

MARSTAIR

REFRIGERATION AND SPECIALIST AIR CONDITIONING

USER MANUAL



MB & MW SERIES AIR COOLER AND UNIT COOLER

Cold Room Evaporator Manual Index

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GENERAL

1. TEV Ltd recommend that personnel working on this equipment be skilled and fully conversant with the appropriate Air Conditioning, Refrigeration and Electrical practices and have sound knowledge of current Industrial Safe Working practices.
2. These units contain live electrical components, moving parts and refrigerant under pressure
3. Always site out of reach of children and protect from vandalism
4. The data plate gives information for the evaporator unit only

1. INTRODUCTION

This manual includes Marstair production of MB and MW types of Cold Room Evaporators which are used in the cooling sector. MB are box type and MW are wedge type ceiling mounted coolers.

Please read this manual carefully to ensure correct usage and maintenance of your products.

1.1 Model Code Explanation

- M :Marstair (MB/MW)
B :Type (Box/Wedge)
MT :Unit Temp (Medium Temp/ Low Temp)
1 :No. of fans (1, 2 or 3)
25 :Fan Diameter (25-30cm)
A :Design Spec (A, B, BE,C, E)

2. SYSTEM

- 1) Product Casing
- 2) Connector
- 3) Fan
- 4) Fan Motor (Klemens)
- 5) Drainage Tray
- 6) Drainage Connector
- 7) Coils
- 8) Inlet & Outlet Connections
- 9) Hinge
- 10) Terminal Box

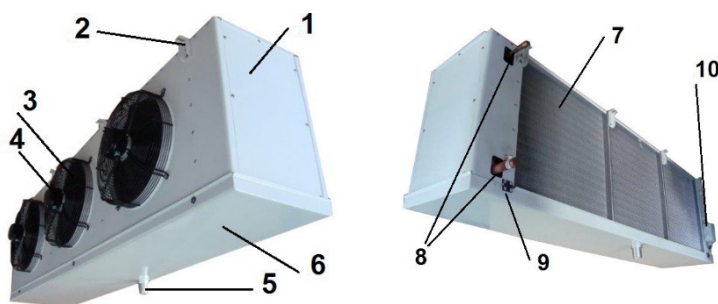


Figure 2.0 General view of product

Refrigerant circulates around the system, while the ambient air is drawn through the coil by the fans. During the cooling process air humidity may cause icing problems and defrosting may be required. Coolers are manufactured with electric defrost.

2.1 Marstair Box type Cold room evaporator

MB type cold room evaporators are manufactured for use in small and medium commercial areas. They have Ø250mm, Ø250mm, Ø300mm, Ø300mm diameters for fans 4,2mm, 6,0mm, 8,0mm and 10mm fin spacing is standard. Drainage tray has hinged design for easy maintenance. MB types can be manufactured with up to 4 fans.

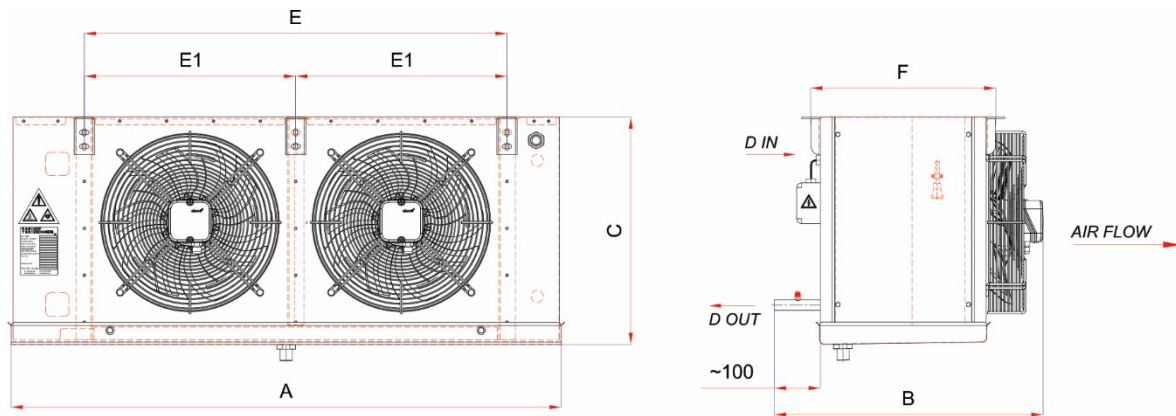


Figure 2.1.1 – MB Evaporator

MODEL	COIL DATA								
	SC2: Evaporating @ -8 °C	DIMENSIONS							WEIGHT
		A	B	C	E	E1	E2	F	
		mm							
MBMT125A	1010	727	520	363	455	-	-	345	15
MBMT125B	1279	727	520	363	455	-	-	345	16
MBMT130B	1731	727	520	426	455	-	-	345	18
MBMT130E	2491	727	520	426	455	-	-	345	20
MBMT230B	3541	1147	520	426	875	438	-	345	27
MBMT230C	4242	1147	520	426	875	438	-	345	29
MBMT230E	4814	1147	520	426	875	438	-	345	32
MBMT230BE	5507	1357	520	426	1085	543	-	345	37
MBMT430AE	9777	1987	520	426	1696	438	420	345	60

MODEL	CAPACITY R404A		COIL DATA								WEIGHT
	SC2: Evaporating @ -8 °C	SC3: Evaporating @ -25 °C	DIMENSIONS								
			A	B	C	E	E1	E2	F		
	W		mm								
MBLT130B	1440	1099	727	520	426	455	-	-	345	18	
MBLT130C	1843	1443	727	520	426	455	-	-	345	19	
MBLT130E	2286	1776	727	520	426	455	-	-	345	20	
MBLT130BE	2659	2099	832	520	426	560	-	-	345	23	
MBLT230C	3732	2946	1147	520	426	875	438	-	345	29	
MBLT230E	4789	3790	1147	520	426	875	438	-	345	32	
MBLT330C	5929	4705	1567	520	426	1295	438	420	345	42	
MBLT330E	7383	5834	1567	520	426	1295	438	420	345	44	

Medium Temperature

Model	Evaporating @ -8°C (SC2)	Air side		Sound	Fan Data				Defrost Heaters			Coil Data		
		Airflow	Air Throw	Sound Pressure Level	Power	No. Of Fans	Fan Diameter	Motor	Coil	Drip Tray	Total	Internal Volume	Inlet	Outlet
		m³/h	m	dB(A)3m	w	pcs	mm		kW			dm³	mm	
MBMT125A	1010	908	5.1	37	77	1	250	230/1/50	0.48	-	0.48	0.6	3/8"	3/8"
MBMT125B	1279	866	4.9	37	78	1	250	230/1/50	0.48	-	0.48	0.8	3/8"	1/2"
MBMT130B	1731	1272	6	41	113	1	300	230/1/50	0.48	-	0.48	1	3/8"	1/2"
MBMT130E	2491	1035	4.9	41	115	1	300	230/1/50	0.96	-	0.96	2.1	3/8"	5/8"
MBMT230B	3541	2543	6.6	44	225	2	300	230/1/50	0.97	-	0.97	2.1	3/8"	5/8"
MBMT230C	4242	2362	6.1	44	227	2	300	230/1/50	1.94	-	1.94	2.7	1/2"	3/4"
MBMT230E	4814	2071	5.4	43	230	2	300	230/1/50	1.94	-	1.94	4	3/8"	3/4"
MBMT230BE	5507	2289	5.9	43	228	2	300	230/1/50	2.14	-	2.14	4.9	1/2"	7/8"
MBMT430AE	9777	4142	5.9	46	459	4	300	230/1/50	3.52	-	3.52	8.2	5/8"	1-1/8"

Low Temperature

Model	Evaporating @ -25°C (SC3)	Air side		Sound	Fan Data				Defrost Heaters			Coil Data		
		Airflow	Air Throw	Sound Pressure Level	Power	No. Of Fans	Fan Diameter	Motor	Coil	Drip Tray	Total	Internal Volume	Inlet	Outlet
		m³/h	m	dB(A)3m	w	pcs	mm		kW			dm³	mm	
MBLT130B	1099	1316	6.2	41	112	1	300	230/1/50	0.48	0.48	0.96	1	Ø9,52	Ø12,7
MBLT130C	1443	1239	5.8	41	113	1	300	230/1/50	0.96	0.48	1.44	1.4	Ø9,52	Ø12,7
MBLT130E	1776	1104	5.2	41	115	1	300	230/1/50	0.96	0.48	1.44	2.1	Ø9,52	Ø15,9
MBLT130BE	2099	1204	5.7	41	113	1	300	230/1/50	1.14	0.57	1.71	2.4	Ø9,52	Ø19
MBLT230C	2946	2478	6.4	43	226	2	300	230/1/50	1.94	0.97	2.91	2.7	Ø12,7	Ø19
MBLT230E	3790	2207	5.7	43	229	2	300	230/1/50	1.94	0.97	2.91	4	Ø12,7	Ø19
MBLT330C	4396	3716	6.7	45	338	3	300	230/1/50	2.8	1.4	4.2	4.1	Ø12,7	Ø22

2.2 Marstair Wedge Type Cold Room Evaporator

MW type cold room evaporators are manufactured to be ceiling mounted. They have fans with Ø300mm fan diameter and they are configurable with up to 3 fans. 4,2mm and 7,00mm are the standard fin spacing. Drainage tray has a hinged design for easy maintenance.

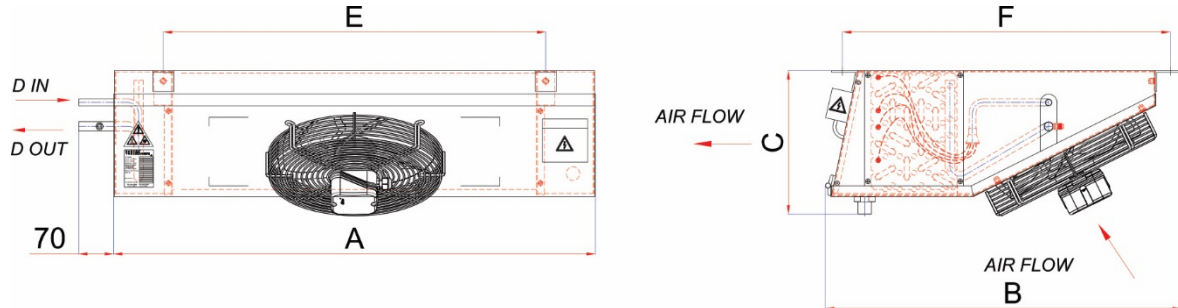


Figure 2.2.1 - MW Evaporator

MODEL	COIL DATA								WEIGHT kg
	SC2: Evaporating @ -8 °C	DIMENSIONS							
		A	B	C	E	E1	E2	F	
		mm							
MWMT130B	1738	780	685	370	515	-	-	630	18
MWMT130C	2051	780	685	370	515	-	-	630	19
MWMT230B	3552	1260	685	370	995	498	-	630	30
MWMT230C	4378	1260	685	370	995	498	-	630	31
MWMT230E	5175	1260	685	370	995	498	-	630	34
MWMT330C	6563	1740	685	370	1475	498	480	630	43

MODEL	CAPACITY R404A		COIL DATA								WEIGHT
	SC2: Evaporating @ -8 °C	SC3: Evaporating @ -25 °C	DIMENSIONS								
			A	B	C	E	E1	E2	F		
	W		mm							kg	
MWLT130B	1332	1012	780	685	370	515	-	-	630	19	
MWLT130C	1787	1396	780	685	370	515	-	-	630	19	
MWLT130E	2258	1751	780	685	370	515	-	-	630	21	
MWLT230B	2823	2228	1260	685	370	995	498	-	630	30	
MWLT230C	3465	2704	1260	685	370	995	498	-	630	32	
MWLT230E	4611	3645	1260	685	370	995	498	-	630	34	
MWLT330C	5474	4305	1740	685	370	1475	498	480	630	44	
MWLT330E	7130	5657	1740	685	370	1475	498	480	630	47	

Medium Temperature

Model	Evaporating @ -25°C (SC3)	Air side		Sound	Fan Data					Defrost Heaters			Coil Data		
		Airflow	Air Throw	Sound Pressure Level	Total Power	Total Current	No. Of Fans	Fan Diameter	Motor	Coil	Drip Tray	Total	Internal Volume	Inlet	Outlet
		m³/h	m	dB(A)3m	w	A	pcs	mm		kW			dm³	mm	
MWLT130B	1012	1459	8.5	43	65	0.29	1	300	230/1/50	0.96	0.48	1.44	0.9	3/8"	1/2"
MWLT130C	1396	1384	8.1	43	66	0.29	1	300	230/1/50	0.96	0.48	1.44	1.3	3/8"	1/2"
MWLT130E	1751	1256	7.3	43	67	0.29	1	300	230/1/50	0.96	0.48	1.44	2	3/8"	5/8"
MWLT230B	2228	2919	11.5	46	129	0.58	2	300	230/1/50	1.92	0.96	2.88	1.8	3/8"	5/8"
MWLT230C	2704	2767	10.9	46	131	0.58	2	300	230/1/50	1.92	0.96	2.88	2.3	3/8"	3/4"
MWLT230E	3645	2512	9.9	46	133	0.58	2	300	230/1/50	1.92	0.96	2.88	3.9	3/8"	3/4"
MWLT330C	4305	4151	13.7	48	196	0.87	3	300	230/1/50	2.88	1.44	4.32	3.9	1/2"	3/4"
MWLT330E	5657	3768	12.5	48	200	0.87	3	300	230/1/50	2.88	1.44	4.32	5.5	5/8"	7/8"

Low Temperature

Model	Evaporating @ -8°C (SC2)	Air side		Sound	Fan Data					Defrost Heaters			Coil Data		
		Airflow	Air Throw	Sound Pressure Level	Total Power	Total Current	No. Of Fans	Fan Diameter	Motor	Coil	Drip Tray	Total	Internal Volume	Inlet	Outlet
		m³/h	m	dB(A)3m	w	A	pcs	mm		kW			dm³	mm	
MWMT130B	1738	1394	8.1	43	66	0.29	1	300	230/1/50	0.96	-	0.96	0.9	3/8"	1/2"
MWMT130C	2051	1304	7.6	43	66	0.29	1	300	230/1/50	0.96	-	0.96	1.3	3/8"	1/2"
MWMT230B	3552	2789	11	46	131	0.58	2	300	230/1/50	1.92	-	1.92	2	3/8"	5/8"
MWMT230C	4378	2608	10.3	46	132	0.58	2	300	230/1/50	1.92	-	1.92	2.6	3/8"	3/4"
MWMT230E	5175	2347	9.2	47	135	0.59	2	300	230/1/50	1.92	-	1.92	3.9	3/8"	3/4"
MWMT330C	6563	3912	12.9	47	198	0.87	3	300	230/1/50	2.88	-	2.88	3.5	1/2"	7/8"

3. SAFETY INSTRUCTIONS

- Installation, electrical connections and operation should be done by authorized and trained persons.
- System must comply with refrigerant type, range of working pressure and range of working temperatures which are shown on product labels.
- The project firm which performs installation should observe EMC Guideline during installation of control units. (EMC 89/336/EEC)

3.1 Positioning

- Make sure the air circulation fulfills the entire room.
- Keep enough space for maintenance. Make sure the side panels and drainage tray are easily removable
- Avoid mounting evaporators above doors.
- Ensure optimum piping and drainage lines
- Sample dimensions for positioning are given below in the table. (H: Evaporator Height). Please consult your project firm for exact dimensions.

Evaporator Height	Distance between product and back wall	Distance between product and side wall	Distance between product and product	Distance between product and front wall	Distance between product and floor
H	1 x H	1 x H	2 x H	5 x H	3 x H

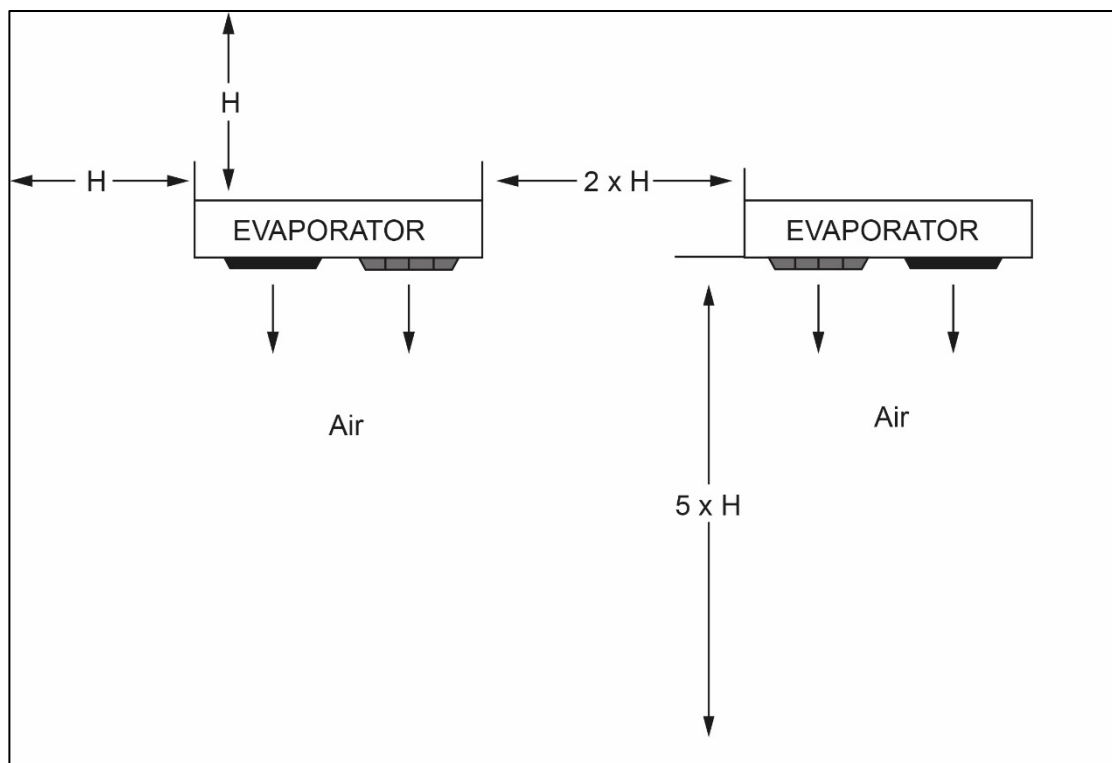


Figure 3.1.1 Layout plan for positioning (

3.2 Installation

- Ensure that product mounting is level and stable.

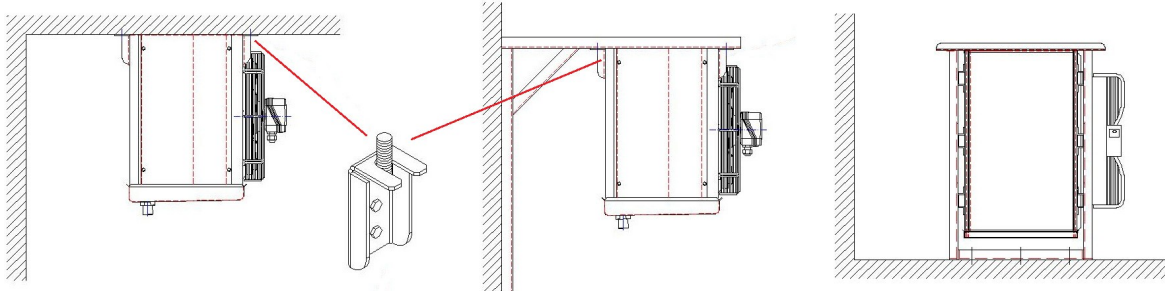


Figure 3.2.1 Connector

3.3 Piping

- Be careful choosing and assembling suction line and its parts for piping. Optimum piping has enough refrigerant or velocity for effective circulation and has a pressure drop which does not reduce system performance.

3.4 Connections

- At the factory products are always tested with air for leakages and contain a nitrogen holding charge.

Model	Test Pressure (air)	Transport Pressure (Nitrogen)
MB	35 bar	6 bar
MW	35 bar	6 bar

- Do not keep the connections in open position or in contact with atmospheric air
- Insert the correct amount of refrigerant in the heat exchanger. This information should be determined by the Project engineer.

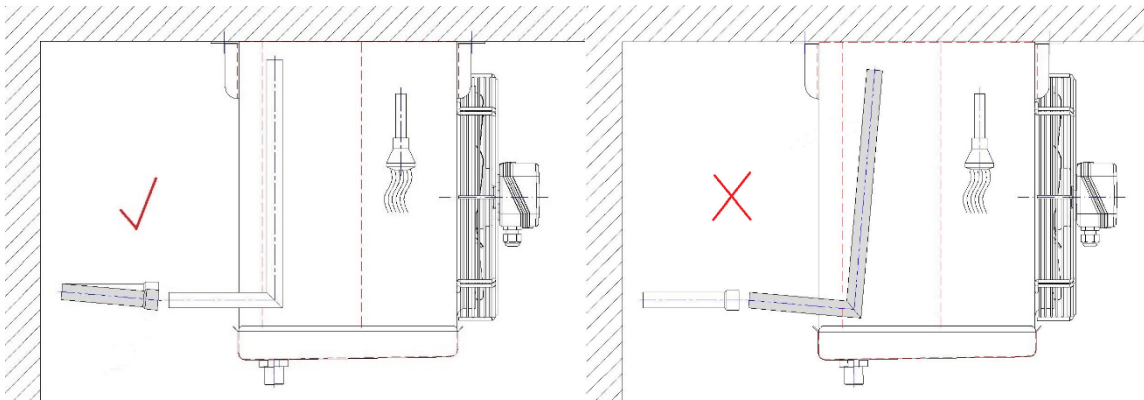


Figure 3.4.1 Correct and incorrect connections

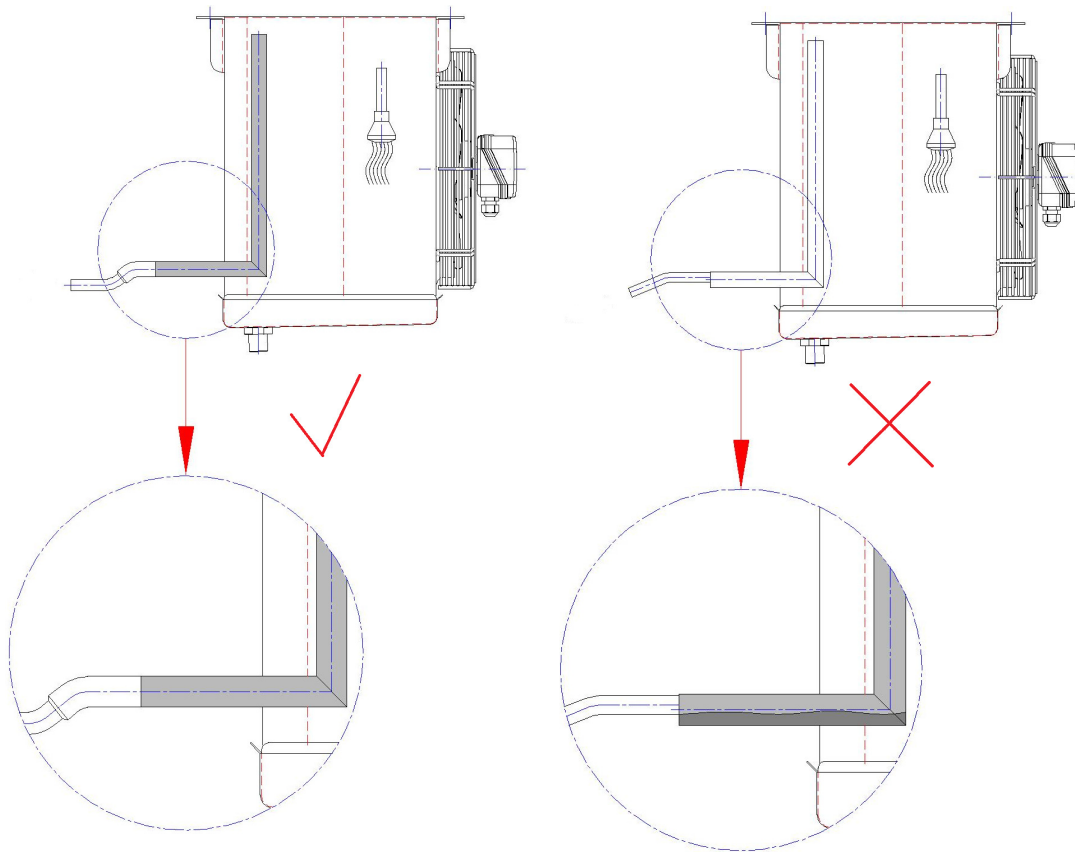


Figure 3.4.2 Correct and incorrect connections

- Do not hold welding torch directly to the product

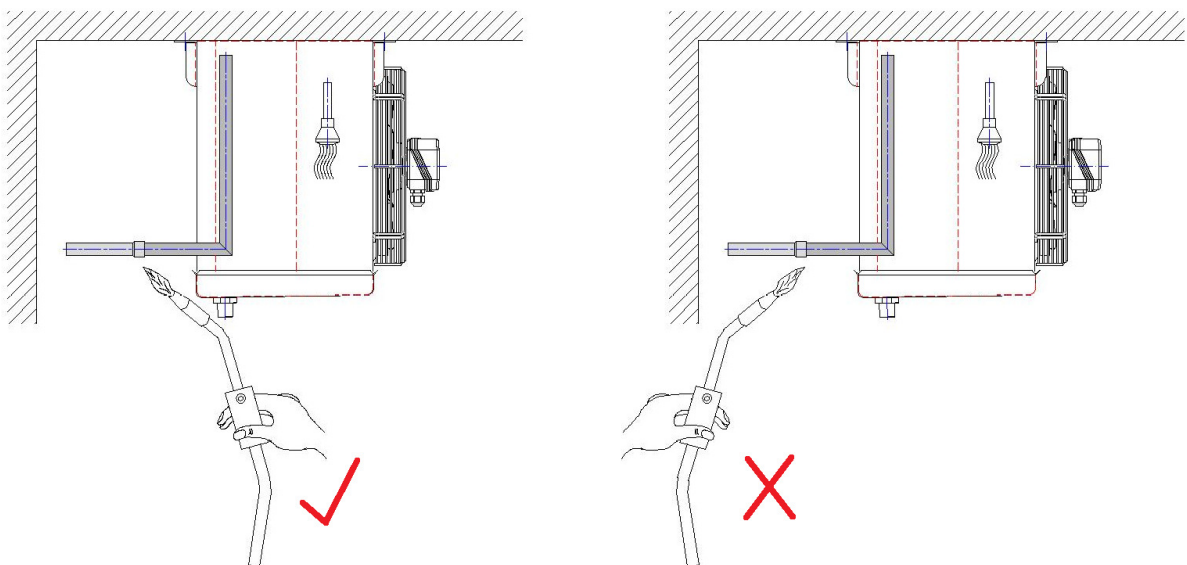


Figure 3.4.3 Correct usage of welding flame

3.5 Drainage

- Make sure the drainage line is gradually lower than the drainage pan, so drainage line must be downward sloping for easy drainage.

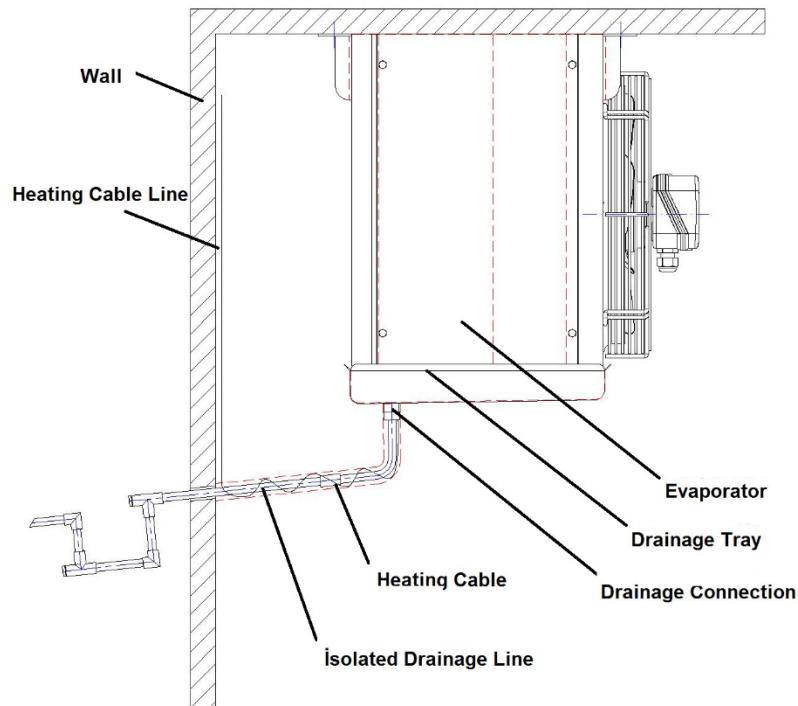


Figure 6.8 Example of recommended drainage line

3.6 Fan

- MB types have inflow fans, MW types have outflow fans.
- Before the first start-up make sure fan is completely rotatable and able to run freely.
- All models have axial fans as standard.

Model	Fan	Min. Working Temperature °C	Max. Working Temperature °C	Protection Class	Number of Poles	Fan Diameter
MB	S4E250-AI02-01	-25	55	IP44	4	250
	VNT 25-40 Ø254-28°	-40	40	IP41	4	254
	S4E300-AS72-37	-40	60	IP44	4	300
	VNT 34 45 Ø300-34°	-40	40	IP41	4	300
MW	S4E300-AS72-80	-25	70	IP44	4	300

3.7 Refrigerant Charge

- Product is charged with a nitrogen holding charge (6 bar pressure). For this reason, inside of tubes should be cleaned out with vacuum before charging with refrigerant.

3.8 Sound Level

- In the below tables, Sound level of products with standard fans are given in db(A) (decibels) for 3 m distance. Values are obtained from fan manufacturers, and they are only for making a comparison, in different installation conditions different values can be obtained. Sound levels are calculated according to EN 13487 standard.

MB

No. of Fans Fan Dia.	1	2	3
Ø250	33	-	-
Ø250	37	-	-
Ø300	37	40	42
Ø300	41	44	46

MW

No. of Fans Fan Dia.	1	2	3
Ø300	40	43	45

- Earpiece must be worn when sound pressure level is over 85 dB(A).

3.9 Capacity Measurement

- Measurement points are taken as shown below.

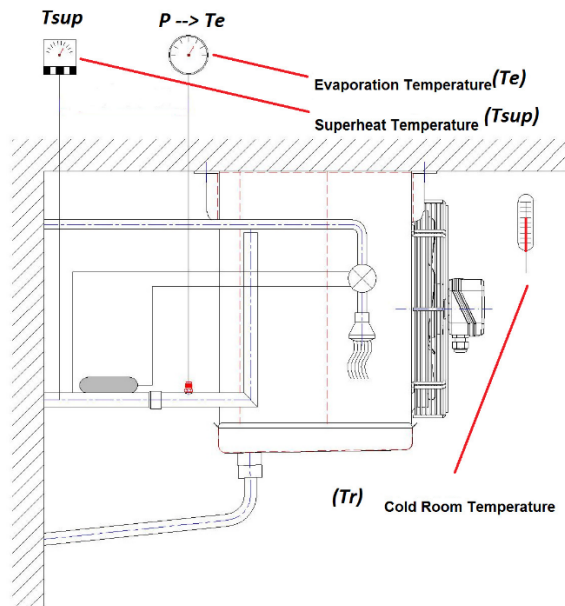


Figure 3.8.1 Measurement point

- Tr: Cold room temperature
- Te: Evaporation temperature
- Tsup: Superheating temperature

For optimal cooling performance (Tsup-Te) should be 0,7 times bigger than (Tr-Te)

4. OPERATION

- Make sure all electric connections are tightened.
- Make sure all fan screws are tightened.
- Make sure heat exchanger mounting is level and stable.
- Make sure all of the defrost heaters are working properly.
- Because of the high humidity of the ambient air high icing formation may be seen during the first start-up. For this reason check icing formation if it occurs.
- Observe defrost cycle.
- Make sure that the system is evacuated well from air. There should not be air pockets inside of the coil.
- Cables should not be affected by heat of resistance.
- Check the defrost process. Defrost time can be extended if it is not enough to melt all of the ice.
- The coil heater is extremely hot. Do not touch without gloves. Be wary of any material splashing and wear protective goggles.
- Fans, cables, etc. in case of fire shut off electricity immediately. Use a fire extinguisher suitable for electrical materials.

5. SPARE PARTS

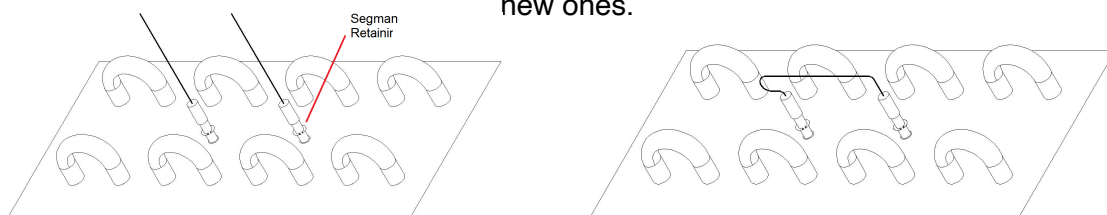
Products for spare parts, please contact Marstair. Any spare parts taken from other companies, Marstair will not be responsible in case of any damage and will be out of warranty.

6. MAINTENANCE

- Please ensure that all maintenance work is done by authorised persons.
- Regular inspection and periodic maintenance is enough to ensure long time usage.
- Make sure drainage water easily flows away. Please see water flows away easily with opening drain pan and side cover.
- Commercial leakage detector can be used in detecting leakages.
- Make sure each fan is running freely.
- Visually inspect all of the electrical wiring connections.
- Observe ice formation and examine defrost cycle.
- Gas circulation must be stopped during maintenance.

6.1 Changing Defrost Heaters

- Electric defrost heaters come in two configurations. One is for light ice formation between 0° C and 5° C temperatures and the other one is for heavy ice formation below 0° C temperatures.
- Before anything is done make sure electric power is off
- Open the terminal box.
- Make sure that heating elements are not extremely hot.
- Disassemble coil heating elements by removing retaining rings and change them with new ones.



Disassembling coil resistances

Figure 6.1.1

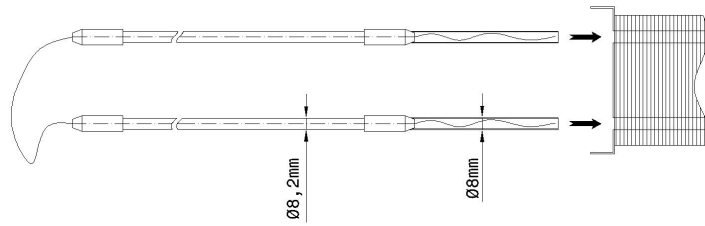


Figure 6.1.2 Disassembling coil resistances

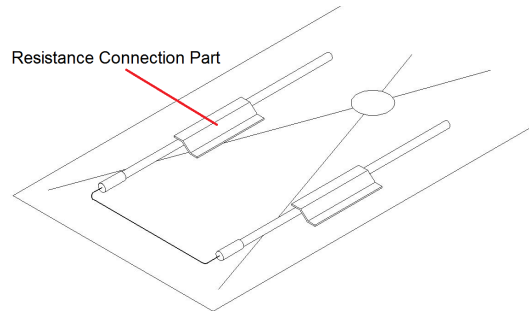


Figure 6.1.3 Changing drainage tray resistances

6.2 Changing Fans

- Ensure that electric power is off.
- Disassemble fan screws.
- Remove electrical wirings.
- Assemble the fan and be sure of the alignment.
- Please repeat instructions.

Changing fan motor;

- Proceed the upper instruction until dissembling fan.
- Remove fan motor wirings.
- Remove fan motor from its place and change the new ones.
- Please repeat instructions.

6.3 Cleaning

- Periodically clean the product with brush and pressurized water.
- Remove the drainage line connection.
- Remove the drainage tray and clean it properly.
- Take care of the drainage line and drainage tray during cleaning.
- Hold the cleaning water vertical to the fins not to harm them.
- Rinse the product until all residues are gone.

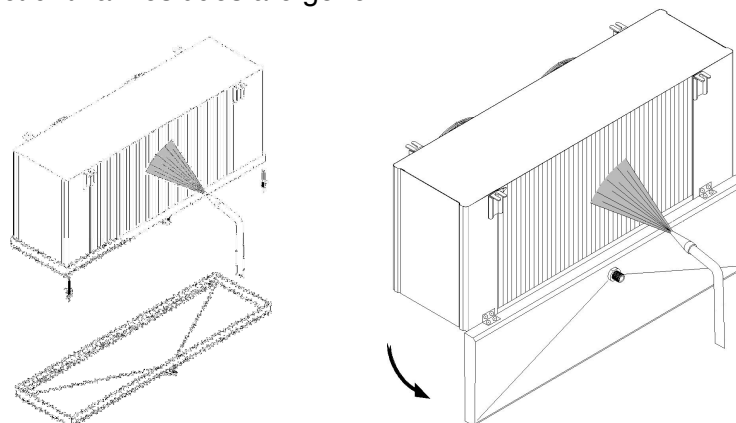


Figure 6.3.1 Preparation for cleaning

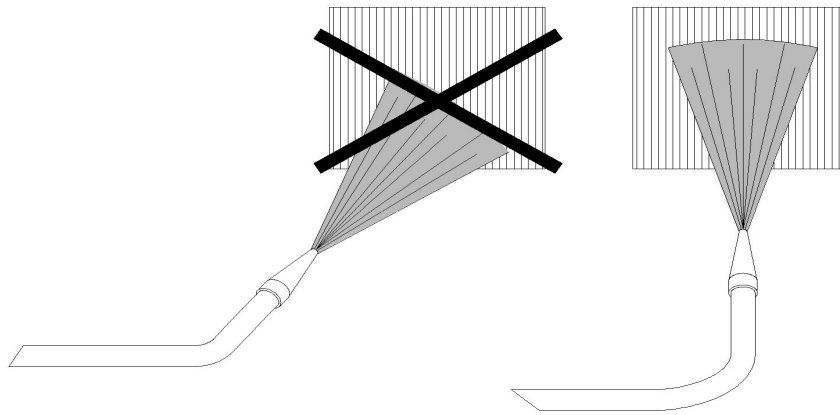


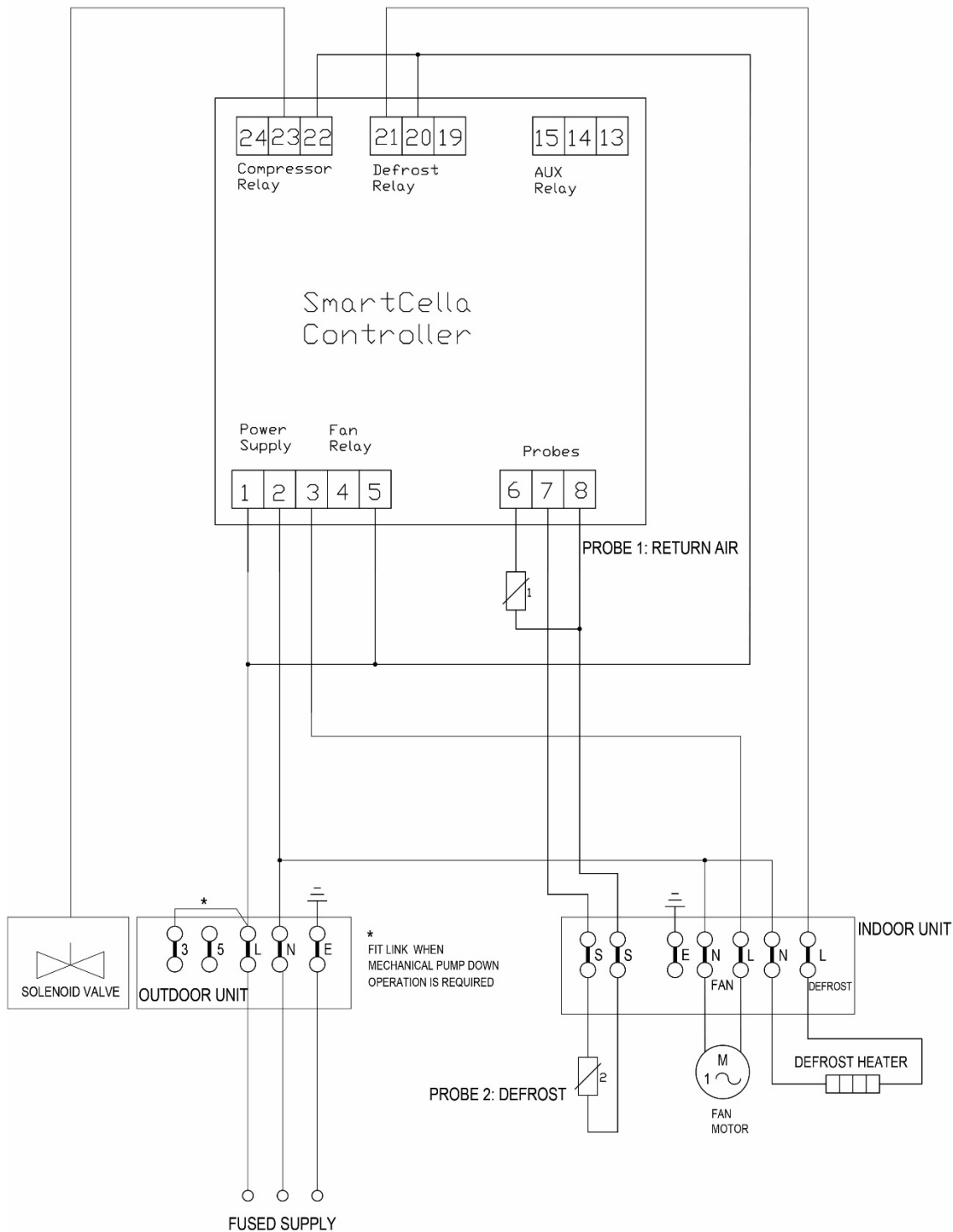
Figure 6.3.2 Hold the water vertical.

7. TROUBLESHOOTING

Problem	Reason	Solution
The product does not operate	-Power is off -Connection damage	-Check the power. Check the fuses -Check connections
Fans are not operate	-Power is off -Block of rotation	-Check the power -Be sure fan runs smoothly and freely
Temperature is too high	-Heat exchanger is covered with ice -Not enough refrigerant -Leakage	-Check the heat exchanger fin surfaces -Add refrigerant -May be a fault before evaporator inlet. - Check for gas leaks. If there is no leakage add the correct amount of gas, if there is a leakage, check the "leakage occurs" section.
Defrost is not working	-Power is off -Electrical connections loosen	-Check the power -Control the electrical wiring -If there is heater malfunction, change it with new one.
Leakage occurs	-Deformation in tubes	-Control the system tightness and get in contact with manufacturer
Not enough air flow	-Polluted heat exchanger -Heat exchanger is covered with ice	-Clean the fin surface -Deice the heat exchanger fin surfaces
Noisy operation	-Icing occurs on fan surface -Fan blade damage -Refrigerant noise	-Deice the fan surfaces -Change fans -Get in contact with the project firm

8. INTERCONNECTING WIRING DIAGRAM

MB Cold Room Evaporators Interconnecting Wiring Diagram



9. PARAMETERS CHANGED ON SMARTCELLA

D1 (Maximum time between consecutive defrosts) = 8

D6 (Terminal display during defrost) = 0 (Alternating display of temperature and def value)

Dc (Time base for defrost) = 0 (dl in hours, dP1 and dP2 in minutes)

D10 (Defrost time in running mode) = 5

F2 (Evaporator fans with compressor OFF) = 0 (see parameter f0)

The AUX output configuration is set to a normally de-energised alarm by default.

Defrost configuration set to electric heater by temperature.