MARSTAIR

REFRIGERATION AND SPECIALIST AIR CONDITIONING

A2LSYSTEMATCH TECHNICAL MANUAL

55008432-06

CONTENTS

1 – GENERAL INFORMATION

1A GENERAL INFORMATION

Installation must be carried out in accordance with the Marstair installation manual, EN 378 and national codes and guidance.

1. Installation work on this equipment to be completed by F Gas certified Technicians who are fully conversant with the appropriate Refrigeration and Electrical practices and have sound knowledge of current Industrial Safe Working practices. It is also advisable that technicians hold the ACRIB Understanding the properties of flammable refrigerants (A2L, A2 and A3) qualification.

   NOTE: it is the responsibility of the operator to ensure the technician is certified to the correct standard (EN13313 or equivalent).

2. These units are supplied with a holding charge of oxygen free nitrogen and polyolester oil. Do not mix oils or refrigerants.

3. These units when installed contain live electrical components, moving parts and refrigerant under pressure. Always site out of reach of children and protect from vandalism.

4. The data plate only gives information for the individual indoor or outdoor unit. For system details add input power and current of indoor and outdoor unit, including any heater load.

5. The refrigerant used should be identified by locating a refrigerant label on the unit case

6. A suitable risk assessment of the installation must be carried out. This ensures a safe working environment is maintained in accordance with The Dangerous Substances and Explosive Atmosphere Regulations and the Management of Health and Safety at Work Regulations. A step by step guidance template is provided within these instructions.

7. The condensing unit must be installed outside.

8. Systems uses R454C refrigerant which is classed as an A2L flammable gas

1B GENERAL INSTALLATION PROCEDURE

- Carry out “step by step” or full risk assessment
- Ensure that no sources of ignition are present during installation
- Only certified natural persons should be present during the installation
- Correct selection of tools and equipment compatible with A2L refrigerants. This should include the following:
  - Flammable gas leak detector placed at a low level next to the service valves of the condensing unit.
  - If adequate natural ventilation is not present throughout the installation process, then forced ventilation should be employed via an A2L compatible or ATEX rated fan and motor.
  - When pressure testing through a refrigerant manifold, ensure that it is suitable for the pressure (no sight glass fitted).
  - A2L compatible 2 stage vacuum pump, exhausted to a safe well ventilated area and away from any source of ignition (check exhaust fumes with flammable gas leak detector).
  - R454C bottle adaptor (left handed female and right handed male connections DIN477-1 21.8mm LH, External, 14 T.P.I).
  - All refrigerant hoses should be as short as possible and have self-closing or ball valve connections in accordance with BS EN 378.
  - If additional refrigerant is to be added, charge in liquid state and ensure a flammable gas leak detector is positioned at a low level near the connections. (If the flammable gas leak detector indicates the presence of a flammable atmosphere, do not energise or de-energise any electrical components until a safe environment has been ensured.)
- Leak checking the system in accordance with EN 1516/2017 directly after installation.
- If a leak is discovered, energise the flammable gas leak detector and place at a low level near connections to the recovery machine and cylinder. Connect an A2L compatible recovery machine and recover into a suitable recovery cylinder (red painted cylinder valve guard and shoulder) in accordance with BS EN 378.

2 - SMC CONDENSING UNITS

2A SPECIFICATION.

SME		15	20	30	40	45	50	80	90	100	150
Nominal cooling capacity (-10°C evaporating temp & 32°C ambient temp) R454C	kW	1.24	1.53	1.78	2.26	2.96	4.17	5.26	5.95	7.45	8.83
1 Ph (230V 50Hz) compressor load only (at nominal cooling capacity)											
Power (nominal)	kW	0.72	0.83	0.98	1.23	1.4	1.8	2.2	2.5	N/A	N/A
Starting current LRA	A	29.5	33	42.2	48	61	76	97	114	N/A	N/A
Nominal current FLA	A	5.4	5.8	6.4	10.3	11.4	16.2	20.6	23.5	N/A	N/A
3Ph (400v 50Hz) compressor load only (at nominal cooling capacity)											
Power (nominal)	kW	N/A	N/A	N/A	1.23	1.36	1.75	2.18	2.47	2.84	3.34
Starting current LRA	A	N/A	N/A	N/A	23	26	32	46	50	64	74
Nominal current FLA	A	N/A	N/A	N/A	3.8	4.2	5.5	6.8	7.8	10.1	11.8
Sound Pressure Levels (SPL) at 10m distance in free field conditions @ 27°C external ambient.											
dBA		34	34	34	34	33	33	34	37	38	37
NR		28	28	28	28	27	27	27	30	31	30
Condenser fan (1Ph 230V 50Hz)											
Airflow (max speed)	m^3/s	0.323	0.323	0.713	0.713	0.713	0.713	0.713	0.713	1.85	1.85
Airflow motor rating	kW	0.065	0.065	0.13	0.13	0.13	0.13	0.13	0.13	2x0.13	2x0.13
Nominal current FLA	A	0.4	0.4	0.6	0.6	0.6	0.6	0.6	0.6	2x0.6	2x0.6
Fans: No. x diameter	#x mm	1x350	1x350	1x457	1x457	1x457	1x457	1x457	1x457	2x457	2x457
Fans max speed	r.p.m	940	940	940	940	940	940	940	940	940	940

2B PERFORMANCE DATA.

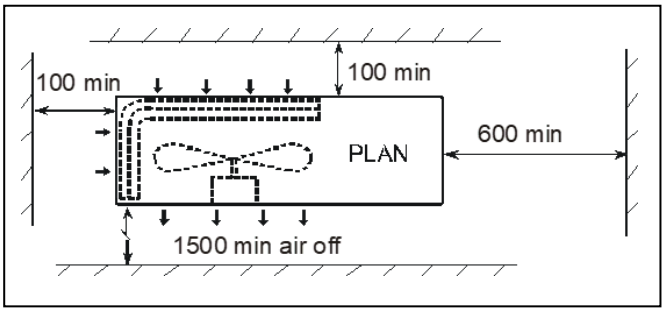
		Evaporating temperature				
	Ambient temperature	-20	-15	-10	-5	0
SMC 15	27	0.77	1.01	1.37	1.64	2.09
	30	0.73	0.95	1.29	1.54	1.98
	32	0.70	0.92	1.24	1.49	1.90
	35	0.66	0.86	1.17	1.40	1.79
	38	0.62	0.81	1.11	1.32	1.69
	40	0.60	0.78	1.06	1.27	1.62
SMC 20	27	0.95	1.25	1.69	2.02	2.59
	30	0.90	1.18	1.60	1.91	2.44
	32	0.86	1.13	1.54	1.84	2.35
	35	0.81	1.07	1.45	1.73	2.22
	38	0.77	1.01	1.37	1.63	2.09
	40	0.74	0.97	1.31	1.57	2.01
SMC 30	27	1.10	1.44	1.96	2.34	3.00
	30	1.04	1.36	1.85	2.21	2.83
	32	1.00	1.31	1.78	2.13	2.72
	35	0.94	1.24	1.68	2.00	2.57
	38	0.89	1.16	1.58	1.89	2.42
	40	0.85	1.12	1.52	1.81	2.32
SMC 40	27	1.40	1.84	2.49	2.97	3.81
	30	1.32	1.73	2.35	2.81	3.60
	32	1.27	1.67	2.26	2.70	3.46
	35	1.20	1.57	2.13	2.55	3.26
	38	1.13	1.48	2.01	2.40	3.07
	40	1.09	1.42	1.93	2.31	2.95
SMC 45	27	2.03	2.55	3.16	3.88	4.72
	30	1.95	2.45	3.04	3.74	4.55
	32	1.90	2.38	2.96	3.64	4.44
	35	1.81	2.28	2.84	3.50	4.26
	38	1.72	2.18	2.71	3.35	4.09
	40	1.67	2.11	2.63	3.25	3.97
SMC 50	27	2.86	3.60	4.46	5.47	6.66
	30	2.75	3.46	4.29	5.28	6.42
	32	2.68	3.36	4.18	5.13	6.26
	35	2.55	3.22	4.01	4.94	6.01
	38	2.43	3.08	3.82	4.73	5.77
	40	2.36	2.98	3.71	4.58	5.60
SMC 80	27	3.61	4.53	5.62	6.90	8.39
	30	3.47	4.36	5.41	6.65	8.09
	32	3.38	4.23	5.26	6.47	7.90
	35	3.22	4.05	5.05	6.22	7.58
	38	3.06	3.88	4.82	5.96	7.27
	40	2.97	3.75	4.68	5.78	7.06
SMC 90	27	4.09	5.13	6.36	7.81	9.50
	30	3.92	4.93	6.12	7.53	9.16
	32	3.82	4.79	5.96	7.33	8.94
	35	3.64	4.59	5.72	7.04	8.57
	38	3.46	4.39	5.45	6.74	8.23
	40	3.36	4.25	5.29	6.54	7.99
SMC 100	27	5.11	6.42	7.95	9.76	11.88
	30	4.91	6.17	7.65	9.41	11.45
	32	4.78	5.99	7.45	9.16	11.17
	35	4.55	5.74	7.15	8.81	10.72
	38	4.33	5.49	6.82	8.43	10.29
	40	4.20	5.31	6.62	8.18	9.99
SMC 150	27	6.06	7.61	9.43	11.58	14.09
	30	5.82	7.31	9.07	11.16	13.58
	32	5.67	7.10	8.84	10.86	13.25
	35	5.40	6.81	8.48	10.45	12.72
	38	5.13	6.51	8.09	10.00	12.21
	40	4.98	6.30	7.85	9.70	11.85

2C MOUNTING, DIMENSIONS & WEIGHTS.

These units are designed to stand on a flat surface. If the unit is to be wall mounted the following kits are available.

KIT	MRC+ 15-80	MRC+ 90-180
Mounting Bracket	55021100	55021101

Whether floor or wall mounted, it is essential that the mounting surface is capable of supporting the unit weight**.** Leave space around the unit for air circulation and access for installation and maintenance.



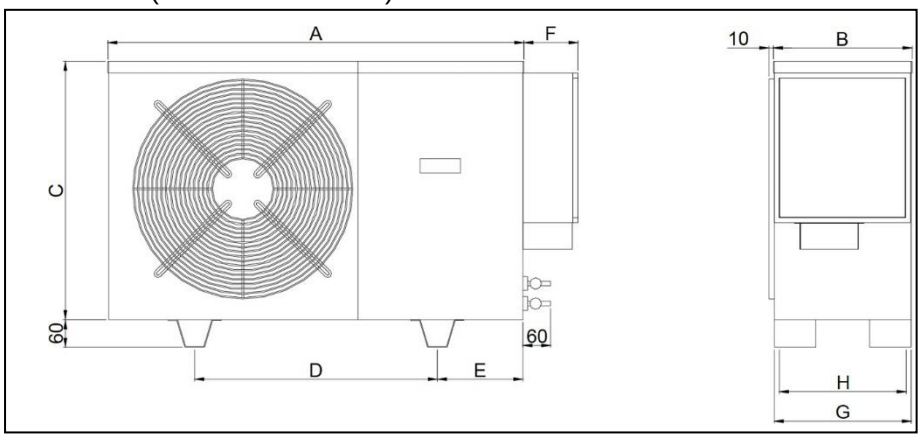
Dimensions in mm.

Condensing unit to be installed outside and not in an enclosed area.

Smoking and naked flames should be prohibited around the area around the condensing unit.

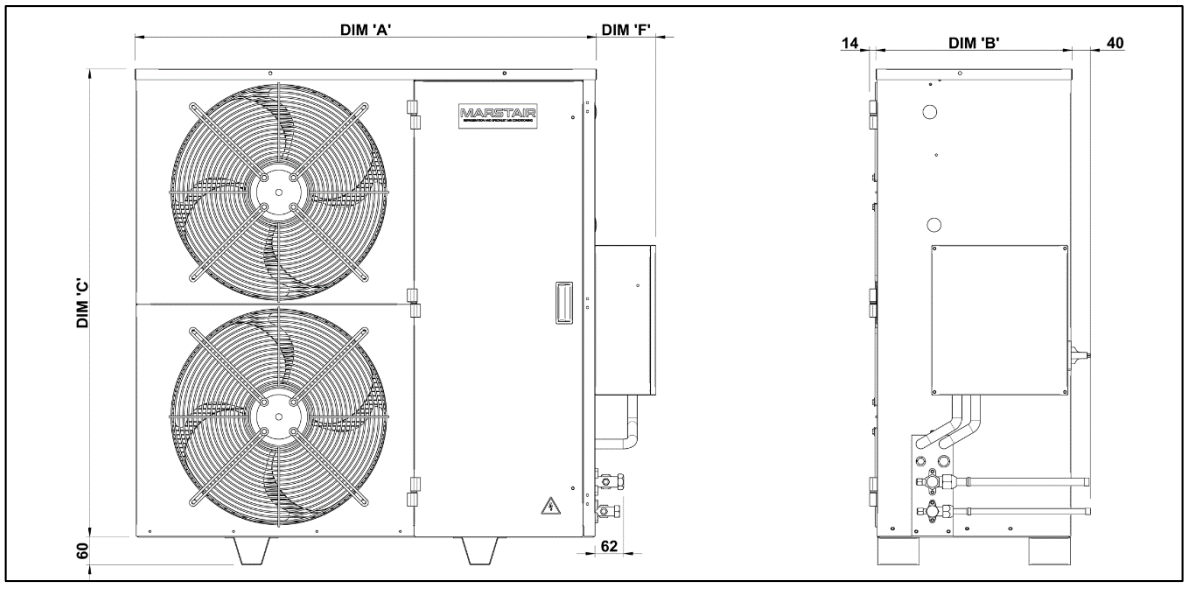
Packed weights					
Model	Dimensions			Weight	
SMC	Width	Depth	Height	1ph	3ph
15	1060	340	620	48	
20	1060	340	620	49	
30	1060	340	620	50	
40	1060	340	620	55	55
45	1160	390	720	63	63
50	1160	390	720	66	66
80	1160	390	720	68	68
90	1160	390	820	78	78
100	1160	465	1080		92
150	1160	465	1080		94

SMC 15-90 (Dimensions in mm.)



Model	Dimensions								Weight	
SMC	A	B	C	D	E	F	G	H	1ph	3ph
15	900	300	560	525	185	117	296	274	46	
20	900	300	560	525	185	117	296	274	47	
30	900	300	560	525	185	117	296	274	48	
40	900	300	560	525	185	117	296	274	53	53
45	1000	350	660	495	250	117	346	324	61	61
50	1000	350	660	495	250	117	346	324	64	64
80	1000	350	660	495	250	117	346	324	66	66
90	1000	350	760	495	250	117	346	324	76	76

SMC 100-150 (Dimensions in mm.)



Model	Dimensions								Weight	
SMC	A	B	C	D	E	F	G	H	1ph	3ph
100	1000	425	760	495	250	117	417	397		90
150	1000	425	760	495	250	117	417	397		92

2D PIPEWORK INSTALLATION.

Supplied Sweat connections										
Model	SMC									
Size	15	20	30	40	45	50	80	90	100	150
Expansion	3/8	3/8	3/8	3/8	3/8	1/2	1/2	1/2	1/2	1/2
Suction	3/8	1/2	1/2	1/2	1/2	1/2	5/8	5/8	3/4	3/4

The installation section of the risk assessment template or equivalent should be carried out before commencing installation.

When installing a split refrigeration system, all interconnecting refrigeration pipework must be manufactured, jointed, tested, insulated and installed in such a way as to ensure that damage cannot occur during normal, service and maintenance operations that may cause a rupture and subsequent leakage.

It is advisable, wherever possible, that brazed or permanent mechanical joints are used when jointing refrigeration pipework designed for an A2L refrigerant.

MAXIMUM PIPE RUNS
80m maximum including 20m lift (50m SMC 15-20). There will be no significant loss of capacity for extended pipe runs provided pipes are correctly sized.
CALCULATING EQUIVALENT LENGTHS
The effects of bends and fittings must be taken into account.
Pipe sizes are based on:
Minimum of 2.5 m/s (500 fpm) suction gas velocity for horizontal or downflow.
Minimum of 5.0 m/s (1000 fpm) suction gas velocity for upflow.
Maximum of 20.0 m/s (4000 fpm) suction gas.
Where vertical risers exceed 3m, oil traps must be formed in the pipe. This will help ensure that oil returns to the compressor. Typically fit an oil trap every 3m with a trap at the bottom of the riser.

GOOD PRACTICE
□ Keep pipe runs as short as possible.
□ Avoid sharp bends
□ Fully insulate both suction and expansion lines including mechanical connections
□ Try to avoid running pipes through hot areas.

	Suction pipe size						Expansion pipe size				
SMC	3/8"	1/2"	5/8"	3/4"	7/8"	1-1/8"	1/4"	3/8"	1/2"	5/8"	3/4"
15	7.5	30	50					50			
20	7.5	23	50					50			
30		15	50	80				50	80		
40		10	36	80				7.5	80		
45		10	36	80				7.5	80		
50		7.5	18	50	80			7.5	50	80	
80			11	30	80				50	80	
90			10	25	55	80			20	80	
100			7.5	22	45	80			15	80	
150				12	27	80			8	50	80
180				7.5	16	55			7.5	35	80

1. Connecting the pipework:
a. Release the nitrogen holding charge by slowly opening the valves using a 5mm or 8mm allen key.
b. Ensure the suction line is fully insulated.
c. Connect the pipework between the units. Do not leave pipes ends, valves etc open to the atmosphere.
d. Use a protective shield to avoid scorching the side panel.

2E PRESSURE TESTING

The pressure testing section of the risk assessment template or equivalent should be carried out before commencing pressure testing.

Pressure and leak testing of the system should be completed in accordance with EN 378.

Note: The interconnecting pipework and evaporator are all on the low-pressure side of the system. The only high-pressure side of the system is within the condensing unit. Therefore, the pressure and leak testing of the pipework can be treated as such within EN 378.

The matched MBMT evaporators all have a maximum allowable pressure of 25Barg

The condensing unit is fitted with a high-pressure limiting device
SMC15-40 = 23Bar
SMC45-150 = 26Bar

The condensing unit has a pressure relief valve is set to 29.5Bar which is equal to the condensing unit maximum allowable pressure do not exceed this pressure if testing the condensing unit.

2F EVACUATING

The Evacuation section of the risk assessment template or equivalent should be carried out before commencing Evacuation.

With the valves open, connect a vacuum pump to the service ports on the outdoor unit valves. Evacuate the interconnecting pipework and indoor unit to 1000 microns (1 Torr) or better. Allow this to be held for a minimum of 15 minutes.

2G ELECTRICAL & FUSES

The installer supplies mains, control and interconnecting cables: equipment must be earthed.
Wiring must be carried out in accordance with local and national codes.
Mains supply cables must be size compatible with the recommended fuse.
Cable clamps for use with stranded cables are supplied in units 15 - 150 and should be used to secure incoming/outgoing cables. Installers must supply a method of securing solid sheathed cables.

THREE PHASE UNITS WITH SCROLL COMPRESSORS:
On 3 Ph units sizes it is possible for the scroll compressor to run backwards.
This becomes obvious on start up - the compressor will not develop a normal running pressure differential and the top will not become warm: it may be excessively noisy. If this happens, switch off the mains power and exchange the two supply phases **not** connected to the indoor unit. This will correct the rotation.
FUSES: The system and its supply/interconnecting wiring must be protected by fuses, preferably High Rupture Current (HRC) motor rated types (to BS EN60269) or miniature circuit breakers to (BS EN60898) or local codes having similar time lag characteristics, that allow starting of the compressor yet still afford close overcurrent protection under running conditions. The ratings below are for HRC motor rated fuses.

1PH Fuse								
SMC	15	20	30	40	45	50	80	90
Fuse	16	16	16	20	16	20	25	32

3PH Fuse							
SMC	40	45	50	80	90	100	150
Fuse	10	10	10	10	16	16	20

The ratings are for the outdoor unit only. Currents for the indoor units including heaters if applicable should be noted and the fuse size increased pro-rata if using same supply.

2H REFRIGERANT

Charging the system

The charging of refrigerant section of the risk assessment template or equivalent should be carried out before commencing refrigerant charging.

1. Evacuate the system and interconnecting pipework ensuring the service valves are fully open.
2. Allow the evacuated system to draw in the majority of the refrigerant charge.

3. The final charge should be adjusted with the system running.

4. All units are fitted with head pressure control. The link wire across the orange terminals allows the fan to operate at full speed. **THIS SHOULD BE REMOVED AFTER CHARGING**

5. A random start delay of up to 1 minute occurs when mains is first applied. A 3 minute delay occurs between successive compressor operations on all systems.

6. Refrigerant and polyolester oil should be introduced through the Schrader valve the service port on the suction service valve on the outdoor unit. **Ensure the refrigerant is the correct type, as shown on the rating plate**. R454C must always be added in the liquid state.

7. Run the system for a few minutes to allow it to stabilize. Check suction and head pressures.

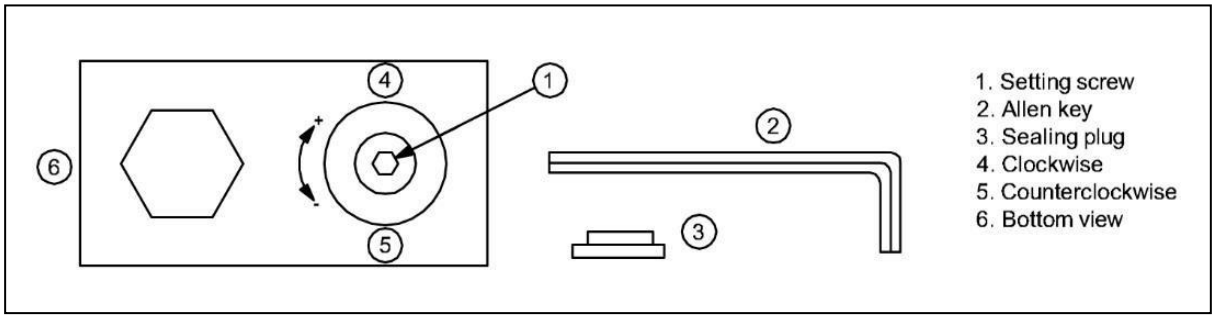
8. Systems should not be overcharged, to avoid liquid return to the compressor

9. HEAD PRESSURE CONTROL ALCO (FSY-42S) & SAGINOMIYA (XGE-4C)
The head pressure controller is factory set to suit the refrigerant. It may be necessary to adjust this to suit site conditions, to raise or lower the nominal head pressure.

ALCO (FSY-42S)
a. With the system switched off, connect a high pressure gauge to the liquid line service valve.

b. Switch on the system and run for a few minutes to stabilise.

c. The head pressure should be approximately:
R454C: 210-220 psig (14.0-15.2barg) to achieve this remove sealing plug and insert 2mm or 5/64”
allen key into setting screw. Turn allen key clockwise (+) or counter clockwise (-) to readjust the setting.



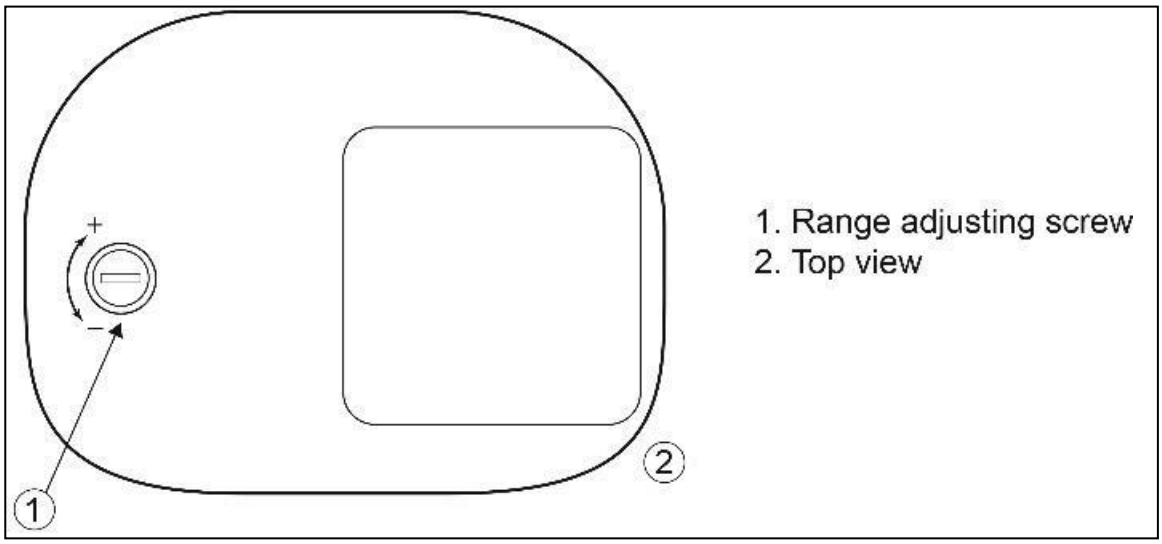
NOTE: The condenser fan may stop if the operating pressure drops below 200 psig (13.8 barg)
Do not turn setting screw **more than 3 turns clockwise** (+3).

Pressure changes per turn of adjusting screw:
Pressure change: 9.2 … 21.2 bar:
Clockwise ~ +2,5 bar, counter clockwise ~ -2,5 bar

After adjustment, re-insert sealing plug and make sure that it is properly fitted. IP65 protection requires firmly sealed plug

NOTES:
Tolerances for condensing temperatures setpoint: ±2K

SAGINOMIYA (XGE-4C)



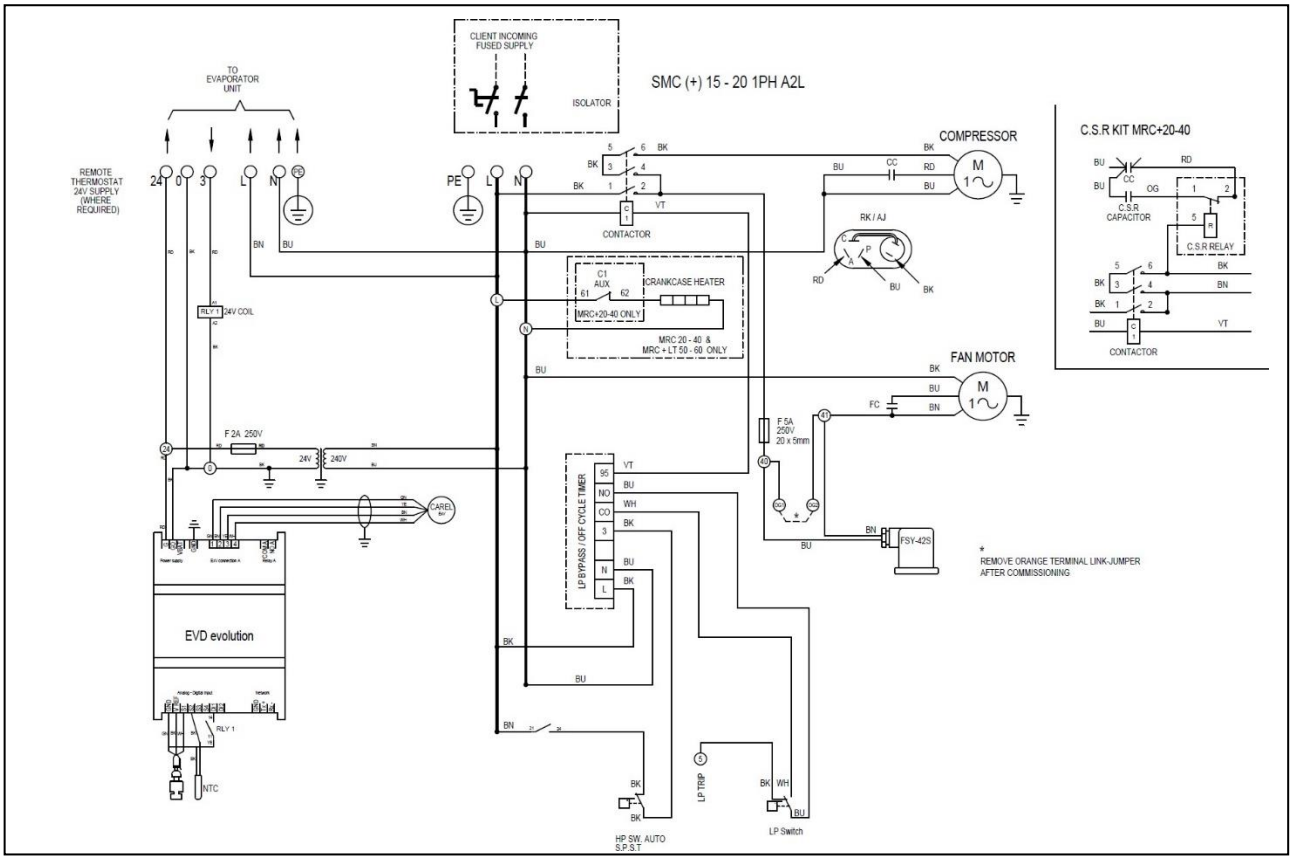
R454C: 210-220 psig (14.0-15.2barg) to achieve this turn the range adjusting screw clockwise (+) for increasing the setting value or counter clockwise (-) for decreasing the setting value.

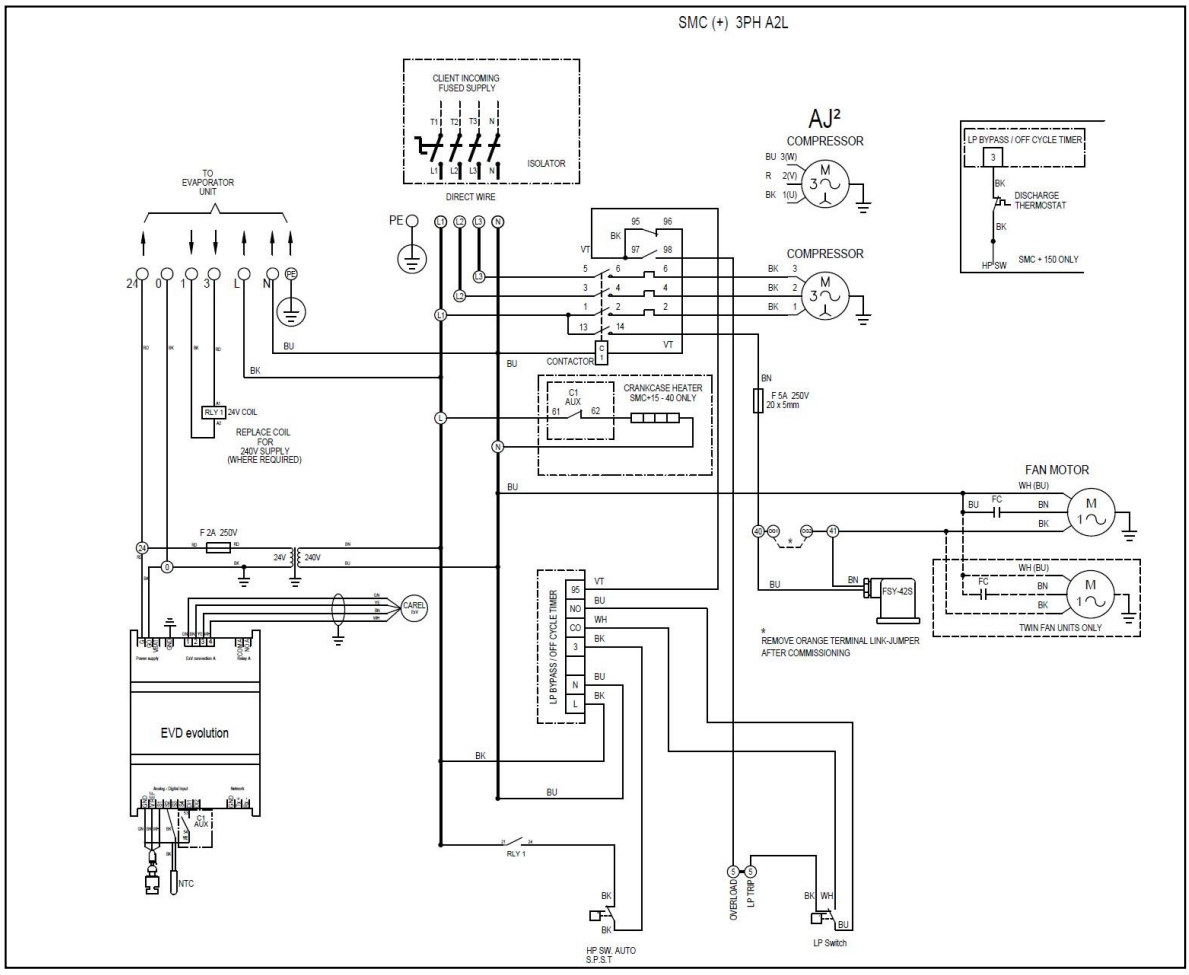
Pressure changes per 1 turn of adjusting screw:

Pressure change: 10 … 25bar:

Clockwise ~ +1.5 bar, counter clockwise ~ -1.5 ba

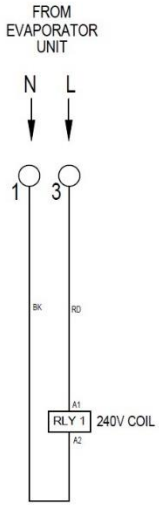
2I CONDENSING UNIT WIRING DIAGRAMS



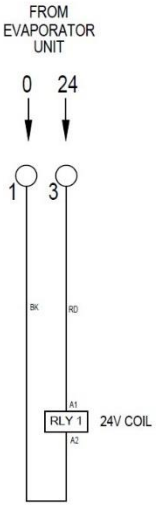


INTERCONNECTING CONTROLS OPTIONS

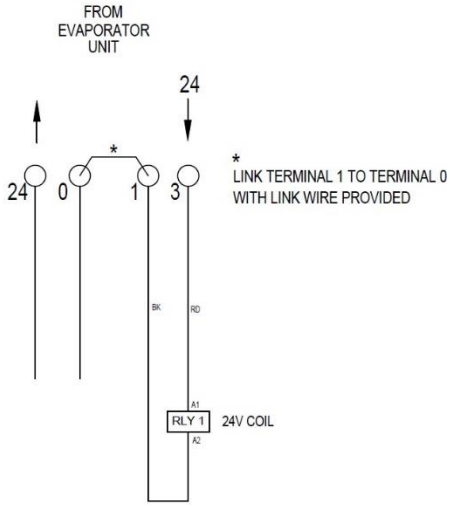
240V CONTROL



24V CONTROL
(FACTORY FITTED)



CONTROL USING 24V SUPPLY FROM THE SMC



REPLACE RELAY COIL TO SUIT CONTROL VOLTAGE

2J ELECTRONIC VALVE DRIVER INTERFACE

Note: The Electronic valve will be factory set to run at 6°C

The user interface consists of 5 LEDs that display the operating status, as shown in the table:

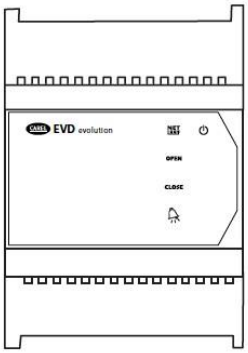


Fig. 2H.a

Key:

LED	ON	OFF	Flashing
NET	Connection available	No connection	Communication error
OPEN	Opening valve	-	Driver disabled (*)
CLOSE	Closing valve	-	Driver disabled (*)
🔔	Active alarm	-	-
⏻	Driver powered	Driver not powered	Wrong power supply (see chap. Alarms)

Tab. 2H.a

(*) Awaiting completion of the initial configuration

2H.1 Assembling the display board (accessory)

The display board, once installed, is used to perform all the configuration and programming operations on the driver. It displays the operating status, the significant values for the type of control that the driver is performing (e.g. superheat control), the alarms, the status of the digital inputs and the relay output. Finally, it can save the configuration parameters for one driver and transfer them to a second driver (see the procedure for upload and download parameters).

For installation:

- remove the cover, pressing on the fastening points;
- fit the display board, as shown;
- the display will come on, and if the driver is being commissioned, the guided configuration procedure will start.

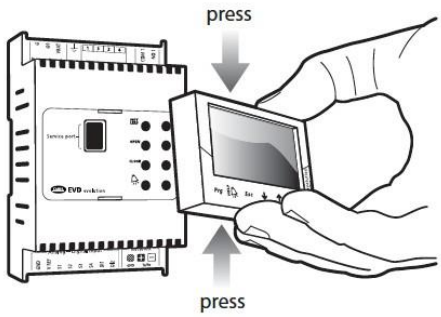


Fig. 2H.b

Important: the driver is not activated if the configuration procedure has not been completed.

The front panel now holds the display and the keypad, made up of 6 buttons that, pressed alone or in combination, are used to perform all the configurationandprogrammingoperationsonthedriver.

2H.2 Display and keypad

The graphic display shows 2 system variables, the control status of the driver, the activation of the protectors, any alarms and the status of the relay output.

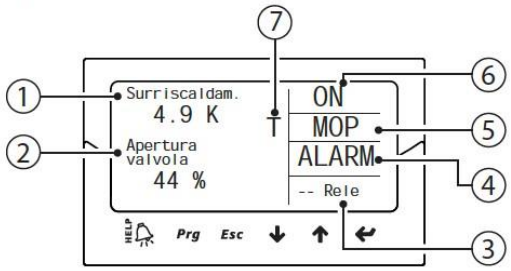


Fig. 2H.c

Key:

1	1st variable displayed
2	2nd variable displayed
3	relay status
4	alarm (press "HELP")
5	protector activated
6	control status
7	adaptive control in progress

Display writings

	Control status		Protection active
ON	Operation	LowSH	Low superheat
OFF	Standby	LOP	Low evaporation temperature
POS	Positioning	MOP	High evaporation temperature
WAIT	Wait	HiTcond	High condensing temperature
CLOSE	Closing		
INIT	Valve motor error recognition procedure (*)		
TUN	Tuning in progress		

Tab. 2H.b

Keypad

Button	Function
Prg	opens the screen for entering the password to access programming mode.
HELP 🔔	• if in alarm status, displays the alarm queue; • in the "Manufacturer" level, when scrolling the parameters, shows the explanation screens (Help).
Esc	• exits the Programming (Service/Manufacturer) and Display modes; • after setting a parameter, exits without saving the changes.
↓ / ↑ UP/ DOWN	• navigates the display screens; • increases/decreases the value.
↵ Enter	• switches from the display to parameter programming mode; • confirms the value and returns to the list of parameters.

Tab. 2H.c

Note: the variables displayed as standard can be selected by confi guring the parameters "Display main var. 1" and "Display main var. 2" accordingly. See the list of parameters.

2H.3 Display mode (display)

Display mode is used to display the useful variables showing the operation of the system.
The variables displayed depend on the type of control selected.

1. press Esc one or more times to switch to the standard display;
2. press UP/DOWN: the display shows a graph of the superheat, the percentage of valve opening, the evaporation pressure and temperature and the suction temperature variables;
3. press UP/DOWN: the variables are shown on the display, followed by the screens with the probe and valve motor electrical connections;
4. press Esc to exit display mode.

For the complete list of the variables shown on the display, see the chapter: "Table of parameters".

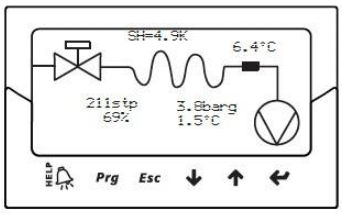


Fig. 2H.d

2H.4 Programming mode (display)

The parameters can be modified using the front keypad. Access differs according to the user level: Service (Installer) and manufacturer.

Modifying the Service parameters

IThe Service parameters, as well as the parameters for commissioning the driver, also include those for the configuration of the inputs, the relay output, the superheat set point or the type of control in general, and the protection thresholds. See the table of parameters.
Procedure:

1. press Esc one or more times to switch to the standard display;
2. press Prg: the display shows a screen with the PASSWORD request;
3. press ENTER and enter the **password for the Service level: 22**, starting from the right-most figure and confirming each figure with ENTER;
4. if the value entered is correct, the first modifiable parameter is displayed, network address;
5. press UP/DOWN to select the parameter to be set;
6. press ENTER to move to the value of the parameter;
7. press UP/DOWN to modify the value;
8. press ENTER to save the new value of the parameter;
9. repeat steps 5, 6, 7, 8 to modify the other parameters;
10. press Esc to exit the procedure for modifying the Service parameters.

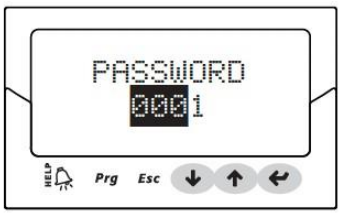


Fig. 2H.e

Note:

- if when setting a parameter the value entered is out-of-range, this is not accepted and the parameter soon after returns to the previous value;
- if no button is pressed, after 5 min the display automatically returns to the standard mode;
- to set a negative value move to the left-most digit and press Up/Down.

Modifying the Manufacturer parameters

The Manufacturer level is used to configure all the driver parameters, and consequently, in addition to the Service parameters, the parameters relating to alarm management, the probes and the configuration of the valve. See the table of parameters.
Procedure:

1. press Esc one or more times to switch to the standard display;
2. press Prg: the display shows a screen with the PASSWORD request;
3. press ENTER and enter the Manufacturer level password: 66, starting from the right-most figure and confirming each figure with ENTER;
4. if the value entered is correct, the list of parameter categories is shown:
   - Configuration
   - Probes
   - Control
   - Special
   - Alarm configuration
   - Valve
5. press the UP/DOWN buttons to select the category and ENTER to access the first parameter in the category;
6. press UP/DOWN to select the parameter to be set and ENTER to move to the value of the parameter;
7. press UP/DOWN to modify the value;
8. press ENTER to save the new value of the parameter;
9. repeat steps 6, 7, 8 to modify the other parameters;
10. press Esc to exit the procedure for modifying the Manufacturer parameters.

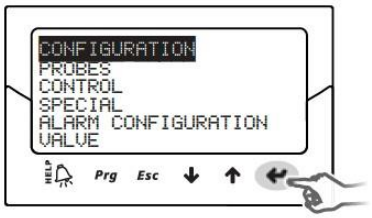


Fig. 2H.f

Note:

- all the driver parameters can be modified by entering the Manufacturer level;
- if when setting a parameter the value entered is out-of-range, this is not accepted and the parameter soon after returns to the previous value;
- if no button is pressed, after 5 min the display automatically returns to the standard mode.

2K ELECTRONIC VALVE DRIVER PARAMETERS

user*	Parameter/description	Def.	Min.	Max.	UOM	Type **	CAREL	Modbus	Notes
	CONFIGURATION								
A	Network address	pLAN: 30 others: 198	1	207	-	I	11	138	
A	Refrigerant: 0= user defined; 1= R22 2= R134a 3= R404A 4= R407C 5= R410A 6= R507A 7= R290 8= R600 9= R600a 10= R717 11= R744 12= R728 13= R1270 14= R417A 15=R422D 16= R413A 17= R422A 18= R423A 19= R407A 20=R427A 21= R245FA 22=R407F 23=R32 24=HTR01 25=HTR02 26=R23 27 = R1234yf 28 = R1234ze 29 = R455A 30 = R170 31 = R442A 32 = R447A 33 = R448A 34 = R449A 35 = R450A 36 = R452A 37 = R508B 38 = R452B 39 = R513A 40 = R454B	0 = User Defined	-	-	-	I	13	140	
A	Valve: 0= user defined 1= CAREL EXV 2= Alco EX4 3= Alco EX5 4= Alco EX6 5= Alco EX7 6=Alco EX8330Hzrecommend CAREL 7= Alco EX8 500Hz specific Alco 8= Sporlan SEI 0.5-11 9= Sporlan SER 1.5-20 10= Sporlan SEI 30 11= Sporlan SEI 50 12= Sporlan SEH 100 13= Sporlan SEH 175 14= Danfoss ETS 12.5-25B 15= Danfoss ETS 50B 16= Danfoss ETS 100B 17= Danfoss ETS 250 18= Danfoss ETS 400 19= Two EXVCARELconnected together 20= Sporlan SER(I)G,J,K 21= Danfoss CCM 10-20-30 22= Danfoss CCM 40 23= Danfoss CCM T 2-4-8 24= Disabled	1 = CAREL EXV	-	-	-	I	14	141	
A	Probe S1: 0= user defined Ratiometric (OUT=0…5 V) 1= -1…4,2 barg 2= -0,4…9,3 barg 3= -1…9,3 barg 4= 0…17,3 barg 5= 0,85…34,2 barg 6= 0…34,5 barg 7= 0…45 barg 21= -1…12,8 barg 22= 0…20,7 barg 23= 1,86…43,0 barg 24= Livello liquido CAREL 25 = 0...60,0 barg 26 = 0...90,0 barg Electronic (OUT=4…20mA) 8= -0,5…7 barg 9= 0…10 barg 10= 0…18,2 bar 11= 0…25 barg 12= 0…30 barg 13= 0…44,8 barg 14= remoto, -0,5…7 barg 15= remoto, 0…10 barg 16= remoto, 0…18,2 barg 17= remoto, 0…25 barg 18= remoto, 0…30 barg 19= remoto, 0…44,8 barg 20= Segnale esterno 4…20 mA	Ratiometric: 4 = 0 to 17.3 barg	-	-	-	I	16	143	
A	Main control: 0= user defined 1= Centralized cabinet/cold room 2= Self contained cabinet/cold room 3= Perturbated cabinet/control room 4= Subcritical CO_2 cabinet/cold room 5= R404A condenser for subcritical CO_2 6= AC or chillerwithplateevaporator 7= AC or chiller with shell tube evaporator 8= AC or chillerwithbatterycoilevaporator 9= AC or chiller with variable cooling capacity 10= AC or chiller perturbated unit 11= EPR Back pressure 12= Hot gas by-pass by pressure 13= Hotgas by-pass by temperature 14= transcritical CO_2 gas cooler 15= analog positioner (4 to 20 mA) 16= analog positioner (0 to10 V) 17= AC/chiller or cabinet/cold room with adaptative regulation 18= AC or chiller with Digital Scroll compressor 19= AC/chiller with BLDC compressor (*) 20= superheat regulation with 2 temperature probes 21= I/O expander for pCO 22= Programmable SH regulation 23= Programmable special regulation 24= Programmable positioner 25= Evaporator liquid level regulation with CAREL sensor 26= Condenser liquid level regulation with CAREL sensor (*)= only for controls for CAREL valves	9= AC or chiller with variable cooling capacity	-	-	-	I	15	142	

user*	Parameter/description	Def.	Min.	Max.	UOM	Type **	CAREL SVP	Modbus	Notes
A	Probe S2: 0= user defined 1= NTC CAREL 2= CAREL NTC- HT high 3= combined NTC SPKP**T0 4= 0 to 10V external signal 5= NTC – LTCAREL lowtemperature	1 = CAREL NTC	-	-	-	I	17	144	
A	Auxiliary control: 0= user defined 1= Disabled 2= high condensing temperature protection on S3 probe 3= modulating thermostat on S4 probe 4= backup probes on S3 and S4 5, 6, 7 = Reserved 8= Subcooling measurement 9= Inversehighcondensationtemperatureprotection on S3 probe 10= Reserved	Disabled	-	-	-	I	18	145	
A	Relay configuration: 1= Disabled 2= alarm relay (opened in case of alarm) 3=Solenoidvalverelay(open in standby) 4= valve + alarm relay(opened in stand-by and controlalarms) 5= Reversed alarm relay (closed in case of alarm) 6= Valve status relay (open if valve closed) 7= Direct command 8= Faulty closure alarm relay (opened if alarm) 9= Reverse faulty closure alarm relay (closed if alarm)	5 =Reversed alarm relay (closed in case of alarm)	-	-	-	I	12	139	
A	DI2 configuration: 1= Disabled 2= valve regulation optimization after defrost 3= Battery alarm management 4= Valve forced open (at 100%) 5= Regulation start/stop 6= Regulation backup 7= Regulation security	Disabled	-	-	-	I	10	137	
C	Display main var. 1: 1= Valve opening 2= Valve position 3= Current cool. capacity 4= Control set point 5=Superheat 6=Suctiontemperature 7= Evaporationtemperature 8=Evaporationpressure 9= Condensing temperature 10= Condensing pressure 11= Modulating thermostat temperature 12= EPR pressure 13= Hot gas bypass pressure 14= Hot gas bypass temperature 15= CO_2 gas cooler outlet temperature 16= CO_2 gascooleroutletpressure 17= CO_2 gas coolerpressureset point 18= S1 probe measurement 19= S2 probemeasurement 20=S3 probemeasurement 21= S4 probe measurement 22= 4-20 mA input value 23= 0-10 V input value	8=Evaporating pressure	-	-	-	I	45	172	
C	Display main var. 2 (See display main var. 1)	7= Evaporation temperature	-	-	-	I	46	173	

user*	Parameter/description	Def.	Min.	Max.	UOM	Type **	CAREL	Modbus	Notes
C	S1 probe alarm manag.: 1= No action 2=Valve forced closed 3=Valve at fixedposit. 4= Use backup probe S3	Valve at fixed position	-	-	-	I	24	151	
C	S2 probe alarm manag.: 1= No action 2=Valve forced closed 3=Valve at fixedposit. 4= Use backup probe S4	Valve at fixed position	-	-	-	I	25	152	
C	S3 probe alarm manag.: 1= No action 2= Valve forced closed 3=Valveatfixedposit.	No action	-	-	-	I	26	153	
C	S3 probe alarm manag.: 1= No action 2= Valve forced closed 3=Valveatfixedposit.	No action	-	-	-	I	27	154	
C	Unit of measure: °C/K/barg; °F/psig	°C(K), barg	-	-	-	I	21	148	
A	DI1 configuration 1= Disabled 2= Valve regulation optimization after defrost 3= Discharged battery alarm management 4= Valve forced open (at 100%) 5= Regulation start/stop 6= Regulation backup 7= Regulation security	Regulation start/stop (tLAN-RS485) / Regulation backup (pLAN)	-	-	-	I	85	212	
A	Language: Italian; English	English	-	-	-	-	-	-	
	PROBES								
C	S1 calibration offset	0	-85(-1233), -85	85(1233), 85	barg (psig) mA	A	34	33	
C	S1 calibrat gain on 4-20 mA	1	-20	20	-	A	36	35	
C	S1 pressure MINIMUM value	0	-20 (-290)	S1 pressure MAXIMUM value	barg (psig)	A	32	31	
C	S1 pressure MAXIMUM value	17.3	S1 pressure MINIMUM value	200 (2900)	barg (psig)	A	30	29	
C	S1 alarm MIN pressure	0	-20 (-290)	S1 alarm MAX pressure	barg (psig)	A	39	38	
C	S1 alarm MAX pressure	17.3	S1 alarm MIN pressure	200 (2900)	barg (psig)	A	37	36	
C	S2 calibration offset	0	-20 (-36), -20	20 (36), 20	°C (°F), volt	A	41	40	
C	S2 alarm MIN temperat	-50	-85(-121)	S2 alarm MAX temp.	°C(°F)	A	46	45	
C	S2 alarm MAX temperat	105	S2 alarm MIN temp.	200 (392)	°C(°F)	A	44	43	
	CONTROL								
A	Superheat set point	6	LowSH: threshold	180 (324)	K(°R)	A	50	49	
A	Valve opening at start-up	50	0	100	%	I	37	164	
C	Valve opened in standby (0=disabled=valveclosed; 1=enabled = valve open according to parameter“Valve position in stand-by”)	1=enabled = valve open according to parameter “Valve position in stand-by”	0	1	-	D	23	22	

user*	Parameter/description	Def.	Min.	Max.	UOM	Type **	CAREL	Modbus	Notes
C	Valve position in stand-by 0 = 25% 1…100% = % opening	50%	0	100	%	I	91	218	
C	start-up delay after defrost	10	0	60	min	I	40	167	
A	Pre-position time	6	0	18000	s	I	90	217	
A	Hot gas bypass temperature set point	10	-85(-121)	200 (392)	°C (°F)	A	28	27	
A	Hot gas bypass pressure set point	3	-20 (-290)	200 (2900)	barg (psig)	A	62	61	
A	EPR pressure set point	3.5	-20 (-290)	200 (2900)	barg (psig)	A	29	28	
C	PID proportional gain	15	0	800	-	A	48	47	
C	PID integral time	150	0	1000	s	I	38	165	
C	PID derivative time	5	0	800	s	A	49	48	
A	LowSH protection threshold	5	-40 (-72)	superheat set point	K(°F)	A	56	55	
C	LowSH protection integral time	15	0	800	s	A	55	54	
A	LOP protection threshold	-50	-85(-121)	MOP protection threshold	°C (°F)	A	52	51	
C	LOP protection integral time	0	0	800	s	A	51	50	
A	MOP protection threshold	50	LOP protection threshold	200 (392)	°C (°F)	A	54	53	
C	MOP protection integral time	20	0	800	s	A	53	52	
A	Enable manual valve position	0	0	1	-	D	24	23	
A	Manual valve position	0	0	9999	step	I	39	166	
C	Discharge superheat setpoint	35	-40(-72)	180 (324)	K (F°)	A	100	99	
C	Discharge temperature setpoint	105	-85(-121)	200 (392)	°C (°F)	A	101	100	
C	Liquid level perc. set point	50	0	100	%	A	118	117	
	ADVANCED								
A	High Tcond threshold	80	-85(-121)	200 (392)	°C (°F)	A	58	57	
C	High Tcond integral time	20	0	800	s	A	57	56	
A	Modul thermost setpoint	0	-85(-121)	200 (392)	°C (°F)	A	61	60	
A	Modul thermost differential	0, 1	0.1 (0.2)	100 (180)	°C (°F)	A	60	59	
C	Modul thermost SHset offset	0	0 (0)	100 (180)	K (°F)	A	59	58	
C	CO_2 regul. 'A' coefficient	3.3	-100	800	-	A	63	62	
C	CO_2 regul. 'B' coefficient	-22.7	-100	800	-	A	64	63	
C	Start manual tuning 0 = no; 1= yes	0	0	1	-	D	39	38	-
C	Tuning method 0…100= automatic selection 101…141= manual selection 142…254=not accepted 255= PID parameters identified model	50	0	255	-	I	79	206	-
C	Network settings 0= 4800; 1= 9600; 2= 19200; 4 = 4800 bps; 5= 9600 bps; 6= 19200 bps; 16= 4800 bps; 17= 9600 bps; 18= 19200 bps; 20= 4800 bps; 21= 9600 bps; 22= 19200 bps; 24= 4800 bps; 25= 9600 bps; 26= 19200 bps; 28= 4800 bps; 29= 9600 bps; 30= 19200 bps.	2	0	30	bit/s	I	74	201	CO
A	Power supply mode 0= 24 Vac; 1= 24 Vdc	0	0	1	-	D	47	46	
C	Enable mode single on twin (parameter disabled) 0= Twin; 1= Single	0	0	1	-	D	58	57	
C	Stop manual positioning if net error 0 = Normal operation; 1 = Stop	0	0	1	-	D	59	58	
C	Programmable regulation configuration	0	0	32767	-	I	101	228	
C	Programmable regulation input	0	0	32767	-	I	102	229	
C	Programmable SH regulation options	0	0	32767	-	I	103	230	
C	Programmable regulation set point	0	-800(-11603)	800(11603)	-	A	112	111	
C	Faulty closure alarm status 0/1=no/yes	0	0	1	-	D	49	48	

user*	Parameter/description	Def.	Min.	Max.	UOM	Type **	CAREL	Modbus	Notes
	ALARMS CONFIGURATION								
C	Low superheat alarm timeout (LowSH) (0= alarm DISABLED)	300	0	18000	s	I	43	170	
C	Low evap temp alarm timeout (LOP) (0= alarm DISABLED)	300	0	18000	s	I	41	168	
C	High evap temp alarm timeout (MOP) (0= alarm DISABLED)	600	0	18000	s	I	42	169	
C	High cond temp alarm timeout (High Tcond) (0= alarm DISABLED)	600	0	18000	s	I	44	171	
C	Low suction temperature alarm threshold	-50	-85 (-121)	200 (392)	°C(°F)	A	26	25	
C	Low suct temp alarm timeout (0= alarm DISABLED)	300	0	18000	s	I	9	136	
C	Alarm delay S1	0	0	240	s	I	131	258	
C	Alarm delay S2	0	0	240	s	I	132	259	
C	Alarm delay S3	0	0	240	s	I	133	260	
C	Alarm delay S4	0	0	240	s	I	134	261	
	VALVE								
C	EEV minimum steps	50	0	9999	step	I	30	157	
C	EEV maximum steps	480	0	9999	step	I	31	158	
C	EEV closing steps	500	0	9999	step	I	36	163	
C	EEV nominal step rate	50	1	2000	step/s	I	32	159	
C	EEV nominal current	450	0	800	mA	I	33	160	
C	EEV holding current	100	0	250	mA	I	35	162	
C	EEV duty cycle	30	1	100	%	I	34	161	
C	EEV opening synchroniz.	1	0	1	-	D	20	19	
C	EEV closing synchroniz.	1	0	1	-	D	21	20	

* User: A= Service (installer), C= Manufacturer.
**Type of variable: A= analogue, D= digital, I= integer

2L ECO DESIGN INFORMATION TABLES

Model(s): SMC 15 S/P			
Refrigerant fluid(s): R454C			
Item	**Symbol**	**Value**	**Unit**
Evaporating temperature	*t*	-10°C	°C
Parameters at full load and ambient temperature 32°C			
Rated cooling capacity	P_A	1.24	kW
Rated power input	D_A	0.72	kW
Rated COP	COP_A	**1.73**	
Parameters at full load and ambient temperature 25°C			
Cooling capacity	P_2	1.41	kW
Power input	D_2	0.68	kW
Rated COP	COP_2	**2.07**	
Other items			
Capacity control		Fixed	
Contact details		TEV Limited Armytage Road Brighouse HD61QF	

Model(s): SMC 20 S/P			
Refrigerant fluid(s): R454C			
Item	**Symbol**	**Value**	**Unit**
Evaporating temperature	*t*	-10°C	°C
Parameters at full load and ambient temperature 32°C			
Rated cooling capacity	P_A	1.53	kW
Rated power input	D_A	0.83	kW
Rated COP	COP_A	**1.84**	
Parameters at full load and ambient temperature 25°C			
Cooling capacity	P_2	1.75	kW
Power input	D_2	0.79	kW
Rated COP	COP_2	**2.22**	
Other items			
Capacity control		Fixed	
Contact details		TEV Limited Armytage Road Brighouse HD61QF	

Model(s): SMC 30 S/P			
Refrigerant fluid(s): R454C			
Item	**Symbol**	**Value**	**Unit**
Evaporating temperature	*t*	-10°C	°C
Parameters at full load and ambient temperature 32°C			
Rated cooling capacity	P_A	1.78	kW
Rated power input	D_A	0.98	kW
Rated COP	COP_A	**1.82**	
Parameters at full load and ambient temperature 25°C			
Cooling capacity	P_2	1.97	kW
Power input	D_2	0.93	kW
Rated COP	COP_2	**2.12**	
Other items			
Capacity control		Fixed	
Contact details		TEV Limited Armytage Road Brighouse HD61QF	

Model(s): SMC 40 S/P			
Refrigerant fluid(s): R454C			
Item	**Symbol**	**Value**	**Unit**
Evaporating temperature	*t*	-10°C	°C
Parameters at full load and ambient temperature 32°C			
Rated cooling capacity	P_A	2.26	kW
Rated power input	D_A	1.23	kW
Rated COP	$\boldsymbol{COP_A}$	**1.84**	
Parameters at full load and ambient temperature 25°C			
Cooling capacity	P_2	2.50	kW
Power input	D_2	1.17	kW
Rated COP	$\boldsymbol{COP_2}$	**2.14**	
Other items			
Capacity control	Fixed		
Contact details	TEV Limited Armytage Road Brighouse HD61QF		

Model(s): SMC 40 3/P			
Refrigerant fluid(s): R454C			
Item	**Symbol**	**Value**	**Unit**
Evaporating temperature	*t*	-10°C	°C
Parameters at full load and ambient temperature 32°C			
Rated cooling capacity	P_A	2.26	kW
Rated power input	D_A	1.23	kW
Rated COP	$\boldsymbol{COP_A}$	**1.84**	
Parameters at full load and ambient temperature 25°C			
Cooling capacity	P_2	2.50	kW
Power input	D_2	1.17	kW
Rated COP	$\boldsymbol{COP_2}$	**2.14**	
Other items			
Capacity control	Fixed		
Contact details	TEV Limited Armytage Road Brighouse HD61QF		

Model(s): SMC 45 S/P			
Refrigerant fluid(s): R454C			
Item	**Symbol**	**Value**	**Unit**
Evaporating temperature	*t*	-10°C	°C
Parameters at full load and ambient temperature 32°C			
Rated cooling capacity	P_A	2.96	kW
Rated power input	D_A	1.36	kW
Rated COP	$\boldsymbol{COP_A}$	**2.18**	
Parameters at full load and ambient temperature 25°C			
Cooling capacity	P_2	3.20	kW
Power input	D_2	1.24	kW
Rated COP	$\boldsymbol{COP_2}$	**2.58**	
Other items			
Capacity control	Fixed		
Contact details	TEV Limited Armytage Road Brighouse HD61QF		

Model(s): SMC 50 S/P			
Refrigerant fluid(s): R454C			
Item	**Symbol**	**Value**	**Unit**
Evaporating temperature	*t*	-10°C	°C
Parameters at full load and ambient temperature 32°C			
Rated cooling capacity	P_A	4.17	kW
Rated power input	D_A	1.75	kW
Rated COP	COP_A	**2.38**	
Parameters at full load and ambient temperature 25°C			
Cooling capacity	P_2	4.49	kW
Power input	D_2	1.60	kW
Rated COP	COP_2	**2.81**	
Other items			
Capacity control		Fixed	
Contact details		TEV Limited Armytage Road Brighouse HD61QF	

Model(s): SMC 80 3/P			
Refrigerant fluid(s): R454C			
Item	**Symbol**	**Value**	**Unit**
Evaporating temperature	*t*	-10°C	°C
Annual electricty consumption	*Q*	9757	kWh/a
Seasonal engery performance ratio	*SEPR*	3.34	
Parameters at full load and ambient temperature 32°C (Point A)			
Rated cooling capacity	P_A	5.300	kW
Rated power input	D_A	2.180	kW
Rated COP	COP_A	**2.43**	
Parameters at part load and ambient temperature 25°C (Point B)			
Declared cooling capacity	P_B	5.73	kW
Declared power input	D_B	1.98	kW
Rated COP	COP_B	**2.89**	
Parameters at part load and ambient temperature 15°C (Point C)			
Declared cooling capacity	P_C	6.32	kW
Declared power input	D_C	1.75	kW
Rated COP	COP_C	**3.61**	
Parameters at part load and ambient temperature 5°C (Point D)			
Declared cooling capacity	P_D	6.86	kW
Declared power input	D_D	1.58	kW
Rated COP	COP_D	**4.34**	
Other items			
Capacity control		Fixed	
Degradation coefficient for fixed and staged capacity units	*Cdc*	0.25	
Contact details		TEV Limited Armytage Road Brighouse HD61QF	

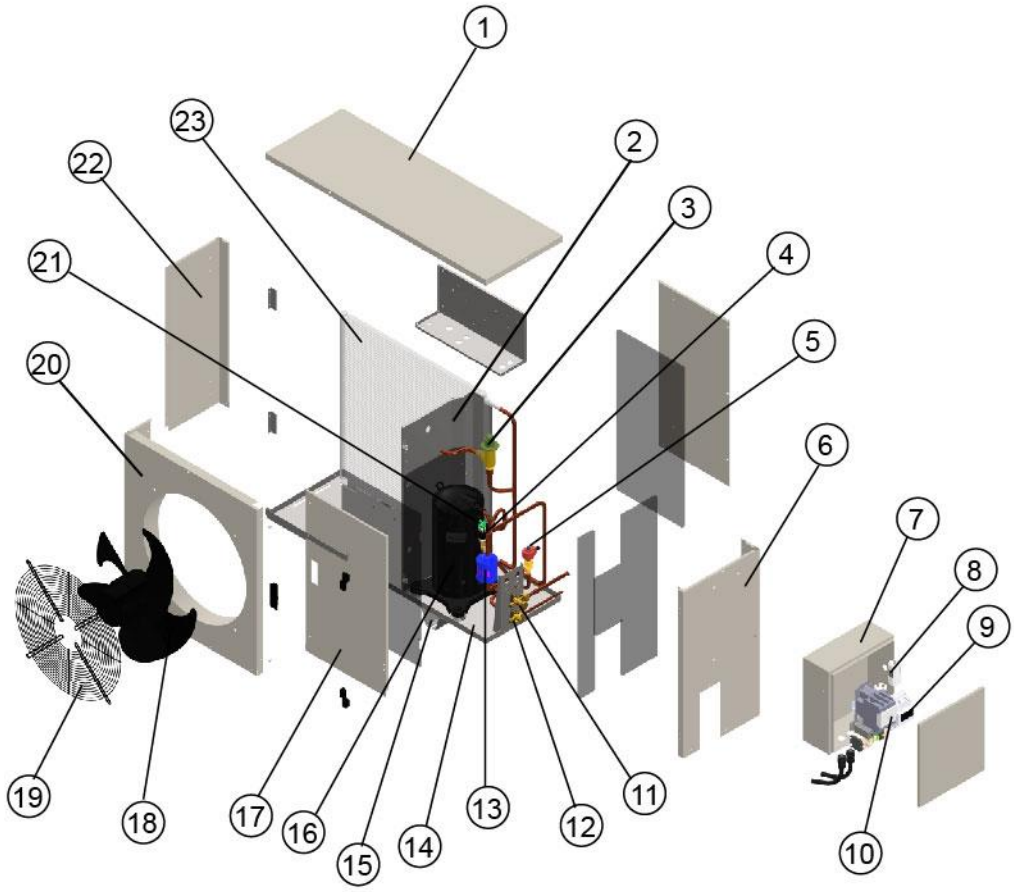
Model(s): SMC 90 3/P			
Refrigerant fluid(s): R454C			
Item	**Symbol**	**Value**	**Unit**
Evaporating temperature	*t*	-10°C	°C
Annual electricty consumption	*Q*	11029	kWh/a
Seasonal engery performance ratio	*SEPR*	3.32	
Parameters at full load and ambient temperature 32°C (Point A)			
Rated cooling capacity	P_A	5.950	kW
Rated power input	D_A	2.470	kW
Rated COP	COP_A	**2.41**	
Parameters at part load and ambient temperature 25°C (Point B)			
Declared cooling capacity	P_B	6.41	kW
Declared power input	D_B	2.24	kW
Rated COP	COP_B	**2.86**	
Parameters at part load and ambient temperature 15°C (Point C)			
Declared cooling capacity	P_C	7.08	kW
Declared power input	D_C	1.97	kW
Rated COP	COP_C	**3.59**	
Parameters at part load and ambient temperature 5°C (Point D)			
Declared cooling capacity	P_D	7.71	kW
Declared power input	D_D	1.79	kW
Rated COP	COP_D	**4.31**	
Other items			
Capacity control		Fixed	
Degradation coefficient for fixed and staged capacity units	*Cdc*	0.25	
Contact details		TEV Limited Armytage Road Brighouse HD61QF	

Model(s): SME 100 3/P			
Refrigerant fluid(s): R454C			
Item	**Symbol**	**Value**	**Unit**
Evaporating temperature	*t*	-10°C	°C
Annual electricty consumption	*Q*	13982	kWh/a
Seasonal engery performance ratio	*SEPR*	3.28	
Parameters at full load and ambient temperature 32°C (Point A)			
Rated cooling capacity	P_A	7.450	kW
Rated power input	D_A	3.100	kW
Rated COP	COP_A	**2.40**	
Parameters at part load and ambient temperature 25°C (Point B)			
Declared cooling capacity	P_B	8.03	kW
Declared power input	D_B	2.83	kW
Rated COP	COP_B	**2.84**	
Parameters at part load and ambient temperature 15°C (Point C)			
Declared cooling capacity	P_C	8.86	kW
Declared power input	D_C	2.50	kW
Rated COP	COP_C	**3.54**	
Parameters at part load and ambient temperature 5°C (Point D)			
Declared cooling capacity	P_D	9.64	kW
Declared power input	D_D	2.27	kW
Rated COP	COP_D	**4.25**	
Other items			
Capacity control	Fixed		
Degradation coefficient for fixed and staged capacity units	*Cdc*	0.25	
Contact details	TEV Limited Armytage Road Brighouse HD61QF		

Model(s): SME 150 3/P			
Refrigerant fluid(s): R454C			
Item	**Symbol**	**Value**	**Unit**
Evaporating temperature	*t*	-10°C	°C
Annual electricty consumption	*Q*	16278	kWh/a
Seasonal engery performance ratio	*SEPR*	3.33	
Parameters at full load and ambient temperature 32°C (Point A)			
Rated cooling capacity	P_A	8.830	kW
Rated power input	D_A	3.600	kW
Rated COP	COP_A	**2.45**	
Parameters at part load and ambient temperature 25°C (Point B)			
Declared cooling capacity	P_B	9.52	kW
Declared power input	D_B	3.29	kW
Rated COP	COP_B	**2.89**	
Parameters at part load and ambient temperature 15°C (Point C)			
Declared cooling capacity	P_C	10.50	kW
Declared power input	D_C	2.91	kW
Rated COP	COP_C	**3.61**	
Parameters at part load and ambient temperature 5°C (Point D)			
Declared cooling capacity	P_D	11.45	kW
Declared power input	D_D	2.65	kW
Rated COP	COP_D	**4.32**	
Other items			
Capacity control	Fixed		
Degradation coefficient for fixed and staged capacity units	*Cdc*	0.25	
Contact details	TEV Limited Armytage Road Brighouse HD61QF		

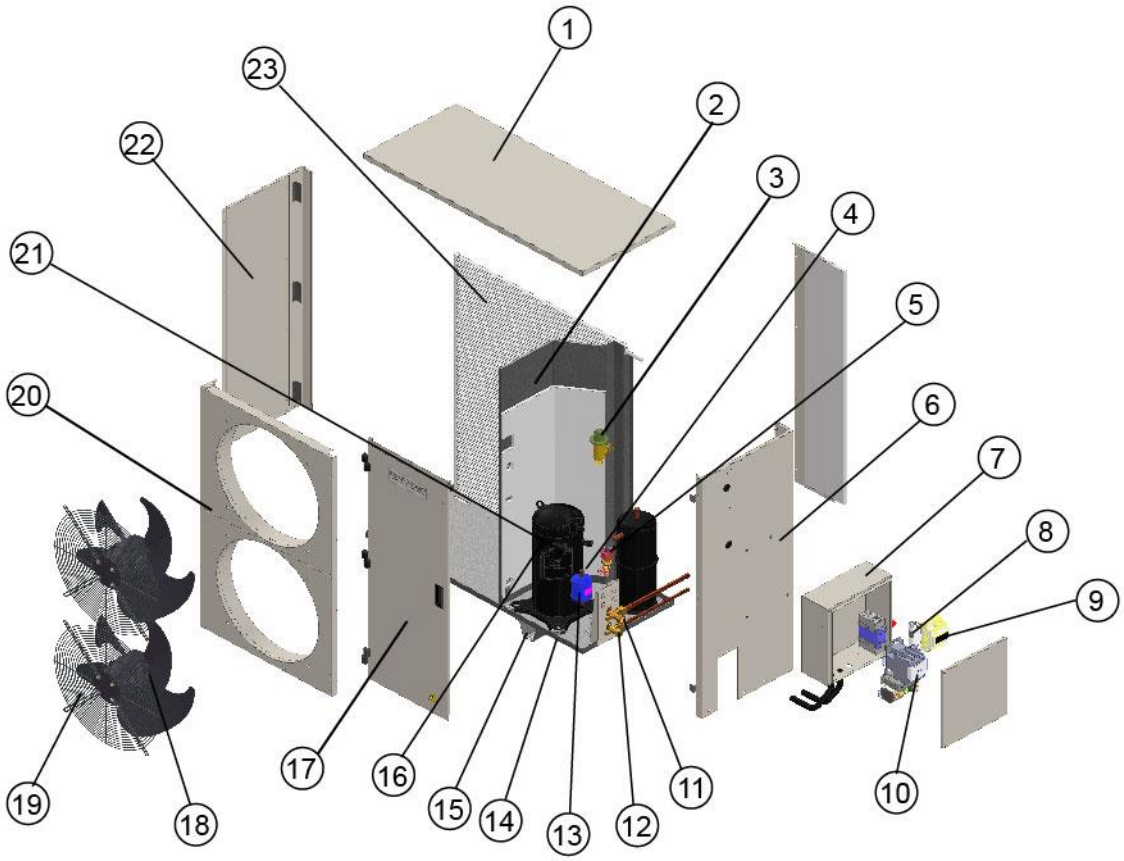
2M COMPONENT IDENTIFICATION SMC+

SMC 15-90



1	LID	9	ELECTRONIC EXPANSION VALVE DRIVER	17	HINGED DOOR
2	BULKHEAD PANEL	10	CONTACTOR	18	FAN / MOTOR ASSEMBLY
3	PRESSURE RELEASE VALVE	11	SERVICE VALVE (SUCTION)	19	FAN GUARD
4	SEPARATE HP AND LP SWITCHES	12	SERVICE VALVE (LIQUID/EXPANSION)	20	FASCIA PANEL
5	ELECTRONIC EXPANSION DEVICE	13	DRIER	21	FAN SPEED CONTROLLER
6	SIDE PANEL	14	BASE	22	CORNER PANEL
7	EXTERNAL ELECTRICS BOX	15	MOUNTING FOOT	23	MICRO CHANNEL COIL
8	COMPRESSOR CAPACITOR	16	COMPRESSOR		

SMC 100-150



1	LID	9	ELECTRONIC EXPANSION VALVE DRIVER	17	HINGED DOOR
2	BULKHEAD PANEL	10	CONTACTOR	18	FAN / MOTOR ASSEMBLY
3	PRESSURE RELEASE VALVE	11	SERVICE VALVE (SUCTION)	19	FAN GUARD
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6	SIDE PANEL	14	BASE	22	CORNER PANEL
7	EXTERNAL ELECTRICS BOX	15	MOUNTING FOOT	23	MICRO CHANNEL COIL
8	COMPRESSOR CAPACITOR	16	COMPRESSOR		

2N CONDENSING UNIT MAINTENANCE

The refrigerant recovery section of the risk assessment template or equivalent should be carried out before commencing refrigerant recovery.

Before engaging in any maintenance or repairs ensure

- Use of trained certified natural persons*.
- Well ventilated working environment.
- Use of a flammable gas leak detector.
- Correct selection of tools and equipment compatible with A2L refrigerants.
- Recovery of remaining refrigerant.
- Purging pipework with a suitable inert gas, prior to, during and for a suitable period after carrying out flame brazing to ensure that a flammable mixture cannot be formed.
- Adequate fire watch.
- Pressure testing of repair in accordance with EN378.
- Evacuation and dehydration in accordance with EN 378.
- Charging of the system in accordance with EN 378.
- Leak checking of the repair and system in accordance with EN 1516/2017.

Any other information identified within the site-specific risk assessment is available and taking into account.

***NOTE: it is the responsibility of the operator to ensure the technician is certified to the correct standard (EN13313 or equivalent).**

IMPORTANT
ISOLATE THE UNIT PRIOR TO COMMENCING ANY MAINTENANCE OR REPAIR WORK

GENERAL

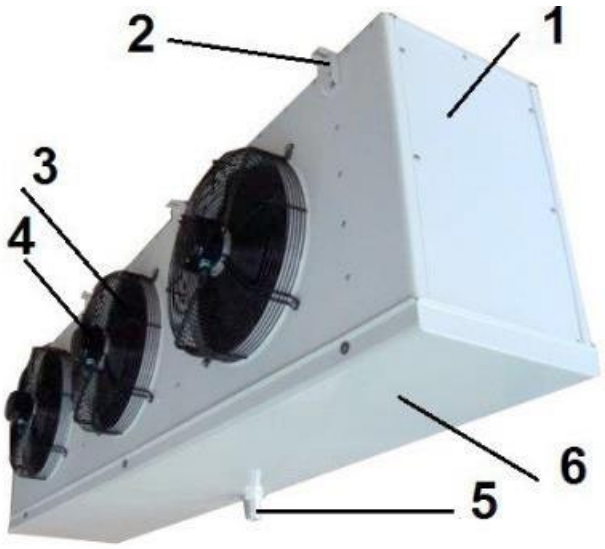
1. Ensure unit is not blocked or enclosed and there is adequate free airflow in and round the condensing unit.
2. Visually inspect the unit for wear and tear.
3. Remove the access panels (retain the screws).
4. Clean the base and insides of the unit.
5. Check all electrical connections are secure.
6. Check the face of the coil for cleanliness. Comb the fins if necessary.
7. Check the tightness of the compressor fixing bolts.
8. Check the fan rotates freely.
9. Check the pipework insulation condition.
10. Suction and discharge pressure.
11. Operation of head pressure control.
12. Visually check for oil patches.
13. Check safety labels are clear

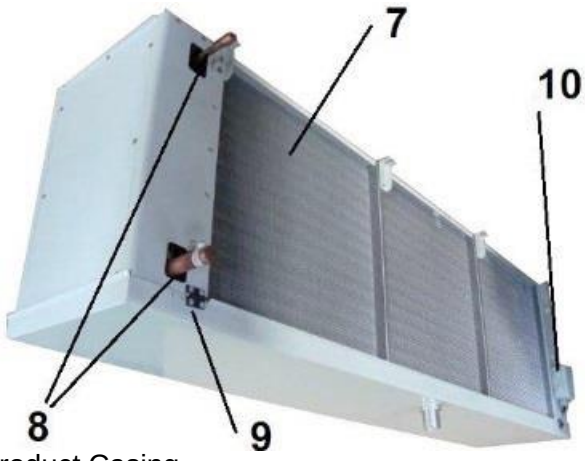
3 – EVAPORATORS

3A MODEL CODE EXPLANATION

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

3B COMPONENT IDENTIFICATION



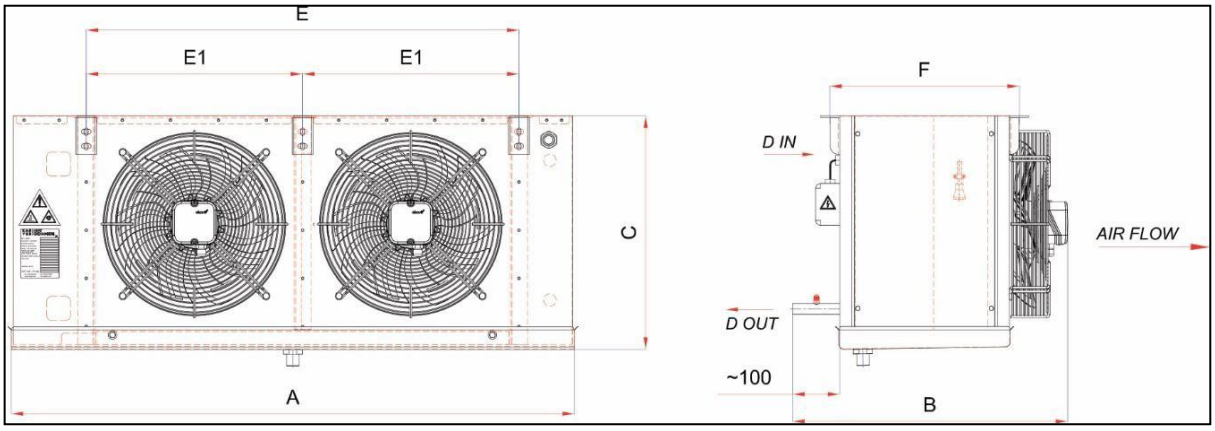


1) Product Casing
2) Mounting brackets
3) Fan
4) Fan Motor
5) Drainage Tray
6) Drainage Connector
7) Coils
8) Inlet & Outlet Connections
9) Hinge
10) Terminal Box

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 ice formation and defrosting may be required. Coolers are manufactured with electric defrost.

3C UNIT DIMENSIONS

MB type cold room evaporators are manufactured for use in small and medium commercial areas. They have Ø250mm or Ø300mm diameters fans and 4,2mm fin spacing for medium temperature as standard. Drainage tray has hinged design for easy maintenance. MB types can be manufactured with up to 3 fans.



MODEL	COIL DATA							
	DIMENSIONS							WEIGHT
	A	B	C	E	E1	E2	F	
	mm							kg
MBMT125A	727	520	363	455	-	-	345	15
MBMT125B	727	520	363	455	-	-	345	16
MBMT130B	727	520	426	455	-	-	345	18
MBMT130E	727	520	426	455	-	-	345	20
MBMT230B	1147	520	426	875	438	-	345	27
MBMT230C	1147	520	426	875	438	-	345	29
MBMT230E	1147	520	426	875	438	-	345	32
MBMT230BE	1357	520	426	1085	543	-	345	37
MBMT430AE	1987	520	426	1716	438	420	345	60

3D SPECIFICATION

Model	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	908	5.1	37	77	1	250	230/1/50	0.48	-	0.48	0.6	3/8”	3/8”
MBMT125B	866	4.9	37	78	1	250	230/1/50	0.48	-	0.48	0.8	3/8”	1/2”
MBMT130B	1272	6	41	113	1	300	230/1/50	0.48	-	0.48	1	3/8”	1/2”
MBMT130E	1035	4.9	41	115	1	300	230/1/50	0.96	-	0.96	2.1	3/8”	5/8”
MBMT230B	2543	6.6	44	225	2	300	230/1/50	0.97	-	0.97	2.1	3/8”	5/8”
MBMT230C	2362	6.1	44	227	2	300	230/1/50	1.94	-	1.94	2.7	1/2”	3/4”
MBMT230E	2071	5.4	43	230	2	300	230/1/50	1.94	-	1.94	4	3/8”	3/4”
MBMT230BE	2289	5.9	43	228	2	300	230/1/50	2.14	-	2.14	4.9	1/2”	7/8”
MBMT430AE	4808	6.8	49	248	4	300	230/1/51	5.6	-	5.6	8.2	1/2”	3/4”

3E PERFORMANCE DATA

		Evaporating temperature				
	Room Temperature	-20	-15	-10	-5	0
MBMT125A	10	N/A	N/A	3.7	2.9	2
	5	N/A	3.6	2.9	2	1.1
	0	3	2.4	1.7	1	N/A
	-5	2.3	1.7	1	N/A	N/A
	-10	1.6	1	N/A	N/A	N/A
	-15	0.9	N/A	N/A	N/A	N/A
MBMT125B	10	N/A	N/A	4.9	3.8	2.6
	5	N/A	5	3.8	2.6	1.4
	0	4.3	3.3	2.3	1.2	N/A
	-5	3.2	2.3	1.2	N/A	N/A
	-10	2.2	1.2	N/A	N/A	N/A
	-15	1.2	N/A	N/A	N/A	N/A
MBMT130B	10	N/A	N/A	6.3	4.8	3.4
	5	N/A	6.3	4.9	3.4	1.9
	0	5.3	4.2	2.9	1.7	N/A
	-5	4.1	2.9	1.7	N/A	N/A
	-10	2.9	1.7	N/A	N/A	N/A
	-15	1.6	N/A	N/A	N/A	N/A
MBMT130E	10	N/A	N/A	8	6.2	4.4
	5	N/A	8	6.3	4.5	2.7
	0	6.8	5.4	3.9	2.3	N/A
	-5	5.3	3.9	2.3	N/A	N/A
	-10	3.8	2.3	N/A	N/A	N/A
	-15	2.2	N/A	N/A	N/A	N/A
MBMT230B	10	N/A	N/A	12.3	9.6	6.8
	5	N/A	12.1	9.6	6.9	4
	0	10.1	8.1	5.9	3.4	N/A
	-5	7.8	5.7	3.4	N/A	N/A
	-10	5.5	3.3	N/A	N/A	N/A
	-15	3.3	N/A	N/A	N/A	N/A
MBMT230C	10	N/A	N/A	14.3	11.1	7.9
	5	N/A	14.2	11.3	8	4.7
	0	11.9	9.6	6.9	4.1	N/A
	-5	9.3	6.8	4	N/A	N/A
	-10	6.6	4	N/A	N/A	N/A
	-15	3.9	N/A	N/A	N/A	N/A
MBMT230E	10	N/A	N/A	15.4	12.1	8.6
	5	N/A	15.4	12.2	8.8	5.2
	0	13	10.5	7.6	4.5	N/A
	-5	10.1	7.5	4.5	N/A	N/A
	-10	7.3	4.4	N/A	N/A	N/A
	-15	4.3	N/A	N/A	N/A	N/A
MBMT230BE	10	N/A	N/A	17.5	13.7	9.8
	5	N/A	17.7	13.9	10	5.9
	0	14.9	12	8.7	5.1	N/A
	-5	11.36	8.6	5.1	N/A	N/A
	-10	8.4	5.1	N/A	N/A	N/A
	-15	5	N/A	N/A	N/A	N/A
MBMT430AE	10	N/A	N/A	33.8	26.1	18.2
	5	N/A	34.1	26.5	18.5	10.4
	0	28.8	22.7	15.9	8.9	N/A
	-5	22.1	15.7	8.8	N/A	N/A
	-10	15.3	8.7	N/A	N/A	N/A
	-15	8.5	N/A	N/A	N/A	N/A

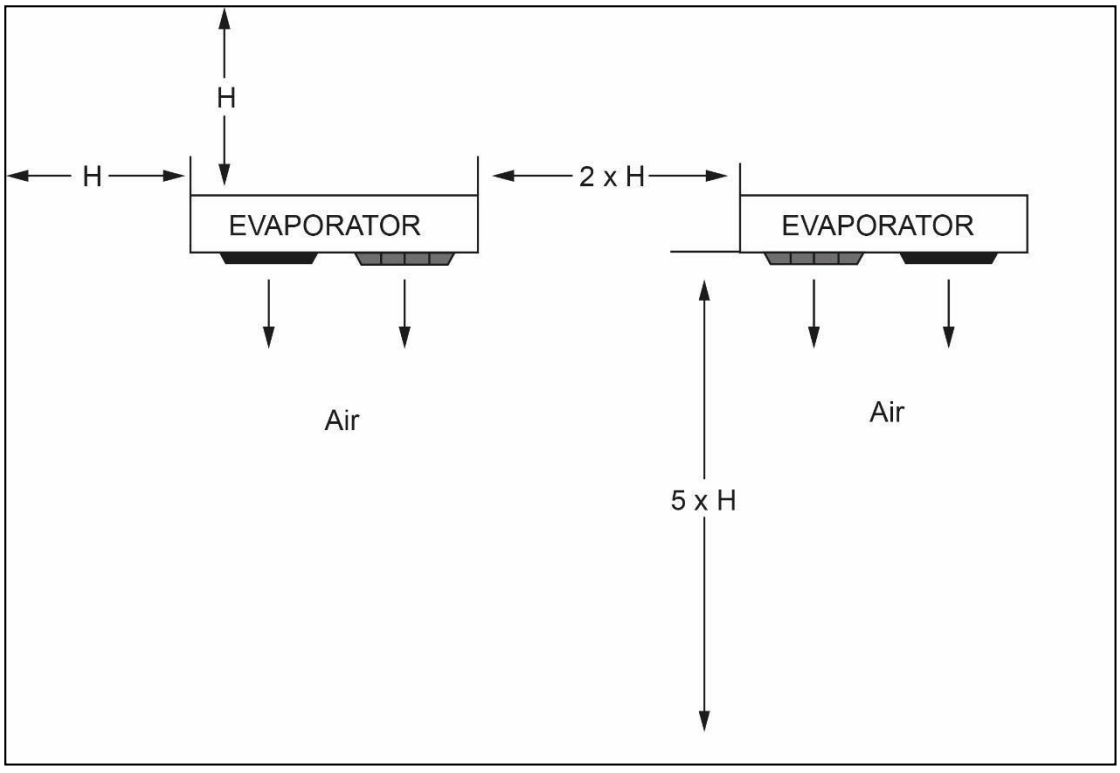
3F EVAPORATOR INSTALLATION

When installing a cold room utilising an A2L refrigerant it is important to ensure that sufficient free space is allowed around the evaporator. The correct amount of space will ensure that, in the unlikely event of a leak occurring, a flammable mixture is not created. These volumes have been precalculated for the pre defined systems. See system selection section for further details.

3F.1 Positioning

- Make sure the air circulation fulfils 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.

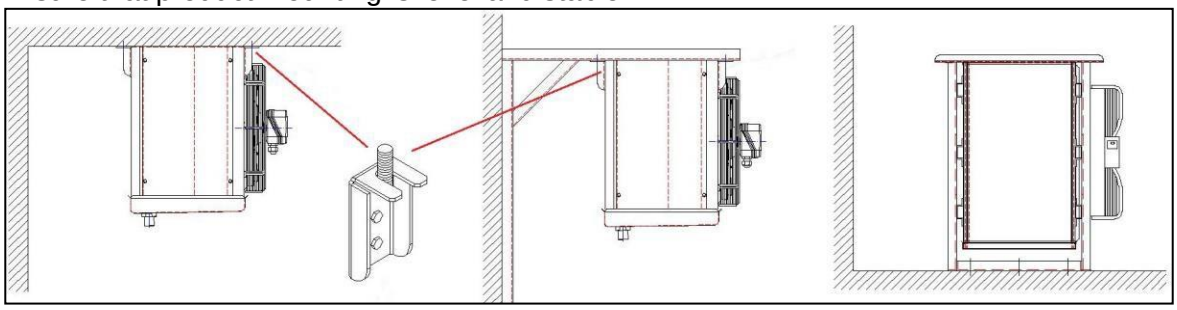
Evaporator Height	Distance between product and back wall	Distance between product and side wall	Distance between product and product	Distance between product and front wall	Distance between product and floor
H	1 x H	1 x H	2 x H	5 x H	3 x H



Layout plan for positioning

3F.2 Installation

•Ensure that product mounting is level and stable.



3F.3 Piping

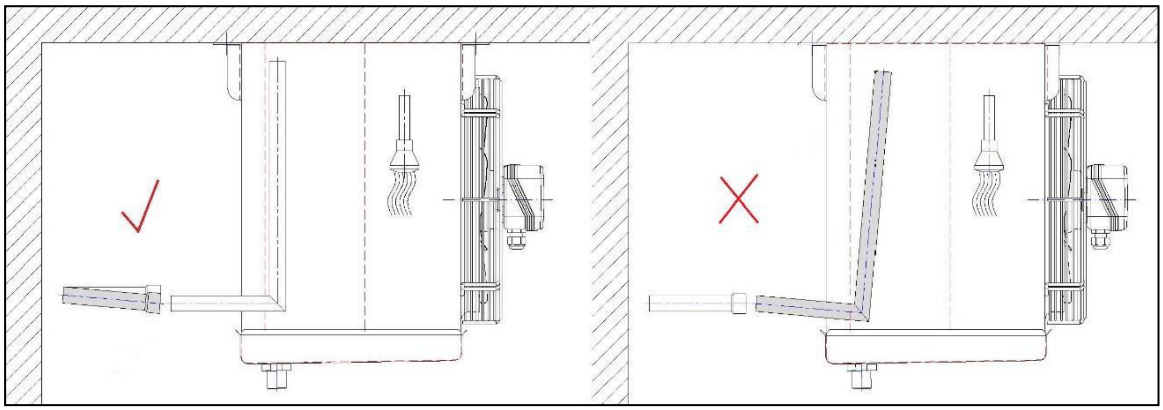
• Follow SMC instructions condensing unit instructions for interconnecting pipe sizing.

3F.4 Connections

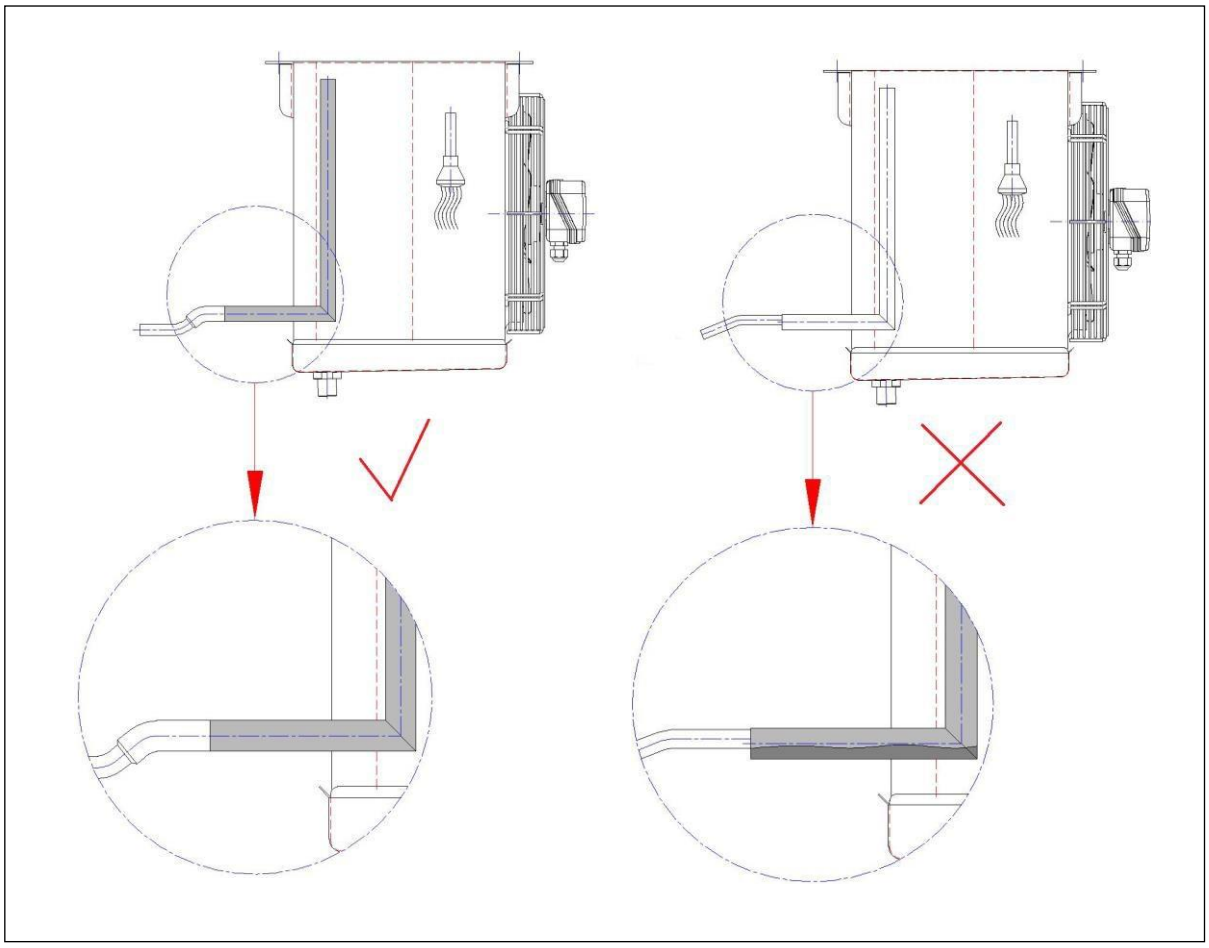
• At the factory products are always tested with air for leakages and contain a nitrogen holding charge of 6bar.

•Do not keep the connections in open position or in contact with atmospheric air

•Ensure system is charged correctly system selection process.

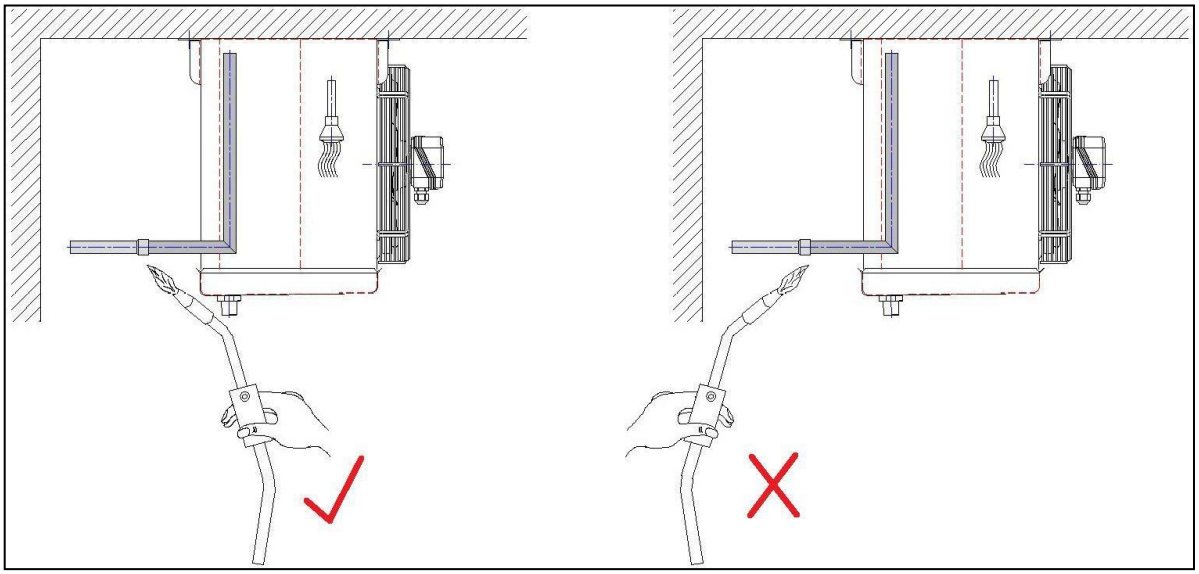


Correct and incorrect connections



Correct and incorrect connections

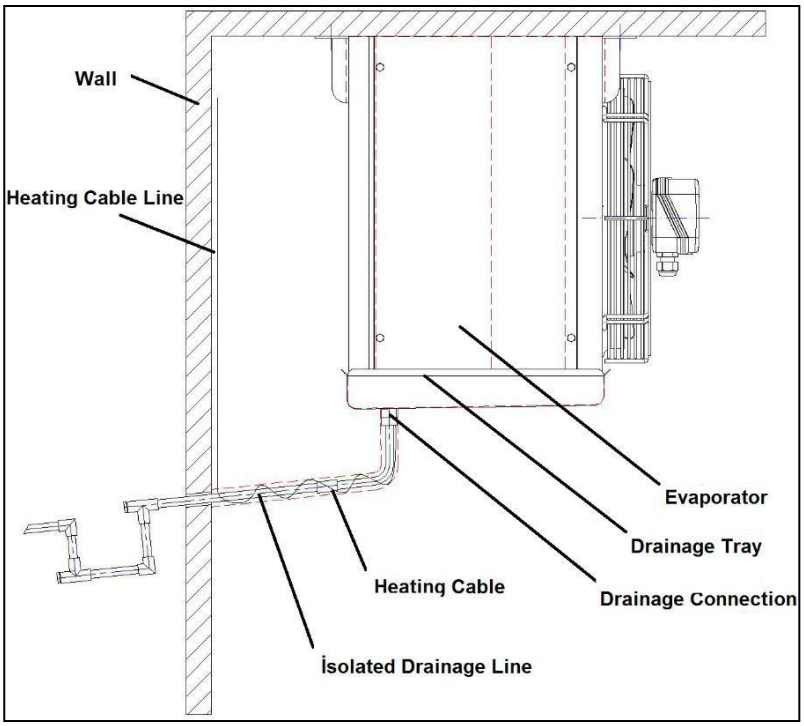
• Do not hold welding torch directly to the product



Correct usage of welding flame

3F.5 Drainage

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



Example of recommended drainage line

3G EVAPORATOR OPERATION

Persons working in and around the cold room must ensure that sources of ignition are not brought into the area.
Do not exceed Marstair guidance on cold room fill capacity; it is important to ensure that the cold room is not overloaded with product to ensure adequate air movement.
Loading and unloading of product should be carried in a way to ensure that damage to the refrigeration containing components cannot occur.
Smoking and naked flames should be prohibited within the cold room and the area around the condensing (outdoor) unit.

In the rare case of a leak occurring. Immediately contact an F Gas approved refrigeration technician. Do not open the door to the cold room. Keeping the door closed will help to maintain the storage temperature of the product and prevent a potentially flammable mixture leaking into to the environment outside the cold room. If product has to be removed from the cold room to be moved to another refrigerated storage facility, please undertake the following procedure:

1. Keep unauthorised personnel away
2. Ensure no smoking, no naked flame and no other potential sources of ignition are present
3. Make sure there is adequate ventilation
4. Open the door to the cold room
5. Wait 30 seconds before entering the cold room
6. Remove product from the cold room as quickly as possible
7. Close the cold room and do not re-enter until the refrigeration technician says that it is safe to do so

If the leak is identified as occurring outside the cold room, but inside a building or enclosure ensure adequate ventilation. No source of ignition shall be energised or brought into the area until the environment is proven to be safe.

3H MAINTENANCE

3H1 General

The refrigerant recovery section of the risk assessment template or equivalent should be carried out before commencing refrigerant recovery.

Before engaging in any maintenance or repairs ensure

- Use of trained certified natural persons*.
- Well ventilated working environment.
- Use of a flammable gas leak detector.
- Correct selection of tools and equipment compatible with A2L refrigerants.
- Recovery of remaining refrigerant.
- Purging pipework with a suitable inert gas, prior to, during and for a suitable period after carrying out flame brazing to ensure that a flammable mixture cannot be formed.
- Adequate fire watch.
- Pressure testing of repair in accordance with EN378.
- Evacuation and dehydration in accordance with EN 378.
- Charging of the system in accordance with EN 378.
- Leak checking of the repair and system in accordance with EN 1516/2017.

Any other information identified within the site specific risk assessment is available and taking into account.

***NOTE: it is the responsibility of the operator to ensure the technician is certified to the correct standard (EN13313 or equivalent).**

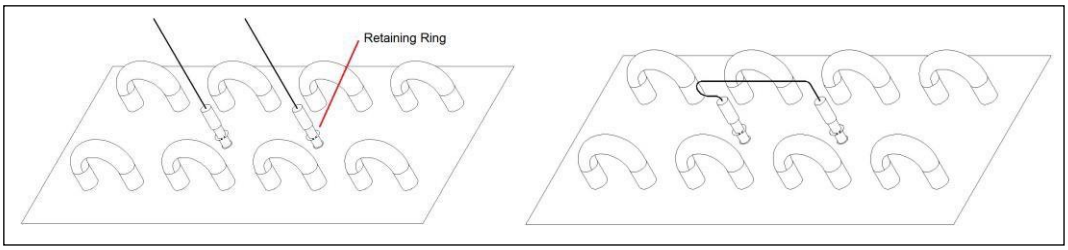
Regular inspection and periodic maintenance is enough to ensure long time usage.

• Make sure all electric connections are tightened.
• Make sure all fan screws are tightened.
• Make sure each fan is running freely.
• 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 ice formation and examine 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.
• Do not touch of coil heater without gloves. Be wary of any material splashing and wear protective goggles.
• Make sure drainage water easily flows away. Please see water flows away easily with opening drain pan and side cover.
• Check safety labels are clear

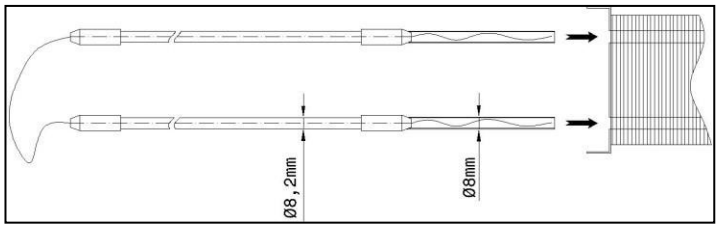
System is to be switched off and isolated during any repairs.

3H2 Changing Defrost Heaters

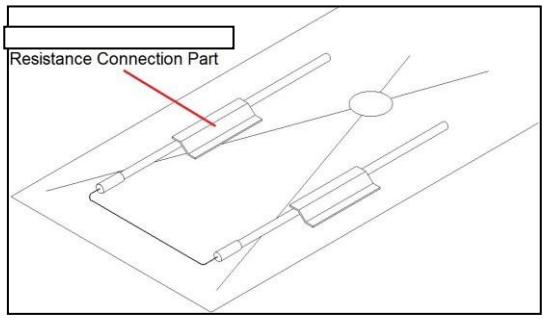
- Electric defrost heaters come in two configurations. One is for light ice formation between 0º C and 5º C temperatures and the other one is for heavy ice formation below 0º C temperatures.
- Before anything is done make sure electric power is off
- Open the terminal box.
- Make sure that heating elements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



Disassembling coil resistances



Disassembling coil resistances



Changing drainage tray resistance

3H3 Changing Fans

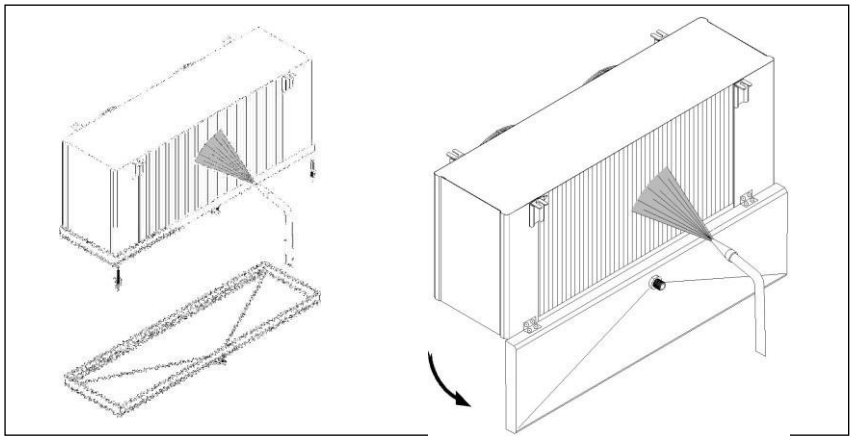
- Ensure that electric power is off.
- Disassemble fan screws.
- Remove electrical wirings.
- Assemble the fan and be sure of the alignment.
- Please repeat instructions.

Changing fan motor;

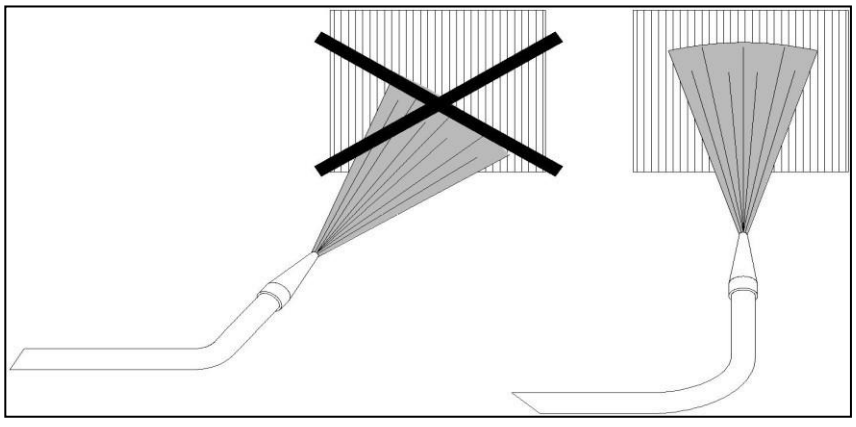
- Proceed the upper instruction until dissembling fan.
- Remove fan motor wirings.
- Remove fan motor from its place and change the new ones.
- Please repeat instructions.

3H4 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.



Preparation for cleaning



Hold the water vertical.

3I TROUBLE SHOOTING

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.
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

3J ALARM INSTALLATION

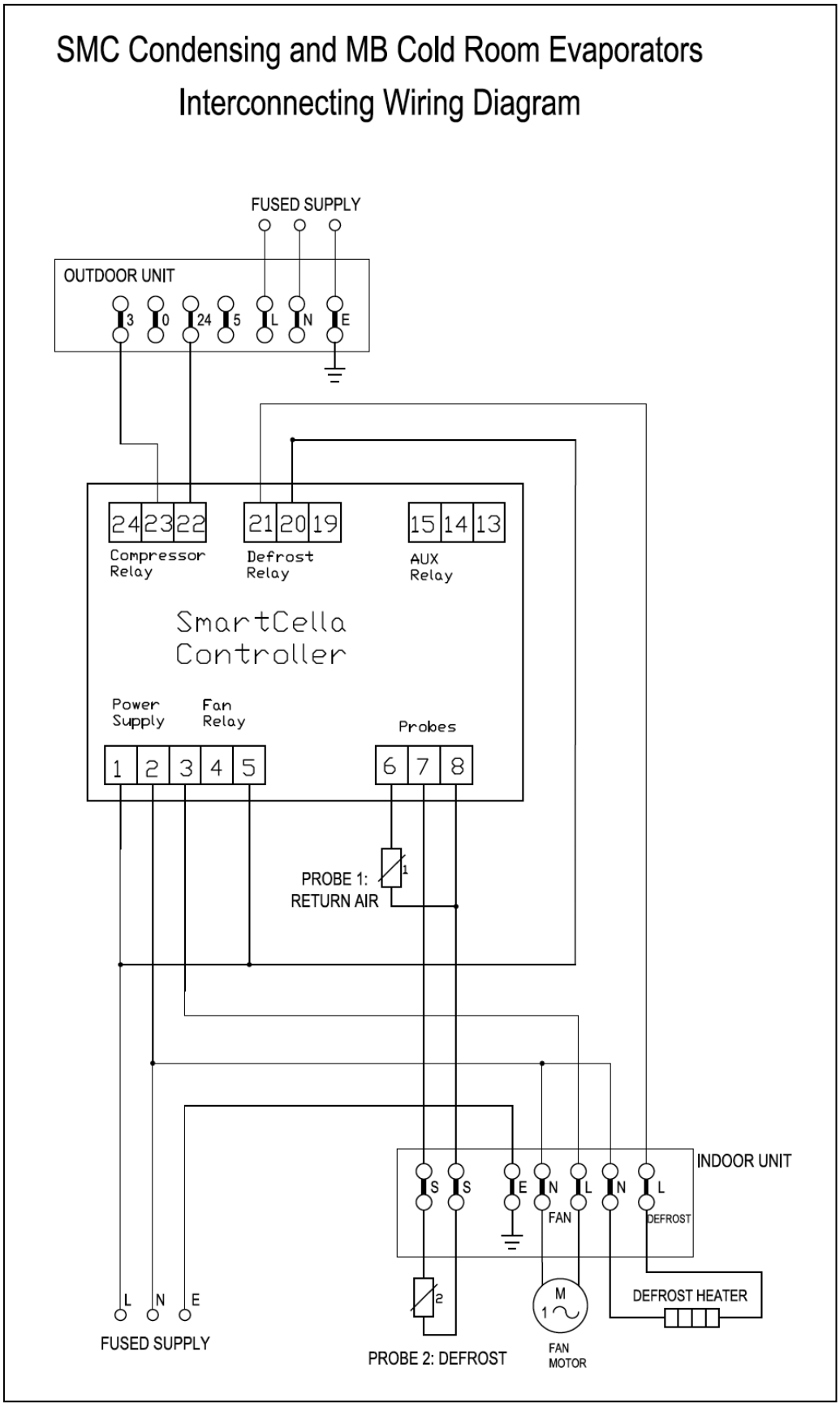
A method of alarm is required identify a potential loss of gas. This can be a cold room out of limited alarm, or something more specific.

In the case of a leak the alarm should as a minimum either: -

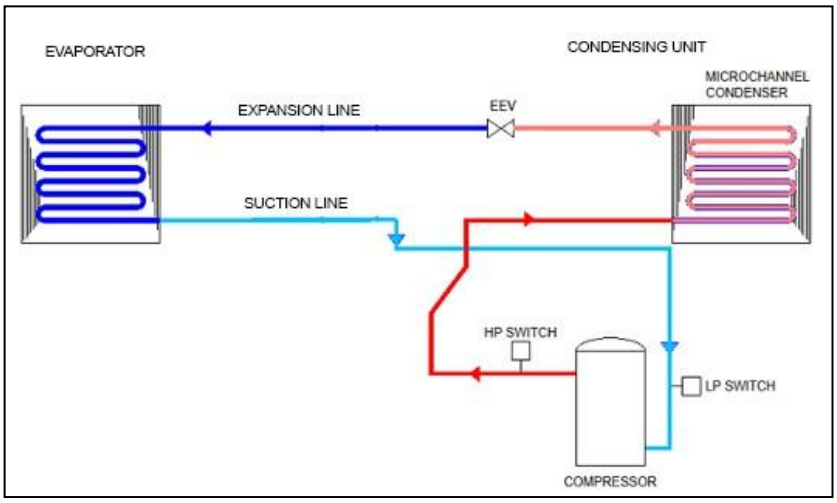
- Alarm lamp flashing or lighting
- Alarm horn sounding
- Display warning on equipment controller

If leak detection is installed, it should be either the sensor type or via existing pressure sensing devices. The leak detection method (sensor type), needs to be calibrated/tested annually and sensitive to < 20% of the lower flammability level of the refrigerant. If the detector uses a drop in pressure, then it needs to be tested for correct operation. If a pressure type of detector is used, due to the inaccuracy of this method, the operator should assume that a flammable mixture could be present within the cold room and appropriate action must be taken.

3K INTERCONNECTING WIRING DIAGRAM



3L REFRIGERANT SYSTEM SCHEMATIC DIAGRAM



3M SMART CELLAR PARAMETERS

Dl (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.

4 – SYSTEM SELECTION PROCESS

1. Select Evaporator based on Duty requirement, Target cold room temperature and evaporating temperature. (See evaporator performance tables)
2. Select Condensing unit based on Duty requirement, maximum external ambient and evaporating temperature. (See condensing unit performance tables)
3. Calculate Expansion pipe size based on Condensing unit selection and pipe run (See pipework installation within condensing unit section)
4. Calculate the system refrigerant charge by adding the condensing unit, evaporator and pipe run charge sizes together.

System Refrigerant charge			
MBMT	Evaporator Base Charge	SMC	Condensing unit base charge
125A	0.084	15	0.196
125B	0.112	20	0.183
130B	0.14	30	0.21
130E	0.294	40	0.166
230B	0.294	45	0.36
230C	0.378	50	0.36
230E	0.56	80	0.395
230BE	0.686	90	0.594
430E	1.148	100	0.82
		150	0.894

Expansion line size	Grams per m pipe run
3/8"	16
1/2"	30
5/8"	48

5. Calculate minimum room size acceptable based on EN 378 = refrigerant charge (kg) / (lower flammability limit X 0.2)
6. Check whether your cold room size is bigger – If it is, that's great you can move on to the next part if not try the following:-
    a. Reducing your pipe run
    b. Use 2 smaller systems instead of 1 big system.
7. Contact Marstair for a Dsear free volume assessment. This is the volume within the cold which needs to be kept clear to ensure a flammable atmosphere will not be formed.

When installing a cold room utilising an A2L refrigerant it is important to ensure that sufficient free space is allowed around the evaporator. The correct amount of space will ensure that, in the unlikely event of a leak occurring, a flammable mixture is not created.

The minimum "free space" required to ensure a safe working environment has been calculated using through the following:-

1. Formula found in BS EN 60079-10-1: 2015
2. Additional formula, to calculate the time it takes for the refrigerant to pool
3. The amount of heat energy within the material upon which the refrigerant pools
4. The time taken for the lower flammability limit of the refrigerant to be reached.

Calculations are based upon refrigerant charge sizes shown in the pre-defined systems table. If refrigerant charges are above the values stated, the free volume requirement will be inaccurate.
This Dsear free volume information is to be passed onto the end user

PRE-DEFINED SYSTEMS

Medium Temperature - R454C (-8°C Evaporating temperature / 0°C return Air / 32°C External)									
				5m Pipe Run			10m Pipe Run		
Cooling kW	Condensing unit	Box Evaporator	System charge 0m	System charge	BS EN 378 Minimum Room Size m³	Dsear assessement Required Free area m³	System charge	BS EN 378 Minimum Room Size m³	Dsear assessement Required Free area m³
1.3	SMC+15	MBMTE125A	0.28	0.36	6.1	3.34	0.440	7.5	3.61
1.6	SMC+20	MBTME125B	0.295	0.375	6.4	3.39	0.455	7.8	3.66
1.9	SMC+30	MBMTE130B	0.350	0.430	7.3	3.58	0.510	8.7	3.85
2.4	SMC+40	MBMT130E	0.460	0.540	9.2	3.95	0.620	10.6	4.23
3.2	SMC+45	MBMT230B	0.654	0.734	12.5	4.62	0.814	13.9	4.89
4.6	SMC+50	MBMT230C	0.738	0.818	14.0	4.90	1.038	17.7	5.65
5.7	SMC+80	MBMT230E	0.955	1.035	17.7	5.64	1.255	21.4	6.39
6.5	SMC+90	MBMT230BE	1.280	1.430	24.4	6.99	1.580	27.0	7.50
8.7	SMC+100	MBMT430E	1.220	1.370	23.4	6.79	1.520	25.9	7.30
10.3	SMC+150	MBMT430E	1.220	1.370	23.4	6.79	1.700	29.0	7.91

Medium Temperature - R454C (-8°C Evaporating temperature / 0°C return Air / 32°C External)									
				15m Pipe Run			20m Pipe Run		
Cooling kW	Condensing unit	Box Evaporator	System charge 0m	System charge	BS EN 378 Minimum Room Size m³	Dsear assessement Required Free area m³	System charge	BS EN 378 Minimum Room Size m³	Dsear assessement Required Free area m³
1.3	SMC+15	MBMTE125A	0.28	0.520	8.9	3.88	0.6	10.2	4.16
1.6	SMC+20	MBTME125B	0.295	0.535	9.1	3.94	0.615	10.5	4.21
1.9	SMC+30	MBMTE130B	0.350	0.590	10.1	4.12	0.67	11.4	4.40
2.4	SMC+40	MBMT130E	0.460	0.700	11.9	4.50	1.060	18.1	5.73
3.2	SMC+45	MBMT230B	0.654	1.104	18.8	5.88	1.254	21.4	6.39
4.6	SMC+50	MBMT230C	0.738	1.188	20.3	6.17	1.338	22.8	6.68
5.7	SMC+80	MBMT230E	0.955	1.405	24.0	6.91	1.555	26.5	7.42
6.5	SMC+90	MBMT230BE	1.280	1.730	29.5	8.01	1.880	32.1	8.53
8.7	SMC+100	MBMT430E	1.220	1.670	28.5	7.81	1.900	32.4	8.59
10.3	SMC+150	MBMT430E	1.220	1.940	33.1	8.73	2.180	37.2	9.55

5 – SPARES

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

6 – END OF LIFE REQUIRMENTS

Refrigerant must be recovered by a certificated technician before the plant is dismantled. Modern refrigerant recovery machines should be able to remove well over 95% of the refrigerant in an old system.
All recovered refrigerants can either be:
a) Sent for destruction by incineration at a licenced waste facility

b) Sent to a specialist plant that can re-process the old refrigerant into a gas with properties identical to virgin refrigerant, to create “reclaimed refrigerant”

c) Given a basic cleaning process, to create “recycled refrigerant”

Given the refrigerant supply shortage that will be created by the phase down process, it is worth trying to send the old refrigerant for reclamation as it may have a good residual value. If the old refrigerant is too contaminated it cannot be reclaimed and must be sent for destruction. It is important not to mix different gases in the same recovery cylinder – as this would render them unsuitable for reclamation.
Reclaimed refrigerant can be used in any refrigeration equipment. Recycled refrigerant must always be used with care as it may be contaminated or of unknown composition.

7 – INSTALLATION RISK ASSESSMENT

Installation of an A2L Split Cold Room System

Prior to installation, it is important to ensure that the location is suitable for this type of system and that the instructions have been followed with regard to the minimum room volume for the maximum charge weight. This assessment process is designed to augment a detailed risk assessment not replace it.

The A2L DSEAR Assessment has identified that if a cold room split system (typically less than 3kg refrigerant charge), is located correctly in accordance with the instructions, then the most likely point of leakage is a flare connection on the condensing unit, which will be located in free air outside. This will result in Zone 2 NE.

BS EN 60079-10-1 states that this zone may be treated as non-hazardous. Such a zone implies that an explosion, if it takes place, will have negligible consequences.

The following step by step assessment assumes that the site in which you are working has no specific risks or hazards. If this is not the case, a full assessment will be required

INSTALLATION

Question	N/A	YES	NO	Comments
1. Has correct PPE been selected?				If yes go to question 2 If no stop assessment
2. Are suitable first aid facilities available?				If yes go to question 3 If no stop assessment
3. Has the electrical supply been suitably isolated?				If yes go to question 4 If no rectify and reassess
4. Are hot works required for jointing of the refrigeration pipework?				If yes go to question 7 If no go to question 5
5. Are permanent mechanical joints required?				If yes go to question 20 If no go to question 6
6. Have the flare connections been made to a suitable standard?				If yes go to question 20 If no rectify and reassess
7. Are you competent to carry out brazing tasks?				If yes go to question 8 If no stop assessment
8. Brazing certificate number				
9. Has a suitable fire extinguisher been selected and a hot work permit been issued?				If yes go to question 10 If no stop assessment
10. Is the area adequately ventilated?				If yes go to question 11 If no stop assessment
11. Are the pressure regulators in date?				If yes go to question 12 If no rectify and reassess
12. Are the flash back arrestors in date?				If yes go to question 13 If no rectify and reassess
13. Has the oxyfuel equipment been leak tested?				If yes go to question 14 If no rectify and reassess

14. Has the Oxygen Free Nitrogen equipment been leak tested?				If yes go to question 15 If no rectify and reassess
15. Are all the cylinders upright and secure?				If yes go to question 16 If no rectify and reassess
16. Is Oxygen Free Nitrogen purging at the correct flow rate through the pipework?				If yes go to question 17 If no rectify and reassess
17. Has a full shutdown of equipment been completed upon conclusion of hot works				If yes go to question 18 If no rectify and reassess
18. Is a fire watch to be undertaken?				If yes go to question 19 If no rectify and reassess
19. Duration of fire watch				

PRESSURE TESTING

20. F Gas certificate number				
21. Is the system to be pressure tested with Oxygen Free Nitrogen?				If yes go to question 22 If no rectify and reassess
22. What is the required strength pressure test?				
23. What is the required tightness pressure test?				
24. Has the pressure been incrementally increased in a safe manner?				If yes go to question 25 If no rectify and reassess
25. Has the system passed the strength test?				If yes go to question 26 If no rectify and reassess
26. Has the system passed the tightness test?				If yes go to question 27 If no rectify and reassess
27. What was the duration of the tightness test?				
28. Has the system been safely de-pressurised into a well ventilated environment?				If yes go to question 29 If no rectify and reassess

EVACUATION

29. Has a flammable gas leak detector been energised and placed in a suitable location?				If yes go to question 30 If no rectify and reassess
30. Have all possible ignition sources been removed from the work area?				If yes go to question 31 If no rectify and reassess
31. Has a suitable vacuum pump been fitted to the system?				If yes go to question 32 If no rectify and reassess
32. Is the oil level satisfactory?				If yes go to question 33 If no rectify and reassess
33. Is the exhaust able to be discharged into a safe environment away from ignition source?				If yes go to question 34 If no rectify and reassess
34. Has a vacuum gauge been connected to the system?				If yes go to question 35 If no rectify and reassess
35. Has a suitable vacuum been achieved and held for a suitable period of time?				If yes go to question 36 If no rectify and reassess

CHARGING OF REFRIGERANT

36. Is additional refrigerant charge required?				If yes go to question 37 If no go to question 44
37. Is a suitable charging cylinder available fitted with the correct bottle adaptor?				If yes go to question 38 If no rectify and reassess
38. Have you selected a calibrated weighing platform?				If yes go to question 39 If no rectify and reassess
39. Calibration certificate number				
40. Has the charging hose been evacuated of air?				If yes go to question 41

				If no rectify and reassess
41. Will the system be charged in liquid or vapour form?				
42. Has the correct additional charge been added in accordance with the manufacturers instructions?				If yes go to question 43 If no rectify and reassess
43. Can the equipment be energised to remove refrigerant from the charging hoses?				If yes go to question 44 If no rectify and reassess
44. Have the isolation valves been opened correctly?				If yes go to question 45 If no rectify and reassess
45. Has the system been leak checked with a suitable leak detector for A2L refrigerant?				If yes go to question 46 If no rectify and reassess
46. Have the running conditions of the system been checked/recorded?				If yes go to question 47 If no rectify and reassess
47. Have the charging hoses been removed safely and with minimum loss of refrigerant?				If yes go to question 48 If no rectify and reassess
48. Is the service valve leak free and cap replaced?				If yes go to question 49 If no go to question 50

REFRIGERANT RECOVERY

49. Have all of the tools, refrigerant and equipment been removed from site?				If yes end assessment If no rectify and reassess
50. Is the area adequately ventilated?				If yes go to question 51 If no rectify and reassess
51. Has a suitable flammable gas leak detector been energised and placed at a low level?				If yes go to question 52 If no rectify and reassess
52. Has a suitable recovery unit been fitted?				If yes go to question 53 If no rectify and reassess
53. Do you have a suitable recovery cylinder with adequate capacity?				If yes go to question 54 If no rectify and reassess
54. Have you placed it on to a suitable calibrated weighing platform?				If yes go to question 55 If no rectify and reassess
55. Calibration certificate number				
56. Have you documented the amount of refrigerant recovered and filled out the appropriate paperwork?				If yes go to question 57 If no rectify and reassess
57. Identify source of leakage and recommence assessment procedure.				

This information is to be given to the end user along with the Marstair internal free volume assessment, and any other risks identified.