pins 2 and 10.

When switch S1 is in position 2, contactor K1.8 is drawn (fan running) and hygrostat B3 is on, then the compressor protection module is energised and current will flow from pin 3 to pin 5 through the module, providing the safety features are satisfied (see later). From pin 5 the current goes through the thermal overload for the compressor (F1.2) and the HP/LP pressure stat B5.2 to the compressor contactor K1.2 and the compressor will start.

When the compressor starts an auxiliary contact on contactor K1.2 energises the solenoid valve Y1.2.

The next compressor(s) each have a similar controls set, energised through K1.8 and B3 as for the first compressor.

The protection relay type CP24 offers effective protection against mis-use and overload of the compressor.

The module is fitted into a cabinet with 11 pin relay, size 83 x 34 x 76 mm.

The relay module contains:

1. Start pulse circuit: every 20 seconds a pulse is given to the output relay. When more than one compressor is connected in parallel these will start at random intervals inside 20 seconds. The probability of two starting at the same time is less than 1%.

2. Start limit circuit: A start limiter prevents re-start within 6 - 10 minutes from the last start, to protect the compressor. The maximum number of starts per hour is therefore 10 times. The light marked PAUSE is on in the period after start. The button marked TEST is used to eliminate the start limiter during service and maintenance and should, of course, not be mis-used.

3. Locking relay: if the thermal overload or pressure stat. switches off the compressor it can not automatically restart and the red light marked with a triangle is on. To re-set, momentarily switch off the system on the Service Switch.

6.02.5. Components

Components fitted in the panel are mounted on 35 mm DIN rails and replacement parts are normally stock items from electrical factors, except for the protection relay which is obtainable from Dantherm.

6.02.6. Isolator

A fused isolator must be installed adjacent to the panel for safety when servicing.

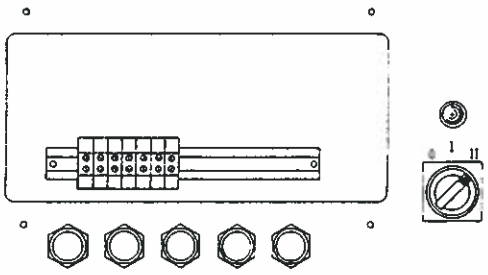
ALL ELECTRICAL CONNECTIONS TO THE PANEL MUST CONFORM TO LOCAL REGULATIONS

6.03. FAN CONNECTIONS

6.03.1. General

Each fan section contains a recessed terminal panel with cable entry glands ready made into the side of the cabinet.

Access to the terminal is gained by removing a weather resistant cover plate held by self tapping screws.



The terminal strip has numbered entries corresponding to its counterpart in the control panel. Direct connection can be made using the appropriate cable size as stated on the wiring diagram enclosed with the panel.

6.03.2. Service Switch

A service switch fitted adjacent to the cover plate allows the isolation of the control panel when servicing the plant (see 7.05.) operated through a 24 V circuit.

Provision on the fan terminal strip is made for a low wattage cable to be connected from the corresponding numbers in the panel with a three core cable.

6.03.3. Internal Wiring

Internal wiring of the fan sections back to motor from the fan terminal strip will have been made at the time of manufacture and no additional wiring is required.

* Should the motor rotation require changing this is more easily done by changing over two phases on the contactors in the control panel or the terminal strip in the fan section, rather than the motor terminal box.

6.04. COMPRESSOR CONNECTIONS

6.04.1. General

The dehumidifier section contains a terminal strip, similar to that described for the fan section.

Each compressor (in units with more than one) has a separate portion of the terminal strip. In addition a number of control wires (24 V) have to be connected.

As for the fan section the terminals are numbered, with equivalent numbers on the corresponding terminal strip in the control panel. Using the appropriate cable sizes, as shown in the wiring diagram enclosed with the panel, direct connection can be made between the unit and the control panel.

The service switch (see 6.03.2. above) will also isolate the compressors.

6.04.2. Controls Wiring

The controls wires are 24 V and are all connected between identically numbered terminals in the panel and in the dehumidifier section. The total number of wires depends on the size of AF.

6.04.3. Internal Wiring

Internal wiring of the dehumidifier section both from the terminal strip to the compressor(s) and the controls will have been made at the time of manufacture and no additional wiring is required.

6.05 ELECTRIC HEATING COILS

6.05.1. General

These units can be either internally mounted or externally mounted to the dehumidifier section.

The connections to both types will be the same with access to the terminal connections via an end cover plate.

6.05.2. Step Output

Regardless of the total heat output of the coil, the ratio of element sizes will always be 1-2-4-4 and by connecting the supply across any two, or all four separately, step control of the heat output can be obtained.

6.05.4. Cable Size

By using the cable sizes as indicated on the drawing supplied with the panel, direct connections can be made between the two units for the 3 phase supply.

6.05.5. Control

Control of the coil operation is either by a four-step thermostat and room sensor, or an electronic sensor with built-in step controller.

When only a room thermostat is used extra cable for 24 volt operation will be required from the control panel.

If it is proposed to operate the electric coil without a Dantherm control panel, reference should be made to the wiring diagrams regarding the wiring and control of the contactors required to operate both the previously explained methods of step heating.

6.05.6. Safety Stats.

The necessary safety thermostats are built into the terminal box to protect the heating coil. A control thermostat (LIM), the temperature setting of which is adjustable, switches off the heat at abnormally high temperatures and switches it on again automatically when the temperature has dropped.

An overheat thermostat (OT) is an extra safety and switches off at an air temperature of 100°C. OT does not reset automatically when the temperature has dropped but has to be manually operated via a reset button on the terminal box.

6.05.7. Service Switch

The service switch on the dehumidifier section will isolate the coil from the panel for service work to be carried out (see 7.05.).

7. ANCILLARY CONTROLS

7.01. GENERAL

When using the Dantherm control panel provision is made for all external controls that may be required for the operation of the plant. These will be as shown on the drawing supplied with the panel.

Additional controls may be added to the 24 volt circuit providing the total loading does not exceed 0.5 Amp and provision is made in the control panel to facilitate connection to the 24 volt supply on the terminal strip. Using this method a permanent electrical supply is available and is unaffected by the panel's system switch or any other function control.

If it is required that the additional system be only operational when the plant is running, the 24 volt connections can be made on terminals live and neutral.

7.02. HYGROSTAT

The compressor ON/OFF function will normally be controlled by a hygrostat situated either in the pool hall or in the return air ductwork.

If supplied by Dantherm the hygrostat will be a SAUTER type HBC. The hygrostat is connected into the control panel as shown in the wiring diagram.

7.03. MOTORISED WATER VALVES

These can be wired as described in 7.01. providing they are of the spring return type and have 24 volt actuators.

Using live and neutral terminals the system would only be operating when the plant is running and with a thermostat control wired in series would activate as demand required.

* Separate arrangements must be made for the modulating type of valve controls.

7.04. CLOGGED FILTER WARNING DEVICE

No provision is made in the panel for connection to this unit and separate arrangements for its connections to a power supply and alarm indicator must be made by others.

If fitted in the dehumidifier at the time of manufacture it will be a Dwyer type pressure unit.

Electrical connections will be: Power to Common, Return signal for Normally Open. The terminal Normally Closed is not used.

7.05. SAFETY WARNING

THE SERVICE SWITCH PROVIDED ON THE AF ALLOWS SERVICE WORK TO BE CARRIED OUT WITH THE POWER FROM THE CONTROL PANEL ISOLATED.

THE COVER TO THE CONTROL PANEL SHOULD REMAIN LOCKED WHEN THIS SWITCH IS USED, TO PREVENT THE MANUAL OPERATION OF THE CONTACTORS BY OTHERS.

8. ELECTRICAL-DATA

8.01. CABLE SIZES

Connection between the Dantherm control panel and the AF terminals should be with cables of an adequate size for the components fitted.

8.01.1. Fan motors, three phase, 420 V and 220 V.

Motor Output kW	Frame	Cable size for Motors 420 V DOL	420 V Y-D	220 V DOL	220 V Y-D
1.1	90S	1.5	-	1.5	-
1.5	90L	1.5	-	1.5	-
2.2	100L	1.5	-	1.5	-
3.0	100L	1.5	1.5	1.5	1.5
4.0	112M	1.5	1.5	2.5	1.5
5.5	132S	-	1.5	-	2.5
7.5	132M	-	1.5	-	2.5
11.0	160M	-	2.5	-	4.0
1.3/0.32	90S	1.5	-	1.5	-
2.5/0.6	100L	1.5	-	1.5	-
3.6/0.75	112M	1.5	-	4.0	-
4.8/1.1	132S	1.5	-	6.0	-
6.5/1.5	132M	1.5	-	6.0	-
9.0/1.9	160M	2.5	-	10.0	-
11.5/2.5	160L	4.0	-	16.0	-

8.01.2. Compressor

AF Model	Compressor kW	Cable size 380/420 V	220 V
A	3.6	1.5	2.5
B	5.5	1.5	4.0
C	7.1	1.5	6.0
CS	8.9	1.5	6.0
D	7.1 x 2	1.5	6.0
DS	8.9 x 2	1.5	6.0
E	7.1 x 3	1.5	6.0
ES	8.9 x 3	1.5	6.0

8.02. CURRENT

The tables below show the current for each motor size and for the compressors, to determine the fusing for the different combinations.

8.02.1. 3-phase - 415 V

415 V 3 Ph kW	Motor current Amps A	B	C	CS	D	DS	E	ES
1.1	2.6							
1.5	3.4							
2.2	5.0	5.0						
3.0		6.4	6.4					
4.0		8.8	8.8	8.8	8.8			
5.5			12.0	12.0	12.0	12.0	12.0	
7.5				15.5	15.5	15.5	15.5	15.5
11.0						21.0	21.0	21.0
1.3/0.32	2.8							
2.5/0.6		5.4	5.4					
3.6/0.75		7.0	7.0					
4.8/1.1			9.6	9.6	9.6			
6.5/1.5				12.5	12.5	12.5	12.5	
9.0/1.9						18.0	18.0	18.0
11.5/2.5								22.7
Compr.	6.9	11.0	13.7	16.5	27.4	33.0	41.1	50.5

8.02.2. 3-phase - 220 V

220 V 3 Ph kW	Motor current Amps A	B	C	CS	D	DS	E	ES
1.1	5.0							
1.5	6.4							
2.2	9.1	9.1						
3.0		12.0	12,0					
4.0		17.0	17.0	17.0	17.0			
5.5			20.0	20.0	20.0	20.0	20.0	
7.5				27.0	27.0	27.0	27.0	27.0
11.0						40.0	40.0	40.0
1.6/0.4	6.8							
2.0/0.6	8.3	8.3						
2.8/0.8		11.8						
4.5/1.1		20.0	20.0	20.0	20.0			
7.6/1.8			26.0	26.0	26.0	26.0		
9.0/2.3				36.4	36.4	36.4	36.4	36.4
12.5/3.5						46.8	46.8	46.8
Compr.	13.0	20.0	25.0	28.0	50.0	56.0	75.0	84.0

8.03. ELECTRIC HEATING COILS

All coils have four separate elements split into a ratio of 1-2-4-4 (coded A-B-C-D).

Each elements has its own three phase terminal connection and, depending on how these are connected, the cable will be sized for the full capacity of the kilowatt loading of the total number of elements it is to be connected to.

Reference should be made to the data supplied with the control panel or if not available, check the output shown at the terminal connections on the heater battery label.

8.04. MAINS SUPPLY

Cable sizes to the three phase input of the panel must be via a fused isolator, adequate in capacity to carry the full output of the plant.

If a Dantherm control panel is supplied, delayed operation between each component's function will be provided, allowing a direct on starting load to be calculated.

Auto trip fuses fitted to the panel will indicate the maximum D.O.L. starting current of each component and should allow the installer to size the cable for either the maximum amperage shown, or the total running current of the equipment installed, whichever is the greater.

Data supplied with the panel will show the recommended cable size.

An approximate guide to mains cable sizes when using a Dantherm control panel are shown below, based on the largest size of component that can be fitted to any individual unit.

Cable sizes in mm^2

Combination	AF Size (420V)							
	A	B	C	CS	D	DS	E	ES
Compressor(s) one fan	6	6	10	10	16	16	25	25
Compressor(s) Two fans	6	10	16	16	25	35	35	35

8.05. MOTOR CONNECTIONS

8.05.1. Cable Connections

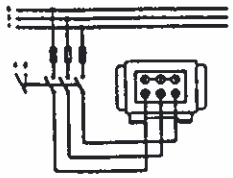
Three phase motors will have six terminal posts in the cable connector box.

Three metal links supplied with the motor will require positioning as shown in the drawing for the type of phase supply in use, or removed completely for certain types of control arrangement.

On pre-wired units, these adjustments will have been carried out prior to despatch from the factory.

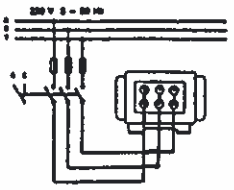
8.05.2. Direct on Start

STAR Coupling Europe and U.K.



Operated from a single contactor on 420 V 3 phase for direct on start.

DELTA Coupling Norway



Operated from a single contactor on 220 V 3 phase for direct on start.

TO CHANGE THE ROTATIONAL DIRECTION, CHANGE ANY TWO PHASE CONNECTIONS

8.05.3. Star Delta or Two Speed Start

For larger motors of 3 phase single speed a Star/Delta Start can reduce the initial current surge and three contactors with interlocking devices fitted can be wired as the drawing below, with the terminal links removed completely.