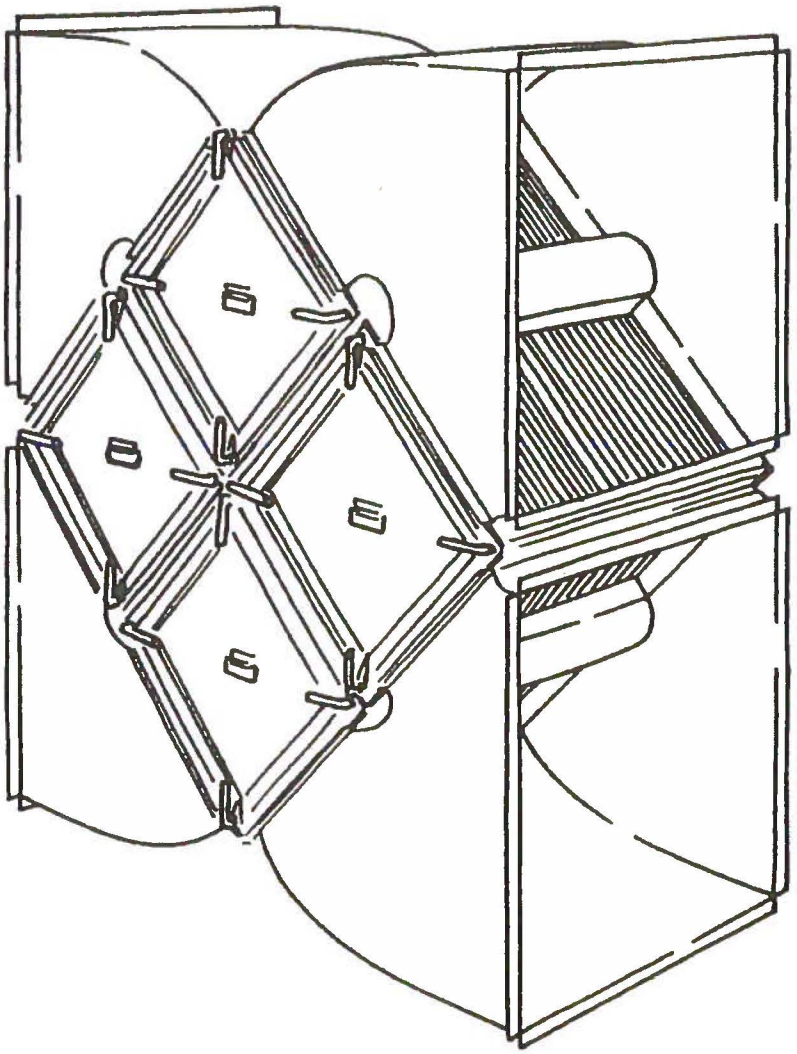
Dantherm®

INSTRUCTION MANUAL MVV

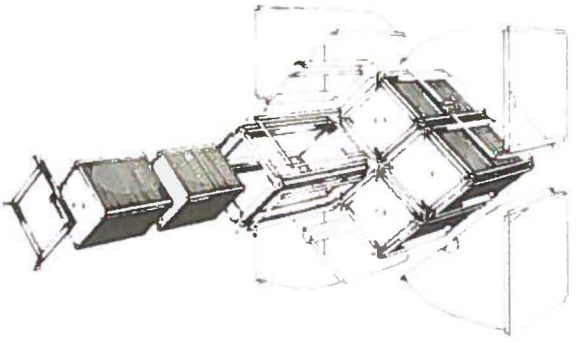


Contents:

0.0.0 Introduction

Dantherm module recuperator type MVV is a system of air to air heat recovery components assembled into modular framework.

The system is built up of frames accomodating various modules, such as diagonal flow heat exchanger, fan, filter, silencer etc. The frames are designed to fit into a ductwork-system, to which the connections are made by means of assembly rails.



1

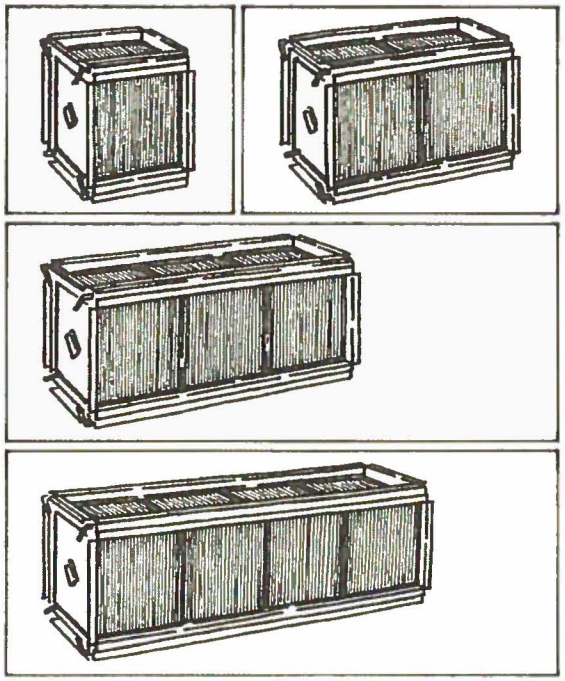
1.0.0 Description of components

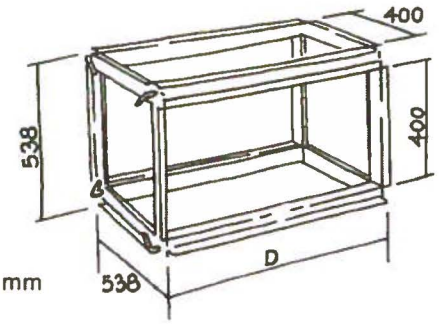
The Dantherm MVV-system comprises a number of standard components which are normally used in ventilation plants.

A common feature of all these components is that they fit either into the module frames or to the flange dimensions for connection by means of assembly rails.

1.1.0 Module frames

The frames are made of extruded aluminium profiles and are available as 1, 2, 3 or 4 modules, with each module 400 mm deep.



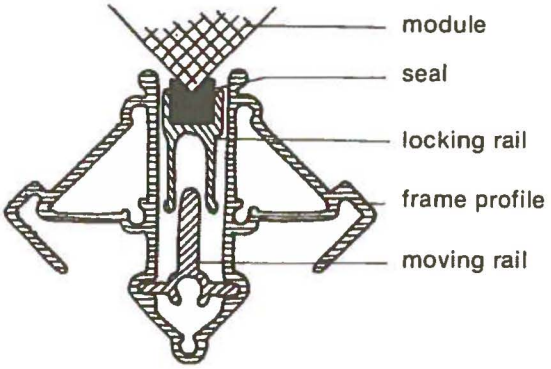


Flange: 25 mm

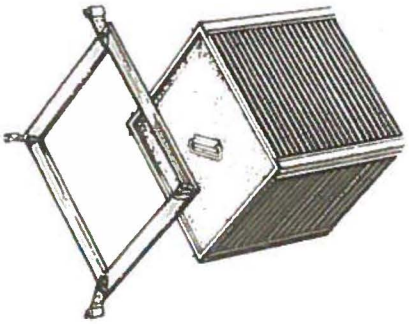
Data:
Module frame type GM-A

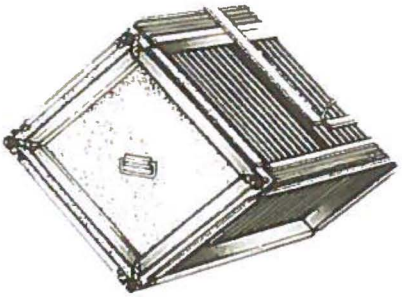
		D (mm)	Weight (kg)
GM I – A	:	400	12
GM II – A	:	805	18
GM III – A	:	1210	24
GM IV – A	:	1610	29

Each corner of a frame is supplied with a locking mechanism. After inserting the module, push in the four handles and turn 45°. By this action the 4 locking rails with a flexible seal are pushed against the corner profiles of the module ensuring a tight seal between frame and module.



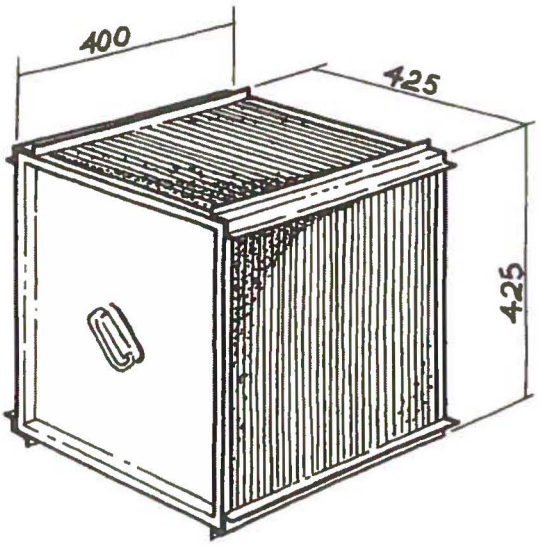
Externally the module frame is covered by a separate front sealing frame providing an air seal between frame and module. The sealing frame is held in position at each corner by four brackets which are fixed to the above mentioned locking handles, when pushed in and turned.





1.2.0 Recuperator module

The recuperator modules are available in one standard size 425×425×400 mm. The weight of the module is 25 kg.

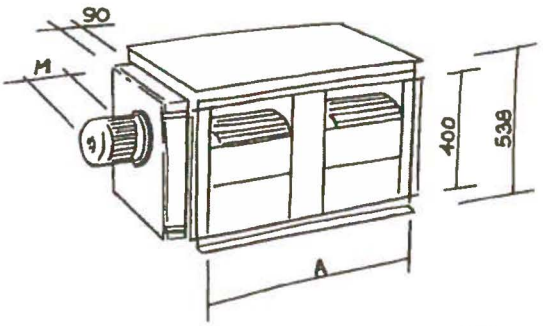


Data:

Type	: MV-A
Dimensions	: 425×425×400
Weight	: 25 kg
Max. temp.	: 140°C
No. of plates	: 94
Sheet dimension	: 0,4 mm
Plate spacing	: 3,65 mm

The module is built up of a series of profiled, epoxy coated anodized aluminium plates with precise spacings which are two by two clamped together at top and bottom edges and their counter parts clamped together at both side edges. This method of connection allows air to pass through the unsealed plates top to bottom and allows air to pass through the other unsealed plates side to side so that the two air streams have no contact with each other.
As shown above these plates are mounted into a box-arrangement with four openings, each separated by corner profiles. The distance between the plates allows air to pass freely in a turbulent flow which increases the heat transmission across the plates.

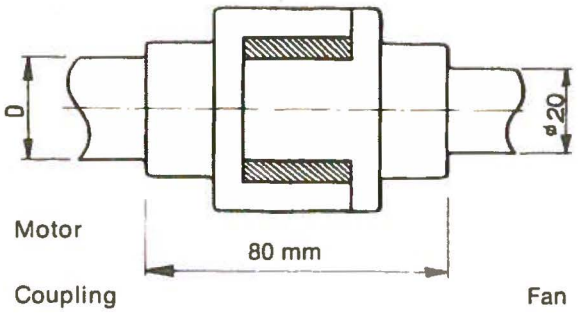
1.3.0 Fan module



The fan module is a complete unit consisting of fans and motor, intended for mounting in the system like standard module frames. The fan module is mounted in the module frame as for the recuperator module, and is kept in position by spring locks without sealing frame and four locking clamps.
The fan modules are available with 1 - 2 - 3 or 4 centrifugal fans. The number of fans depends on the size of the module frame. The fans have one single shaft, which by means of a flexible coupling is connected to the externally mounted fan motor.
The motor directly drives the fans and therefore the r.p.m. of these fans is constant - and identical to that of the motor. On standard units 1400 r.p.m. motors (4-pole) are used, but motors with a lower r.p.m. rating and two-speed motors are available. As the motor is not in the air stream this allows the module to be used at temperatures up to 85°C, this temperature being the limit for the fan bearings. Exhaust air fans should be fitted after the heat recuperators and linked to the supply air fan if exhaust temperatures are higher than 85°C.
The fact that the fan module fits into standard module frames facilitates servicing, all components such as fans, shaft, bearings, coupling and motors are accessible when removed. To remove the fan motor from the module sealing box un-do the four bolts of the motor flange. When remounting the motors the coupling is taken apart for inspection and servicing.

Type	Fan	Motor 3×380V, 50 Hz	Noise-level*) dB (A)	A mm	M mm	D mm Ø
FA/1×1 M	1×AT 9/9	0,55 kW 1380 rpm	71	400	209	19
FA/1×2 M	2×AT 9/9	1,1 kW 1410 rpm	74	805	226	24
FA/1×3 M	3×AT 9/9	1,5 kW 1415 rpm	76	1210	248	24
FA/1×4 M	4×AT 9/9	2,2 kW 1425 rpm	77	1610	270	28

*) Noise level measured 1 metre away from exhaust opening with nominal air volume and recuperator module on the suction side.

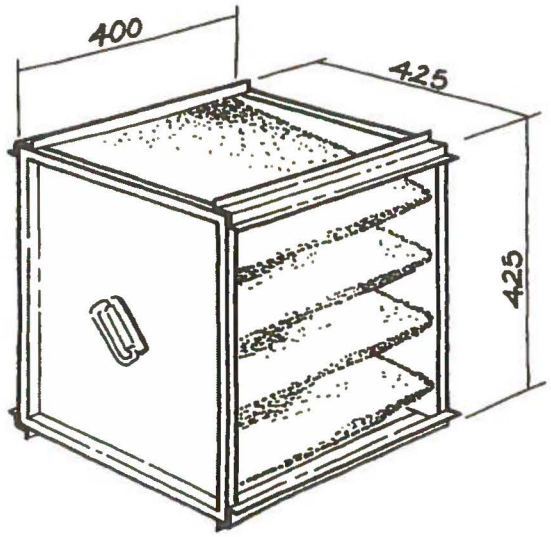


1.4.0 Filter module

The spacings between the plates of the heat exchanger are small so that the air flow through the module could possibly be obstructed by dust deposits, unless a protective filter is fitted before the module.

The filter module is built up in the same way as the recuperator module and is mounted in a module frame which is closed at the top and the bottom with galvanized plates. The filter material is fitted over spacing rods and fixed at each end. The filter material can be cleaned with compressed air, washing, or it can be replaced. If better filtration is required, a separate filter should be fitted, independently of the protective filter.

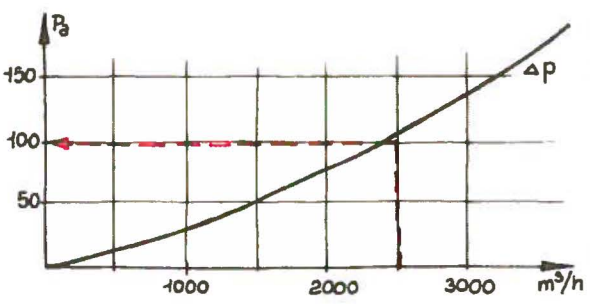
Filter module



Data:

Type	:	FI
Dimensions	:	425×425×400 mm
Weight	:	3 kg
Cutting dimensions for filter	:	2900×400 mm
Filter thickness	:	20 mm
Separation degree	:	85%

Pressure drop



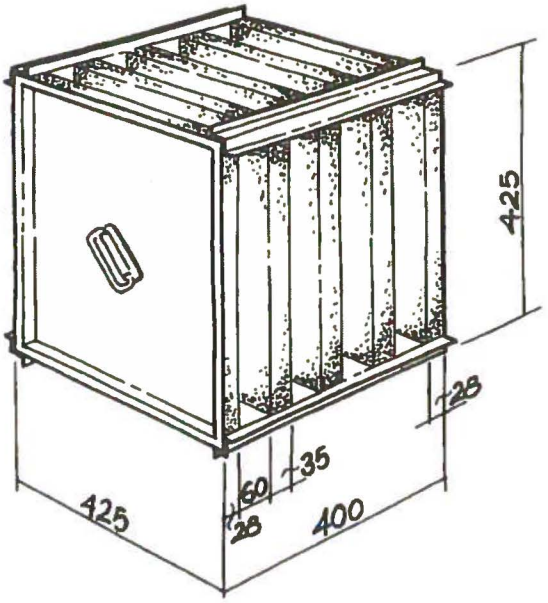
1.5.0 Silencer module

Construction
The silencer cabinet consists of a module frame closed at the top and the bottom with galvanized plates which are insulated on the inside.

The dimensions of the silencer module itself are the same as for the recuperator module and it is mounted in the module frame in the same way.

The sound baffles are constructed from hard mineral wool slabs with a firm surface and they are edged by a galvanized U-rail.

Silencer unit



Data:

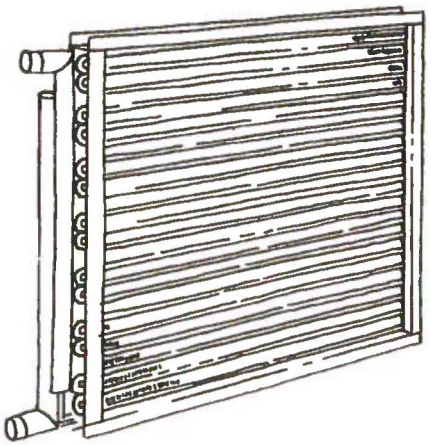
Type	:	LD
Dimensions	:	425×425×400 mm
Weight	:	4 kg
No. of baffles	:	3 + 2 sides
Air passage	:	0,1 m²
Silencing capacity	:	**7 dB (A)**

Pressure drop

Air volume m³/h	1500	2000	2500	3000
Pressure drop Pa	3	5	7	10

1.6.0 Heating coil module, water/steam

After-heating coils for heating inlet air to required temperature are available sized to the actual module combination.



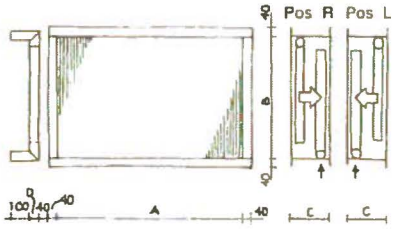
Standard heating coils for water are designed for a max. working pressure of 15 bar.

The heating coils are available for steam or hot water, on request.

The heating coils are made of copper tubes with aluminium-fins and threaded steel headers.

The frame is made of galvanized plate and it is possible to fix it to the flange of the module frame by means of bolts as the dimensions are identical, or it can be installed using assembly rails, similar to the other components.

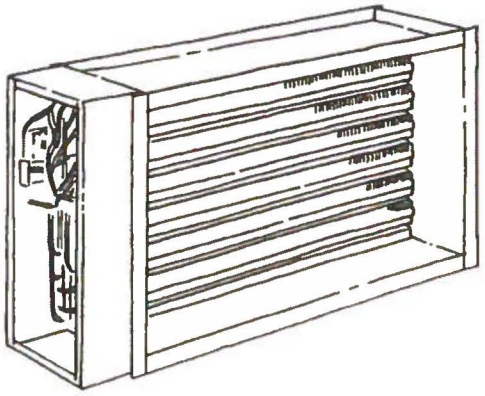
Data:



HC/	A mm	B mm	A×B m²	C		
				1R	2R	3R
1×1M	370	360	0,133	100	130	160
1×2M	775	360	0,279			
1×3M	1180	360	0,425			
1×4M	1580	360	0,570			

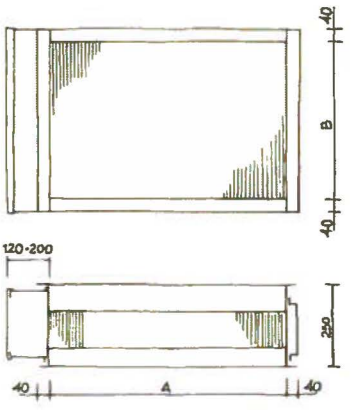
1.7.0 Heating coil module, electric

Electric heating coils are particularly suitable for preheating, as frost-protection, but can, of course, be used for after-heating as well.



The coils consist of electric elements which are equipped with aluminium-fins ensuring a high heat transfer and uniform distribution. A double thermostat safety-system is built into the coils. A LIMIT thermostat, with adjustable temperature control switches off the heat at abnormally high temperatures and resets automatically when the temperature has fallen. An overheat thermostat (OT) switches off when the temperature exceeds 90°C, but does not reset automatically when the temperature falls.
Reset is done manually via a reset button in the terminal box of the heating coil when the probe temperature is below 80°C.
These two thermostats are to be electrically connected to the control system for the heating elements. Normally the heating element is divided into several groups for step control and this must be taken into consideration when making the electrical connections.
The electrical heating coil frame is made of galvanized plate and it can be bolted to the flange of the module frame, or it can be installed in ductwork and fitted by means of assembly rails.

Data:



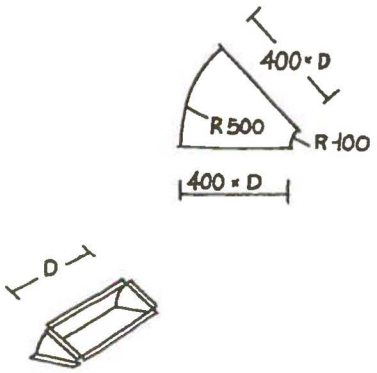
EC/	A mm	B mm	A×B m²
1×1M	370	360	0,133
1×2M	775	360	0,279
1×3M	1180	360	0,425
1×4M	1580	360	0,570

1.8.0 Duct connections

Due to the fact that condense water is likely to occur in most heat recuperating plants, the recuperator module is in most cases in a diamond position. As duct arrangements are normally in a horizontal position, 45° duct bends are required for connection of the various combination possibilities.

Such duct connections are part of the system and are connected at both ends by means of assembly rails.

45° single duct connection

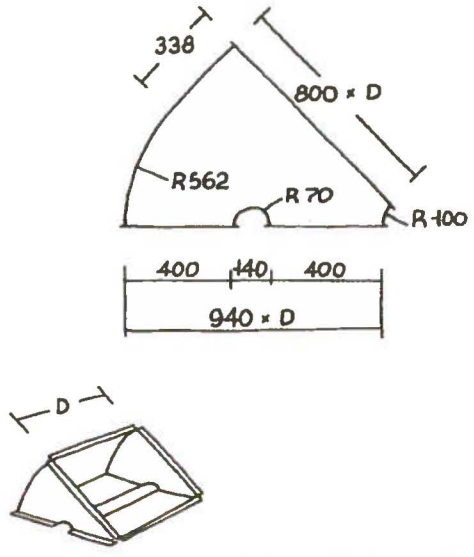


Type	1 M	2 M	3 M	4 M
D-dimension	400	805	1210	1615

25 mm flanges for assembly rails

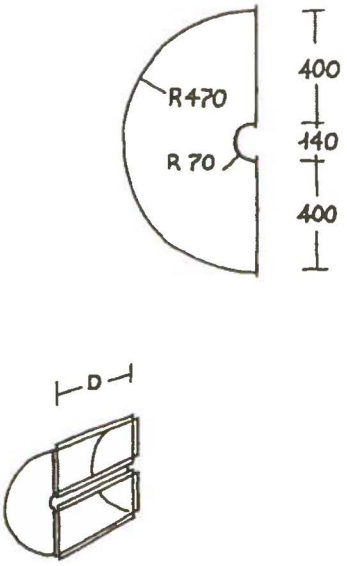
All dimensions in mm

45° double duct connection



Type	1 M	2 M	3 M	4 M
D-dimension	400	805	1210	1615

U-shaped duct connection



Type	1 M	2 M	3 M	4 M
D-dimension	400	805	1210	1615

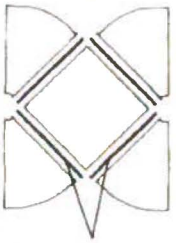
1.9.0 Assembly rails

Two types of rails are used to join together module frames and heating coils.

U-rails made of extruded aluminium are used to join module frames. These rails are always used in pairs to allow each frame to be joined with its adjacent frame.

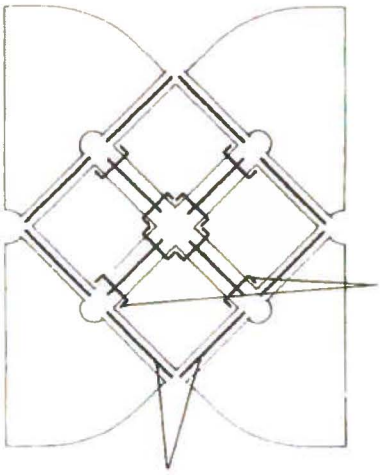
25 mm assembly rails are used for all connections, both between module frames and between module frames and duct connections. Assembly rails are always used in sets consisting of 4 rails, that is 2 transverse rails, the length of which depends on the number of modules and 2 outer rails, the length of which always is the same as one module frame.

GM/1 –



Assembly rails

GM/4 –



Assembly rails

The diagram below indicates the number of U-rails and assembly rails to be used for joining together various components:

	Joining together of module frames			Assembly of duct connections	
	U-rails	Assembly rails		Assembly rails	
		transv. rails	outer rails	transv. rails	outer rails
GM/1	0	0	0	8	8
GM/4	8	8	8	16	16

Length of assembly rails:
Transverse rail 1M: 450 mm
Transverse rail 2M: 857 mm
Transverse rail 3M: 1260 mm
Transverse rail 4M: 1655 mm
Outer rail : 450 mm

Length of U-rails:
1M: 395 mm
2M: 795 mm
3M: 1195 mm
4M: 1595 mm

2.0.0 Installation

2

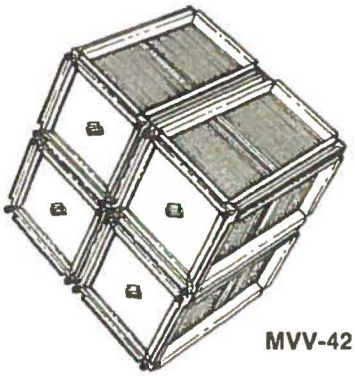
The building up of a Dantherm Modular Recovery System will normally be shown on an installation drawing with indication of the various components.

In this section duct-work installation is not dealt with.

It is necessary to ensure that the module components can be removed from their frames, by allowing sufficient room on the access side.

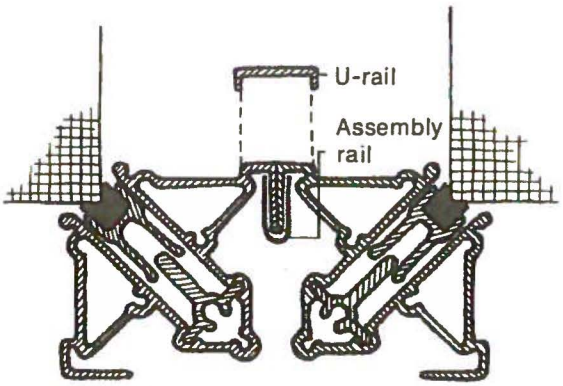
2.1.0 Assembly of the recuperator module

In general the recuperator module section is the most complicated part of the installation work, particularly if the system contains four sets of modules. The procedure is the same irrespective of the number of modules across.



MVV-42

First of all the module frames are connected in pairs. This is simplest and easiest carried out by aligning the frames on a table or workbench at a convenient height, with the flanged edges turned downwards.



Corner profile module frame A

Corner profile module frame B

Join the frames by means of the U-shaped aluminium rails which are internally serrated.

Fit the U-rails on the assembly and knock carefully into place with a soft hammer. Care should be taken that the frames are correctly aligned before fitting the rail, as it cannot be removed without damaging both frame and rail. To ensure complete air tightness the joints under the U-rail and the vertical joints between front and rear frame should be coated with a sealing compound.

Having carried out the internal joining, the assembly rails are fitted and fastened with a bolt in each corner of the assembled pair. Place the other pair of assembled frames on top of the first pair.
Having positioned the four sections two by two, they are aligned as described above. To ensure correct positioning use clamps during the assembly work. Fit the internal U-rails as described above on both frame joints, followed by the assembly rails.

Finally the required duct connections are made, using assembly rails.

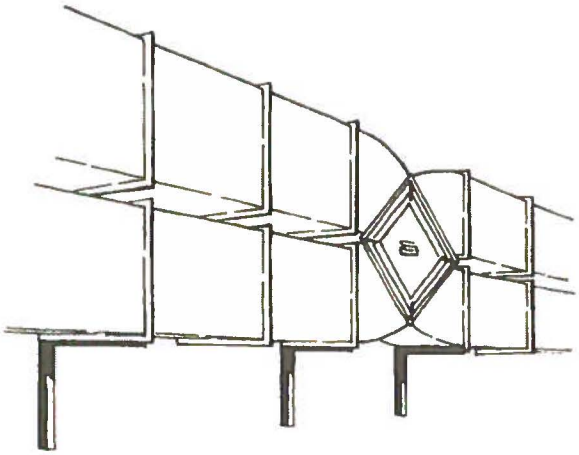
2.2.0 Suspension of the recuperator section

In most cases the recuperator section is to be suspended to suit ductwork and other components of the plant.

It is rarely possible to suspend the MVV components from the duct work itself, therefore separate suspension or support of each individual component is required.

2.2.1 Suspension from a wall

If the ductwork is fixed to the wall, it is normally positioned on brackets, which are bolted to the wall. In such cases the module can be installed on brackets, too.

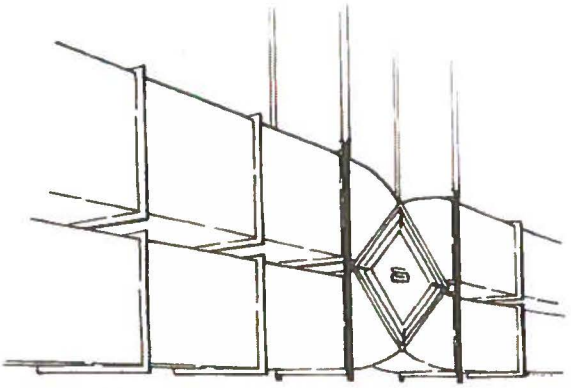


When sizing the brackets, calculations should be made on basis of following weights of module sections and duct connections:

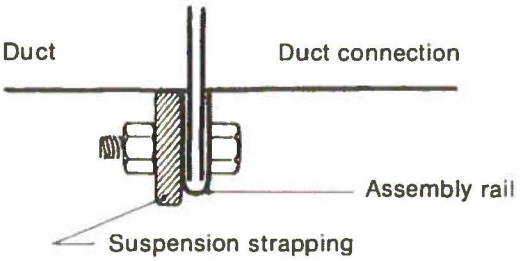
	GM/1-1M	GM/1-2M	GM/1-3M	GM/1-4M
Weight kg	48	86	123	160
	GM/4-1M	GM/4-2M	GM/4-3M	GM/4-4M
Weight kg	174	310	445	574

2.2.2 Roof suspension of the recuperator section

When the installation is to be suspended from the roof, some form of strapping should be used for fixing it to the roof structure. In such cases the recuperator section needs to be suspended on rails which are parallel to the vertical assembly rails of the duct connections.



A strap should be made of 30×6 mm flat mild strip, which is attached with 4 bolts through the assembly rails.



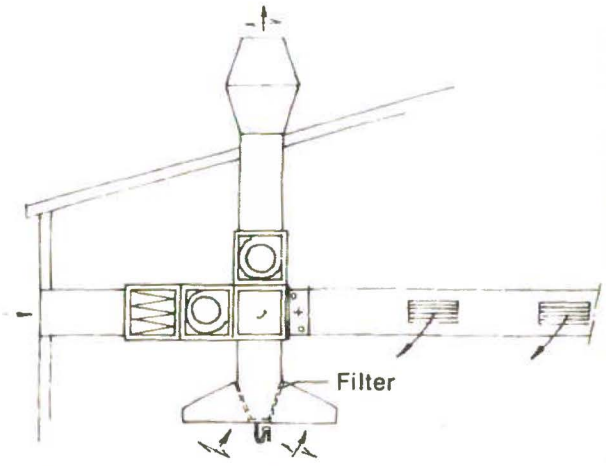
2.3.0 Suspension of other components

Other components of the MVV plant can be suspended in exactly the same way as described above.

2.4.0 Duct work

Normally the duct work will be shown on the installation drawing. If the duct work is not supplied by Dantherm, it can be manufactured according to the dimensions in section 1.8.0.

The dimensions shown are for the actual duct opening and 25 mm must be allowed on all four sides for connection to the frame flanges. The 140 mm spacing shown corresponds to the distance between 2 frames and allows enough space for fitting assembly rails. The duct bends shown below are intended for modules which are mounted in a diagonal position. If the modules are mounted in a horisontal position, duct connection is easier.



System with: 1×1, 2, 3 or 4 modules.

The horisontal position should only be used when the relative humidity of the exhaust air is low.

2.5.0 Inserting the modules

When all assembly and installation work is completed, the various modules can be put in position. Ensure that all metal swarf and the like is removed before insertion of the modules.

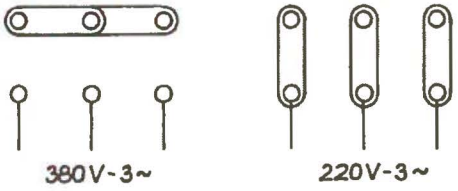
If difficulty is experienced in inserting the modules, it is possible that the framework has been distorted during assembly and suspension. This must be corrected, otherwise there is a risk that the pressure seals will be damaged and will no longer tighten satisfactorily.

2.6.0 Electrical installation

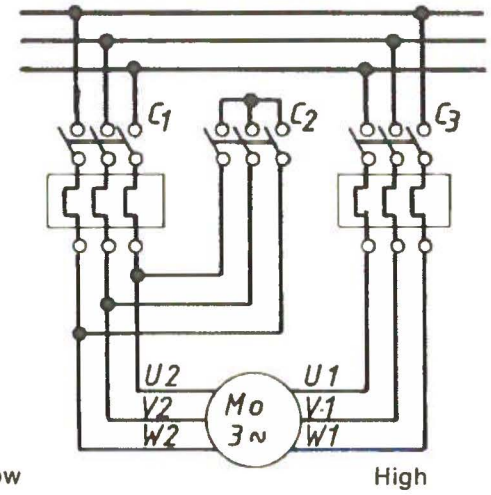
As the Dantherm MVV system is designed as a part of a general ventilation system, the electrical connections are a part of the main control system and only general recommendations can therefore be made.

2.6.1 Electric motors

Electric motors are supplied with the fan module. The motors are three-phase motors for 380/415 Volt supply. 380/415 Volt motors must be wired in a Star-connection.

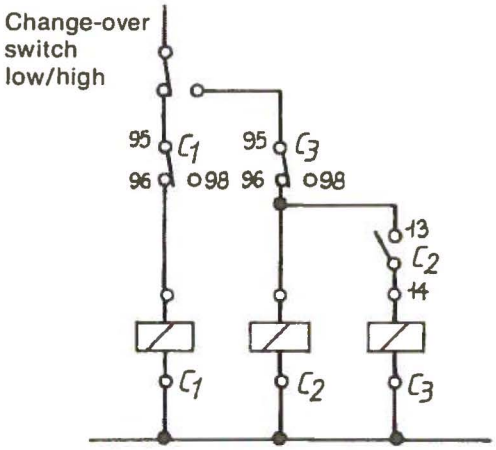


When the fan modules are specified and delivered with two-speed motors for high and low air volume, such motors will have been especially selected for fan operation and the power difference of lowest and highest stage is considerable.
When making the connection to such motors, please note that they are pole-changing wound and this requires two contactors for the highest r.p.m-rating.



Pole changing-wound motor

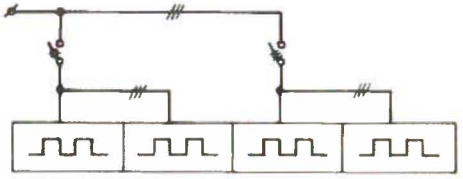
When designing control system ensure that the windings of the C2 contactor are connected before the C3 contactor starts to work. Therefore the connections shown below are recommended.



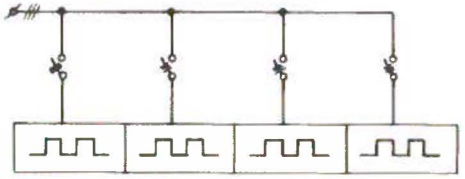
2.6.2 Electric heating coils

Electric heating coils which are supplied for the MVV system are of different heating outputs, depending on the type of plant and purpose. In most cases the heat output is split into several steps with different outputs, making it possible to switch on and off in steps. Each step requires its own contactor.

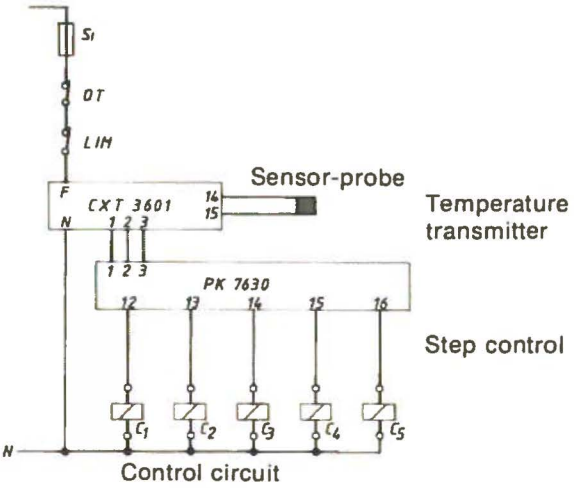
Electric heat output split into 2 steps.



Electric heat output split into 4 steps.



When a simpler type of control is acceptable - e.g. via 2 steps - as shown on the top sketch, a simple thermostat solution is sufficient. On more complicated controls, e.g. via 4 steps, as shown on the bottom sketch, some kind of electronic control will be needed.
Such electronic controls can be built as shown below.



2.6.3 Other electrical components

In some cases a number of different control functions may be incorporated, such as motor control of dampers, operation of solenoid valves etc. These functions are often controlled by thermostats, hygrostats, pressurestats etc. In such cases refer to system drawings and design the control system accordingly.

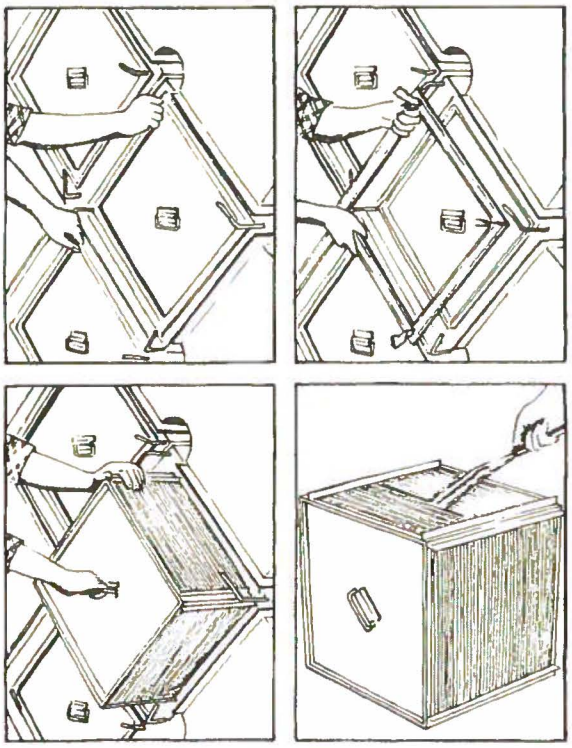
3.0.0 Maintenance

3

The time period between maintenance and service will be determined by site conditions and the condition of the air.
The different components of the plant require different kinds of inspection but irrespective of the regular operational inspection, at least one thorough inspection should be carried out each year.

3.1.0 Cleaning of recuperator module

Remove the recuperator from the frame after having taken off the front sealing frame.
The locking handles on each corner are turned clockwise from the 45° locked position, to the 90° position so that the levers are in line with the edge of the frame.
At this position the pin on the shaft of the handles will be in line with the cut out slot in the frame and the handles can be pulled outwards releasing the pressure from the seals and also freeing the front sealing frame.
Remove the front sealing frame by turning the corner locking catches inwards.
By pulling firmly on the handles, the modules can be withdrawn from the frame and removed for cleaning.
Depending upon the condition of the modules, cleaning can be done in one of two ways. For normal dust deposits, blow compressed air through each plate spacing. When the deposit on the plates consists of grease, hose down with hot water and detergent. If necessary, immerge the module in a suitable vessel filled with a detergent solution.



Do not use hard or sharp tools to remove deposits as the plates are easily damaged.
If the deposits are of such a nature that cleaning takes a long time, it is advisable to have a spare set of modules available.

When the module is dry after cleaning, check the seals at both ends of the module for damage or loss of flexibility. To change the seal prise up the edge of the seal and pull clear from the channel. Fit the new seal and trim ends to make an airtight fit.

3.2.0 Cleaning of fan module

It will be necessary to clean the fan module at least every 12 months. Remove the module from the frame as described above for recuperator module.

Dust and other deposits on the fan wheels are cleaned with a vacuum cleaner or by washing.

> It is important to remove anything that may have fallen into the fan housing.

At the same time check fan bearings for wear and the motor shaft coupling.

3.3.0 Cleaning of filter module

Remove the filter modules as described above and clean by compressed air blown through from the clean air side or by vacuum cleaning. If necessary remove the filter mat and either wash in soapy water or replace completely. Refit the filter module in the frames and lock. The frequency of cleaning cannot be determined in advance, as it depends on site conditions.

However, it is recommended during the initial running period to check the filters frequently in order to find out how often cleaning will be required. If required a filter guard, differental pressure switch, or horisontal manometer can be installed to indicate when the filter needs cleaning.