MARSTAIR

TECHNICAL MANUAL
MCU+ 180-200

This manual provides technical and installation information for
MCU+180m - 200 Condensing Unit:

550 series MCU+ condensing units } **R134A Refrigerant**

INDEX

GENERAL

1. Marstair 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 are supplied pre-charged with R134A refrigerant and polyolester oil.
Do not open the valves until the system is fully installed.
Do not mix oils or refrigerants.

3. These units 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 outdoor unit. For system details add input power and current of indoor and outdoor unit, including any heater load.

5. FUSES- for recommended fuse size see indoor unit instructions.

550 Series CONDENSING UNITS (MCU/MCU+)

MCU+ 3Ph Scroll	**180**	200
R134A	**TBA**	**55033054**

UNPACKED DIMENSIONS AND WEIGHTS
CONDENSING UNITS

Model		MCU+ 180	MCU+ 200
HEIGHT* mm		1275	1275
WIDTH mm		1100	1100
DEPTH mm		425	425
WEIGHT kg	3 Ph	118	173

Includes 60mm for mounting feet.

PACKED DIMENSIONS AND WEIGHTS
CONDENSING UNITS

Model		MCU+ 180	MCU+ 200
HEIGHT mm		1280	1280
WIDTH mm		1215	1215
DEPTH mm		465	465
WEIGHT kg	3 Ph	123	178

FEATURES/ACCESSORIES
OUTDOOR

	MCU+
Fan speed head pressure control	STD
LP cutout auto	STD
HP cutout auto	STD
HP cutout manual	*
Isolator	*
Low ambient start / 3 minute delay	STD
Wall mounting brackets	*
Contactor	STD
Overload (standard on 3Ph)	STD
Compressor jacket	*
Volt free alarm relay	*

Key: * = site option STD = standard

AIRFLOWS OUTDOOR/DUCTED UNITS

Model	MAX Speed
MCU+	**m^3/s**
180 - 200	1.85

TECHNICAL INFORMATION

MCU+ 180 - 200 Capacities R134A

MODEL	AIR ON TO CONDENSER EC	EVAPORATING TEMPERATURE										
		-15	-12.5	-10	-7.5	-5	-2.5	0	2.5	5	7.5	10
		TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
MCU+ 180	25	5.51	6.21	6.98	7.82	8.73	9.71	10.80	11.95	13.15	14.50	15.95
	30	5.22	5.90	6.64	7.44	8.31	9.26	10.30	11.40	12.60	13.85	15.25
	35	4.92	5.57	6.28	7.05	7.89	8.80	9.78	10.85	12.00	13.20	14.55
	40	-	5.33	6.01	6.76	7.57	8.45	9.40	10.40	11.55	12.75	14.00
	45	-	-	5.64	6.36	7.13	7.97	8.87	9.85	10.90	12.05	13.30
	50	-	-	-	5.84	6.57	7.35	8.21	9.13	10.10	11.20	12.35
	55	-	-	-	-	5.99	6.72	7.52	8.38	9.31	10.30	11.40
MCU+ 200	25	6.07	6.89	7.80	8.80	9.90	11.06	12.24	13.92	15.75	17.18	18.48
	30	5.69	6.48	7.35	8.30	9.35	10.48	11.67	13.13	14.85	16.22	17.76
	35	5.46	6.21	7.04	7.94	8.93	10.03	11.10	12.48	14.01	15.33	16.88
	40	-	5.93	6.71	7.58	8.53	9.56	10.67	11.85	13.27	14.65	16.28
	45	-	-	6.34	7.16	8.04	9.01	10.01	11.17	12.36	13.71	15.48
	50	-	-	-	6.57	7.40	8.30	9.29	10.28	11.29	12.61	14.39
	55	-	-	-	-	6.74	7.58	8.50	9.37	10.26	11.48	13.30

SOUND POWER and SOUND PRESSURE LEVEL

MAXIMUM SPEED

MCU+	Compressor	SOUND POWER LEVELS Frequency Hz 125	250	500	1K	2K	4K	dBA	SOUND PRESSURE LEVELS dBA	NC
180	Scroll	72.5	71.9	71.7	68.9	66.0	58.2	75.5	59.2	53.0
200	Scroll	73.0	71.8	71.5	70.1	66.1	58.3	75.7	62.0	56.0

MINIMUM SPEED

MCU+	Compressor	SOUND POWER LEVELS Frequency Hz 125	250	500	1K	2K	4K	dBA	SOUND PRESSURE LEVELS dBA	NC
180	Scroll	65.7	65.9	67.1	61.3	65.3	55.1	73.2	53.7	49.0
200	Scroll	66.5	66.1	67.9	66.7	66.0	57.2	75.6	55.6	51.0

Sound Power Levels were obtained in full accordance with the direct method of ISO 3741: 1988. Quantities are shown in dB with a standard reference of 1 pW.
Sound Pressure Levels are dB relative to 2 x $10^{-5}N/m^2$ and are calculated from the results under anechoic conditions and are quoted as an average of all points on a sphere of a radius of 3m away from the centre of the unit (in cooling mode); (add 3dBA or 3NC for units at an intersection of a wall, add 1dBA or 1NC for high level wall mounted units).

ELECTRICAL DATA (Cooling Data rated at 55C external conditions)

MCU+	180	200
FAN MOTOR	1.2	1.2
R134A COMPRESSOR (3 PHASE) NOMINAL FLA	11.9	16.9

FUSES

The system and its supply/interconnecting wiring must be protected by fuses, preferably High Rupture Current (HRC) motor rated types (EN60269) or miniature circuit breakers (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.

SYSTEMS WITH 3 Ph 400V 50Hz OUTDOOR UNITS (A/Ph)

MCU+	180	200
	25	32

INSTALLATION of 550 Series CONDENSING UNITS

MCU+ = standard condensing unit + FSC + LP

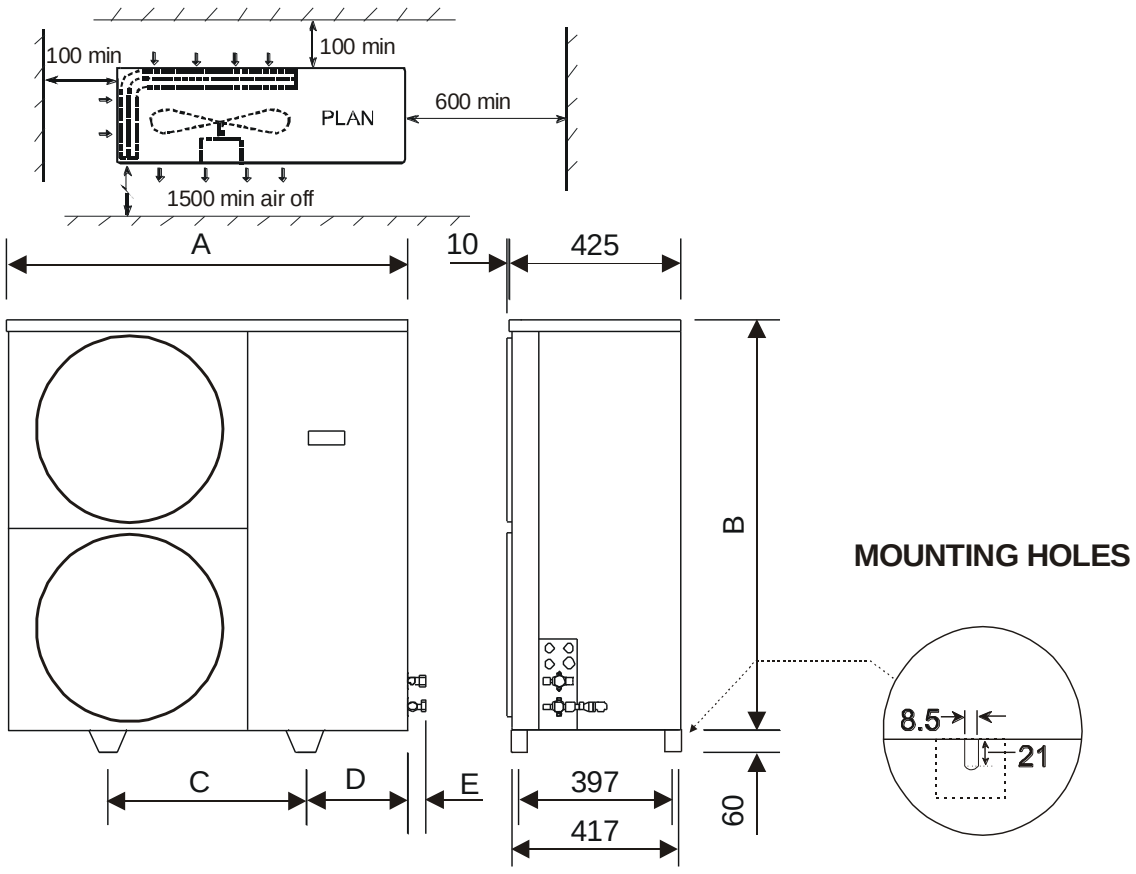
The installer will require:
2 open ended spanners for securing the flare fittings
A 4 or 5mm Allen Key for the valves (dependant on valve type).
Note: It is easier to fit kits prior to mounting the unit.

These units are designed to stand on a flat surface. If the unit is to be wall mounted the following kits are available.
(TEV cannot accept liability for installers own mounting arrangements).

Model	MCU+ 180 - 200
Mounting Bracket Kit	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.

MOUNTING: MCU+ 180 - 200



All dimensions are in millimetres.

Model	A	B	C	D	**E**	**Weight (kg)**
MCU+ 180	1100	1215	675	211	95	118
MCU+ 200	1100	1215	675	211	95	173

APPLICATION - ALL CONDENSING UNITS

1. To maximise performance, pipe runs should be kept as short as possible, avoiding sharp bends. However, individual pipe runs to a maximum of 45m, including 20m lift, are permissible provided good refrigeration practice is followed.

Published performance duties are based on 7.5m pipe runs. Correctly sized pipes for each installation, and fitting the correct thermal expansion valve will result in no significant loss of capacity on extended pipe runs.

a) Pipe sizes are based on:-
Minimum of 3.8 m/s (750 fpm) suction gas velocity for horizontal or downflow.
Minimum of 7.6 m/s (1500 fpm) suction gas velocity for upflow.
Maximum of 15.2 m/s (3000 fpm) suction gas.

b) 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.

2. The maximum pipe lengths to be used for each pipe size and outdoor unit are shown in the table opposite. Use of these sizes and lengths is recommended in order to achieve optimum system performance

	SUCTION LINE SIZE				**LIQUID LINE SIZE**	
MCU+	**0 - 6M**	**6 - 15M**	**15 - 21M**	**21 - 45M**	**0 - 21M**	**21 - 45M**
180 - 200	**7/8**	**1 - 1/8**	**1 - 1/8**	**1 - 3/8**	**1/2**	**5/8**

3. In calculating equivalent lengths of pipe runs, the effect of bends and fittings must be taken into account. Information relating to the equivalent lengths of line fittings and bends etc is generally available to the design engineer. The table below covers the fittings most likely to be encountered in this type of installation. The equivalent lengths of all the fittings in a particular pipe run must be added together and the total added to the actual length of pipe in the run, in order to calculate its total equivalent length.

FITTING	**PIPE SIZE (OUTSIDE DIAMETER IN INCHES)**					
	3/8	**1/2**	**5/8**	**3/4**	**7/8**	**1 - 1/8**
45° BEND	**0.12**	**0.15**	**0.18**	**0.21**	**0.24**	**0.3**
90° BEND R/D = 1	**0.37**	**0.43**	**0.49**	**0.55**	**0.61**	**0.79**
90° BEND R/D = 2	**0.24**	**0.27**	**0.30**	**0.37**	**0.43**	**0.52**
180° BEND C/D = 1	**0.73**	**0.91**	**1.10**	**1.28**	**1.46**	**1.83**
180° BEND C/D = 2	**0.46**	**0.55**	**0.64**	**0.76**	**0.85**	**1.07**
90° ELBOW	**0.67**	**0.85**	**1.04**	**1.25**	**1.46**	**1.89**
R = RADIUS OF BEND D = DIAMETER OF TUBE C = CENTRES OF BEND						

4. Use the shortest possible route, avoiding sharp bends.

5. Fully insulate the suction line, (or suction and liquid line if run together).

PIPE CONNECTIONS/RESTRICTORS

1. Outdoor units are supplied with the following brazed connections (sizes in inches);

Model Size	MCU+
	180 - 200
Expansion	1/2
Suction	7/8

NOTE: Ensure that both service valves on the outdoor unit are closed (IN, fully clockwise) before commencing installation. Indoor units have a low pressure holding charge of nitrogen, which may be released into the atmosphere without damage to the environment. This should be done prior to making pipework connections.

2. Intdoor units are delivered with thermal expansion valve fitted.

ELECTRICAL CONNECTIONS

Mains, control and interconnecting cables must be supplied and fitted by the installer.
Installer wiring must be carried out in accordance with local and national codes.

Mains supply cables must be size compatible with the recommended fuse for a given system).

An all pole isolator switch should be positioned within easy reach of the indoor unit.

The equipment must be earthed.

Cable clamps for use with stranded cables should be used to secure all incoming/outgoing cables.
Installers must supply a method of securing any solid sheathed cables.

Systems require a supply to the outdoor/ducted unit with connecting cables run to the indoor unit.

SCROLL COMPRESSOR ROTATION

On 3 Phase units 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 any two of the phases supplying the unit. This will correct the rotation of the compressor.

OUTDOOR UNIT WIRING

Cable entry for the outdoor unit electrics is through the cabinet access panel to a terminal block.

MCU+ units are supplied wired via a head pressure controller to give maximum control. Ensure that all connections are secure and that both units are earthed.

DATA PLATES

Because of the ability to mix-match indoor and outdoor units, the data plate only gives information on outdoor units. To obtain the system details, input power and currents from indoor and outdoor units should be added together. Data plates show basic units with electric heater kit loads shown separately.

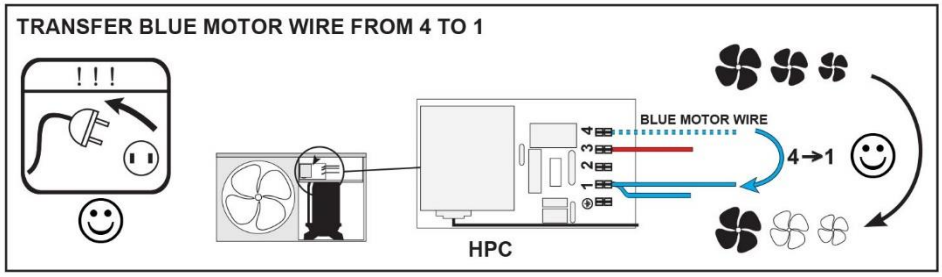
EVACUATING

Connect a vacuum pump to the service ports on the outdoor unit valves and evacuate the interconnecting pipework and indoor unit to 1000 microns (1 Torr) or better and allow to be held for a minimum of 15 minutes.

ADDING REFRIGERANT

1. After evacuating the indoor unit and interconnecting pipework, open the valves using a 4 or 5mm Allen key. The high and low side pressures should equalise within a minute.
2. Additional charge for all systems, including heat pumps, should be introduced with the system in the **AIR CONDITIONING MODE.**
3. If a manual HP cutout is fitted, ensure that the reset button is depressed.
4. 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.
5. Additional charge should be introduced through the Schrader valve on the indoor unit or the service port on the suction service valve on the outdoor unit (see charging section below to calculate the weight).
6. **MCU** outdoor units should have a speed appropriate to their expected operating ambient**.**
7. Ensure that the refrigerant being added is the same refrigerant that the system was factory charged with.
8. Run the system for a few minutes to allow it to stabilize.
9. System to be charged to fitted sight glass.
10. **HEAD PRESSURE CONTROL SAGINOMIYA (RGE – ZIN4 – SH)**

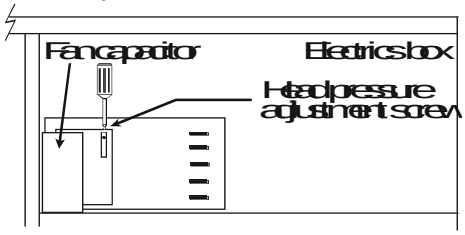
The head pressure controller is factory set to suit the refrigerant. It may be necessary to adjust this to suit site conditions, to raise or lower the nominal head pressure.



a. With the system switched off, connect a high pressure gauge to the liquid line service valve.

b. Switch on the system, indoor fan set to high speed, and run for a few minutes to stabilise.

c. The head pressure should be approximately:



R134A: 140 – 145 psig (9.7 – 10 barg) at 32°C ambient temperature, 250 – 260 psig (17.2 – 17.9 barg) at 55°C ambient temperature to achieve this adjust the screw clockwise to increase pressure or anticlockwise to decrease. Each ½ turn will alter the pressure by approx 5 psig (0.5 barg)

Min fan speed (0 rpm) and fan cut in pressure 200 psig (13.8 barg) are factory set and not adjustable.

NOTE: The condenser fan may stop if the operating pressure drops below 200 psig (13.8 barg)

11. **HEAD PRESSURE CONTROL ALCO (FSY-42S) & SAGINOMIYA (XGE-4C)**

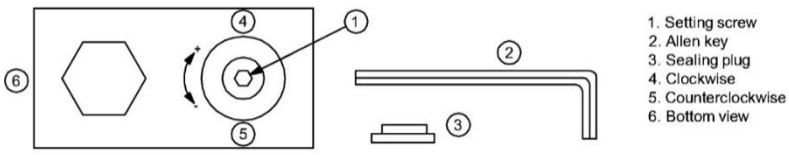
The head pressure controller is factory set to suit the refrigerant. It may be necessary to adjust this to suit site conditions, to raise or lower the nominal head pressure.

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:



Min fan speed (0 rpm) and fan cut in pressure 200 psig (13.8 barg) are factory set and not adjustable.

NOTE: The condenser fan may stop if the operating pressure drops below 200 psig (13.8 barg)

R134A: 140 – 145 psig (9.7 – 10 barg) at 32°C ambient temperature, 250 – 260 psig (17.2 – 17.9 barg) at 55°C ambient temperature to achieve this adjust the screw clockwise to increase pressure or anticlockwise to decrease. Each ½ turn will alter the pressure by approx 5 psig (0.5 barg)

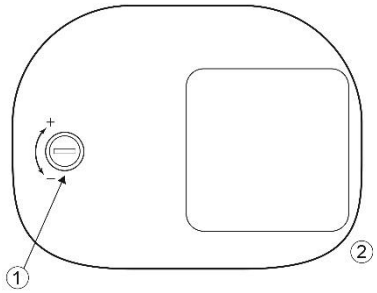
Pressure changes per turn of adjusting screw:

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)



1. Range adjusting screw
2. Top view

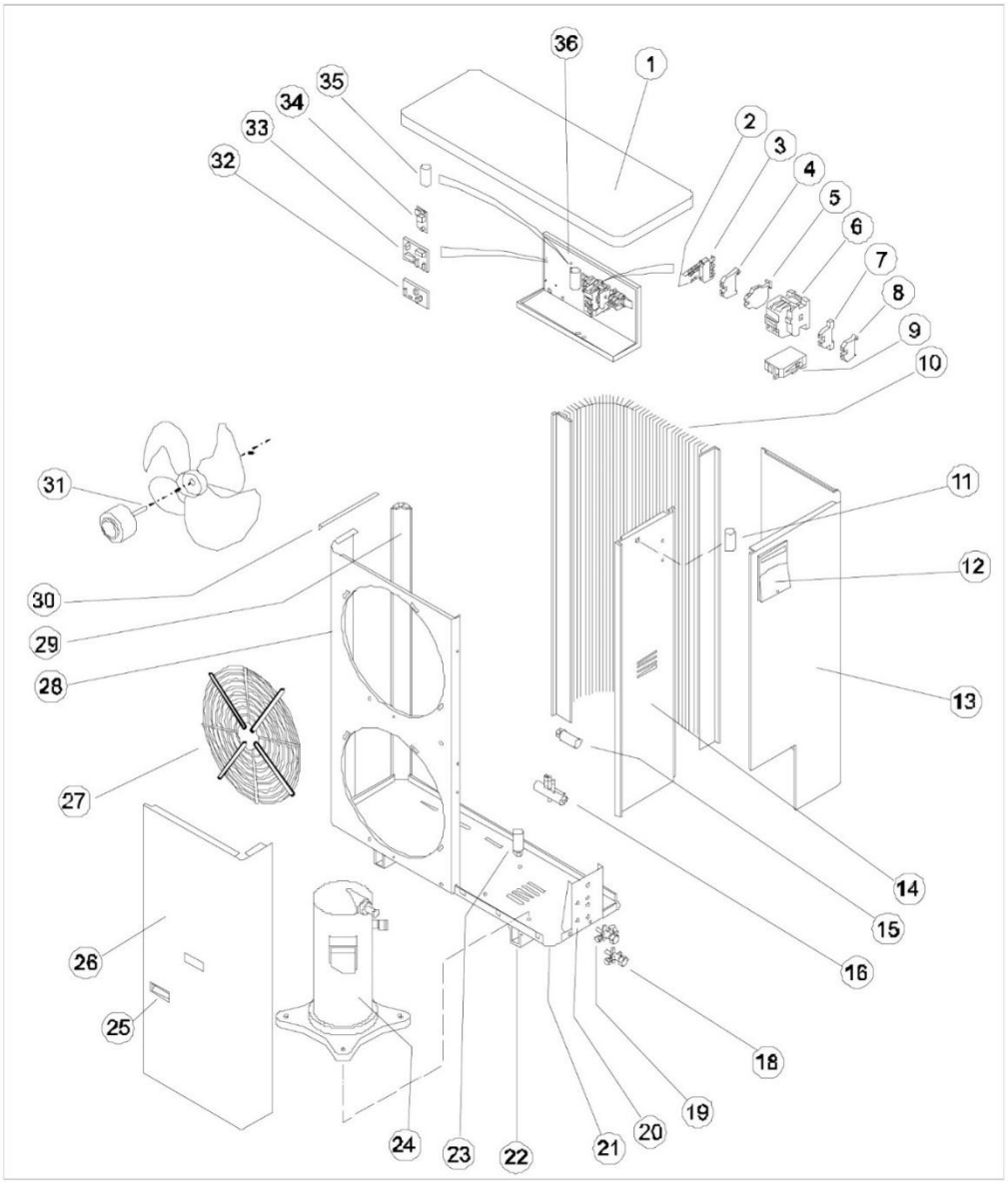
R134A: 140 – 145 psig (9.7 – 10 barg) at 32°C ambient temperature, 250 – 260 psig (17.2 – 17.9 barg) at 55°C ambient temperature to achieve this adjust the screw clockwise to increase pressure or anticlockwise to decrease. Each ½ turn will alter the pressure by approx 5 psig (0.5 barg)

Pressure changes per 1 turn of adjusting screw: Pressure change: 10 … 25bar:
Clockwise ~ +1.5 bar, counter clockwise ~ -1.5 bar

WHEN INSTALLATION HAS BEEN COMPLETED - CHECK:-

1.All pipe work and joints for leakage.
2.All pipe work and fittings for insulation.
3.All bolts are secure and that the fan rotates freely

MCU+ 180 COMPONENT IDENTIFICATION



1	Lid
2	Fuse terminal
3	Fuse
4	Terminal (screw - screw)
5	Terminal (4 way)
6	Contactor
7	Earth terminal
8	End clamp
9	Overload
10	Heat exchanger
11	Fan capacitor
12	Mains terminal cover

13	Rear access panel
14	Bulkhead panel
15	HP switch (manual: Accessory)
16	Reversing valve (MHPUE)
17	
18	Service valve (expansion)
19	Service valve (suction)
20	Valve panel
21	Base
22	Mounting foot
23	LP switch
24	Compressor

25	Handle
26	Front access panel
27	Fan guard
28	Fascia panel
29	Corner panel
30	Support bracket
31	Fan motor assembly
32	Head pressure control pcb
33	Power board (MHPUE)
34	3 minute timer pcb
35	Compressor capacitor (1Ph)
36	Electrics box