marstair

INSTALLATION INSTRUCTION

550 SERIES CONDENSING UNITS AND 551 SERIES HEAT PUMP OUTDOOR UNITS

55008279-16

GENERAL

1. TEV Ltd recommend that personnel working on this equipment be skilled and fully conversant with the appropriate Air Conditioning, Refrigeration and Electrical practices and have sound knowledge of current Industrial Safe Working practices.

2. These units are supplied pre-charged with R407C refrigerant and polyolester oil.
Do not open the valves until the system is fully installed.
Do not mix oils and 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.

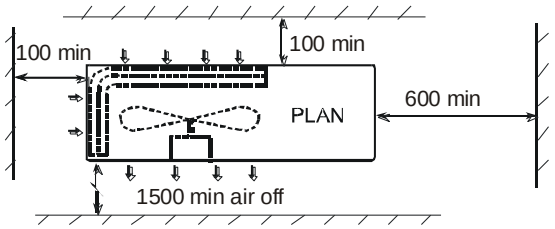
5. FUSES- for recommended fuse size see indoor unit instructions.

MOUNTING

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

KIT	MCU+ 15-80 / MHPUE 15 / 60	MCU+ 90-200 / MHPUE 80-180
Mounting Bracket	55021100	55021101

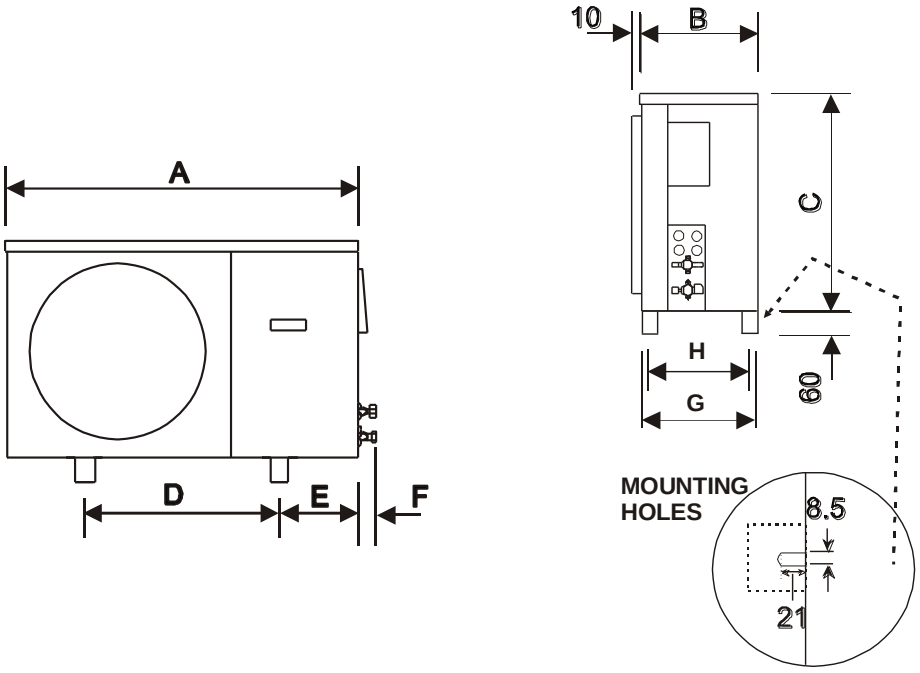
Whether floor or wall mounted, it is essential that the mounting surface is capable of supporting the unit weight**.** Leave space around the unit for air circulation and access for installation and maintenance.



Dimensions in mm.

DIMENSIONS & WEIGHTS

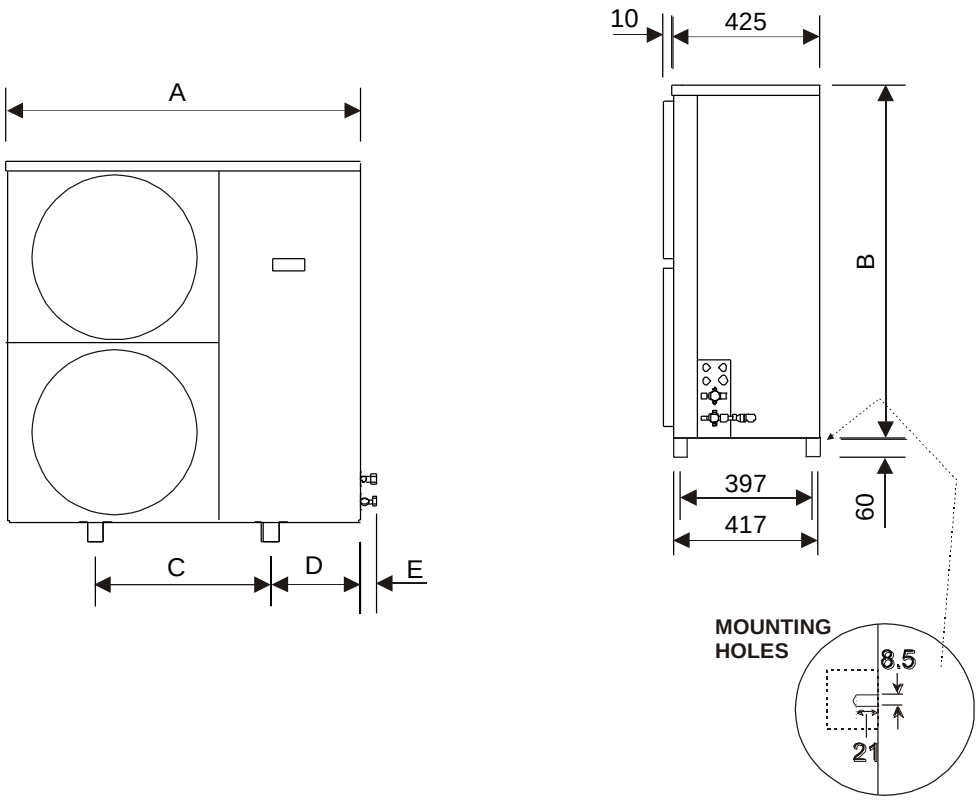
MCU+ 15-100 & MHPUE 15-90 (Dimensions in mm.)



MODEL	A	B	C	D	E	F	G	H	Weight (kg)	
									1 Ph	3 Ph
MCU+ 15	900	300	560	525	185	60	295	275	45	--
MCU+ 20	900	300	560	525	185	60	295	275	46	--
MCU+ 30	900	300	560	525	185	60	295	275	48	48
MCU+ 40	900	300	560	525	185	60	295	275	53	53
MCU+ 50	1000	300	660	570	213	60	295	275	64	62
MCU+ 60	1000	300	660	570	213	60	295	275	65	63
MCU+ 80	1000	300	660	570	213	60	295	275	66	64
MCU+ 90	1000	350	760	495	250	70	345	325	76	73
MCU+ 100	1000	350	760	495	250	70	345	325	--	81

MHPUE 15	900	300	560	525	185	60	295	275	47	--
MHPUE 30	900	300	560	525	185	60	295	275	50	50
MHPUE 40	1000	300	660	570	213	60	295	275	61	61
MHPUE 50	1000	300	660	570	213	60	295	275	64	62
MHPUE 60	1000	300	660	570	213	60	295	275	68	66
MHPUE 80	1000	350	760	495	250	70	345	325	75	72
MHPUE 90	1000	350	760	495	250	70	345	325	77	75

MCU+ 130 - 200 and MHPUE 100 – 180 (Dimensions in mm.)



MODEL	A	B	C	D	E	Weight (kg)
MCU+ 130	1000	1020	495	251	100	101
MCU+ 150	1000	1020	495	251	100	103
MCU+ 165	1000	1020	495	251	100	103
MCU+ 180	1100	1215	675	211	95	118
MCU+ 200	1100	1215	675	211	95	173
MHPUE 100	1000	1020	495	251	100	101
MHPUE 130	1000	1020	495	251	100	102
MHPUE 150	1000	1020	675	211	95	106
MHPUE 165	1100	1215	675	211	95	120
MHPUE 180	1100	1215	675	211	95	122

PIPEWORK

Supplied male flare connections (sizes in inches)

Model	**MCU+**													
Size	**15**	**20**	**30**	**40**	**50**	**60**	**80**	**90**	**100**	**130**	**150**	**165**	**180**	**200**
Expansion	3/8	3/8	3/8	3/8	3/8	3/8	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Suction	3/8	3/8	1/2	1/2	1/2	5/8	5/8	5/8	3/4	3/4	3/4	3/4	7/8*	7/8*

Model	**MHPUE**											
Size	**15**	**30**	**40**	**50**	**60**	**80**	**90**	**100**	**130**	**150**	**165**	**180**
Expansion	3/8	3/8	3/8	3/8	3/8	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Suction	3/8	1/2	1/2	1/2	5/8	5/8	3/4	3/4	3/4	3/4	7/8*	7/8*

*** Brazed connections**

MAXIMUM PIPE RUNS

80m maximum (MCU+ 15-20 = 50M) including 20m lift. There will be no significant loss of capacity for extended pipe runs provided pipes are correctly sized and the correct restrictor is fitted.

CALCULATING EQUIVALENT LENGTHS
The effects of bends and fittings must be taken into account. The table on top of page 5 covers the fittings most likely to be encountered in installation.

ACTUAL PIPE LENGTH + TOTAL EQUIVALENT FITTING LENGTHS = TOTAL EQUIVALENT LENGTH

FITTING LOSSES in equivalent straight lengths of pipes (m)

FITTING	PIPE SIZE (outside diameter in inches)						INSTALLERS TABLE	
							Nº OF FITTINGS	EFFECTIVE LENGTH
	⅜	½	⅝	¾	⅞	1⅛		
45° Bend	0.12	0.15	0.18	0.21	0.24	0.30		
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**			**TOTAL =**	

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 including mechanical connections
- Try to avoid running pipes through hot areas.

PIPE SIZES

UNIT	MAXIMUM LENGTH OF EQUIVALENT SUCTION LINE PIPE SIZES (m)							EXPANSION LINES				FACTORY CHARGE FOR 7.5M RUNS AT UK CONDITIONS (g)
	⅜	½	⅝	¾	⅞	1⅛	1⅜	⅜	½	⅝	¾	R407C
MCU+ 15	7.5	30	50					50				660
MCU+ 20	7.5	23	50					50				1030
MCU+ 30		15	50	80				50	80			1000
MCU+ 40		10	36	80				7.5	80			1240
MCU+ 50		7.5	18	50	80			7.5	50	80		1690
MCU+ 60			14	36	80			7.5	50	80		2000
MCU+ 80			11	30	80				50	80		1880
MCU+ 90			10	25	55	80			20	80		2060
MCU+ 100			7.5	22	45	80			15	80		2520
MCU+ 130				15	30	80			12	60	80	4170
MCU+ 150				12	27	80			8	50	80	4170
MCU+ 165				8	18	60	80		7.5	40	80	4540
MCU+ 180				7.5	16	55	80		7.5	35	80	4640
MCU+ 200					15	50	80		7.5	30	80	5480
MHPUE 15	7.5	30	50					50				800
MHPUE 30		15	50	80				50	80			900
MHPUE 40		10	36	80				7.5	80			1600
MHPUE 50		7.5	18	50	80			7.5	50	80		1660
MHPUE 60			14	36	80			7.5	50	80		1590
MHPUE 80			11	30	80				50	80		1780
MHPUE 90				25	55	80			20	60	80	2260
MHPUE 100				22	45	80			15	50	80	3380
MHPUE 130				15	30	80			12	60	80	4470
MHPUE 150				12	27	80			8	50	80	4200
MHPUE 165				7.5	18	60	80		7.5	40	80	4650
MHPUE 180					16	55	80		7.5	35	80	5620

RESTRICTORS

Outdoor units (cool only & heat pumps) are supplied with expansion assemblies and cooling restrictors fitted.

MCU+	15	20	30	40	45	50	60	80	90	100	130	150	165	180	200
Restrictor	0.033	0.033	0.040	0.044	0.046	0.050	0.052	0.057	0.063	0.068	0.071	0.080	0.082	N/A	

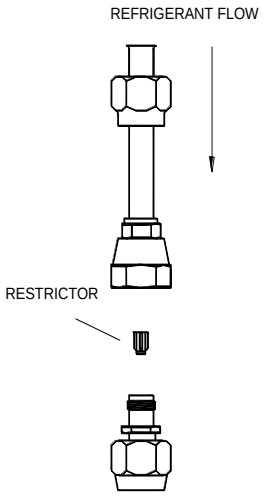
HEAT PUMP HEATING

All heat pump units have an additional expansion assembly supplied loose inside the unit. This is to be fitted to some indoor units for heating. Fit the assembly within 10m of the indoor unit in the expansion line.
Note: the refrigerant flow is from indoor to outdoor, opposite to cooling assembly. Placing it directly at the indoor coil may cause increased noise during the heating cycle. No separate check valve is needed. The expansion assembly and line must be fully insulated.

Note: The indoor units listed below are fitted with heating capillarys.
WM60H, WM80H, WM100H, CC875/80H, CC875/110H, CC875/140H, HL380, HL460, HL540
The additional heating expansion assembly (supplied loose in the heat pump unit) is not required. Retain as a spare.

MHPUE(L)	15	20	30	40	45	50	60	80	90	100	130	150	165	180
Restrictor Cooling	0.033	0.037	0.040	0.044	0.046	0.052	0.055	0.058	0.065	0.068	0.076	0.079	N/A	
Restrictor Heating	0.035	0.036	0.039	0.042	0.043	0.043	0.053	0.053	0.058	0.083	0.092	0.093	N/A	

CONNECTING THE UNITS



1. Ensure both service valves on the unit are closed (clockwise) before commencing installation.

2. If the cooling restrictor is to be changed:

a. Remove the entire expansion assembly from the outdoor unit.
b. Split the expansion assembly in the middle and remove the existing restrictor.
c. Drop the new restrictor vertically into the field connector.
d. Reassemble in the vertical plane (field connector lowest) when reassembled the restrictor can be heard to be free to move if the assembly is shaken.
e. Refit the expansion assembly.

3. Connecting the pipework:

a. Remove the flare nuts from the suction service valve and the expansion device as appropriate.
b. Ensure that both the suction and expansion lines are fully insulated.
c. Place the flare nuts over the incoming pipework and flare the pipe ends.
d. Connect the pipework between the units. Do not leave pipes ends, valves etc open to the atmosphere. Always use 2 spanners when tightening the flare nuts to avoid twisting the pipes. Use a small amount of refrigerant oil on the mating surfaces.
e. Sight glasses and filters driers are not necessary, but if required should be fitted between the out door unit liquid shut off valve and the expansion device on the MCU+ units.
f. MCU+ 180 & 200 and MHPUE 165 & 180 have a ⅞¨ suction pipe with brazed connections. Use a protective shield to avoid scorching the side panel.

EVACUATING

With the valves closed, 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

ELECTRICAL

The installer supplies mains, control and interconnecting cables: equipment must be earthed.
Wiring must be carried out in accordance with local and national codes.
Interconnecting wiring diagrams are in the indoor unit installation instructions.
Mains supply cables must be size compatible with the recommended fuse (see indoor unit instructions).
An all pole isolator switch should be positioned within easy reach of the indoor unit.
Cable clamps for use with stranded cables are supplied in units 15 - 90 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 50 - 200 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.
SYSTEMS INCLUDING AN ELECTROMECHANICAL UNIT:
These require a supply to the outdoor unit with connecting cables run to the indoor unit.

ELECTRONIC SYSTEMS (INDOOR 'E' MATCHED WITH MHPUE):
It is recommended that these systems have a supply taken to the outdoor unit **and** a separate supply taken to the indoor unit, which in many cases can be from a domestic 13 Amp socket. If a 1ph system is being run from a 3ph supply ensure that both units are supplied from the same phase.
Otherwise run a supply to the outdoor unit with connecting cables run to the indoor unit.

Communication between indoor and outdoor electronic units is via a two wire (max. 0.75mm^2) non-polarised connection (installer supplied), using cable type RS 485 or equivalent (e.g. two cores of 00526077, 4 core cable, available from TEV). **The cable screen must be secured to ground (earth) at both ends using the clamps provided.**
Do not attempt to run the communication in the spare cores of any power carrying cable.

Alarm terminal 5: this terminal is live (230V L1) when a fault is present. Load range is 2W- 100W (loads less than 2W may indicate false alarms). External alarm loads must be returned to the system neutral.

ISOLATOR SWITCHES:
On 3 phase systems ensure that the neutral contact of the isolator switch is an early make, late break type. This applies to all switches in the supply line. **Failure to observe this could result in damage to the electronic board. If in doubt, do not switch the neutral but connect it solidly.**

1PH FUSE SIZE												
MCU(+)	30	40	50	60	80	90	100	130	150	165	180	200
FUSE	16	20	16	20	25	32	-	-	-	-	-	-

3PH FUSE SIZE												
MCU(+)	30	40	50	60	80	90	100	130	150	165	180	200
FUSE	10	10	10	10	10	16	16	16	20	20	25	32

REFRIGERANT

IF NO ADDITIONAL REFRIGERANT CHARGE IS REQUIRED:

Open the valves very slowly using a 5 or 8mm Allen key. On MHPUE units, remove **link JP6** on the pcba (identified by a white label), otherwise the fan will always run at maximum speed and the infrared handset will be inoperative. Replace the caps on the service ports, (torque to 25NM).

IF ADDITIONAL REFRIGERANT IS REQUIRED:

1. After evacuating the indoor unit and interconnecting pipework, slowly open the valves using 5 or 8mm Allen key. The high and low pressure should equalise within a minute.

2. Additional charge should be introduced with the system running in the **air conditioning mode** (including heat pumps). See indoor unit instruction for additional system charge.

3. MCU+ 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**

ADDITIONAL REFRIGERANT - pipe runs over 7.5m.

Add refrigerant and oil for each additional metre over 7.5m, based on the following:

Expansion line size.	3/8"	1/2"	5/8"
Additional refrigerant (g/m).	16	30	48
Additional POE oil	25g per 350g of additional refrigerant to a maximum of 300g		

Additional polyolester oil: L'Unite 181-023, ICI Emkarate RL32S or RL32CF, Mobil Arctic EAL22 or EAL22C.

4. **MHPUE:**
These are supplied with link JP6 fitted on the pcba; this allows additional charging and overrides alarms during the charging process. With both units powered, the MHPUE fans will run at high speed. After charging, **remove link JP6 on the pcba (identified by a white label),** otherwise the fan will run at maximum speed.

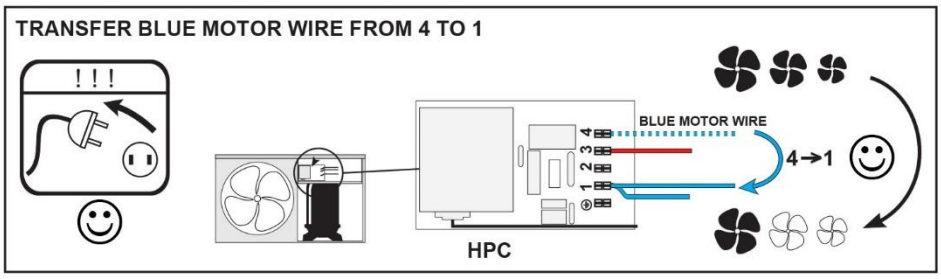
5. If a manual HP cutout is fitted, ensure that the reset button is depressed.

6. **MHPUE:**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 MCU+ and MHPUE systems.

7. Additional refrigerant and polyolester oil should be introduced through the Schrader valve on the indoor unit, or 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**. R407C must always be added in the liquid state.

8. Run the system for a few minutes to allow it to stabilize. Where possible, charge to a sweat line on the evaporator. Typical suction pressures on short lines at UK conditions, with high speed evaporator fan, high speed condenser fan (commissioning speed for MHPUE), should be; electromechanical comfort system approx 4.4 bar (65 psig); electronic comfort system approx 3.8 bar (55 psig); heat pump system approx (58 psig). **Systems should not be overcharged, to avoid liquid return to the compressor**.

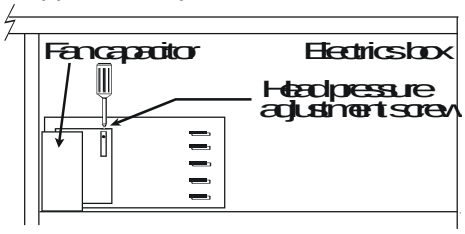
9. **MCU+: HEAD PRESSURE CONTROL SAGINOMIYA (RGE – ZIN4 – SH)**
The head pressure controller is factory set to suit the refrigerant. It may be necessary to adjust this to suit site conditions, to raise or lower the nominal head pressure.



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:



R407C: 275-280 psig (18.9-19.6barg) 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)

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

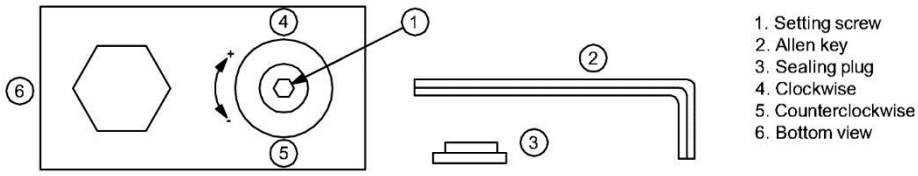
The head pressure controller is factory set to suit the refrigerant. It may be necessary to adjust this to suit site conditions, to raise or lower the nominal head pressure.

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)

R407C: 275-280 psig (18.9-19.6barg) 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.
Do not turn setting screw **more than 3 turns clockwise** (+3). Use following table as a quick guideline for setting:

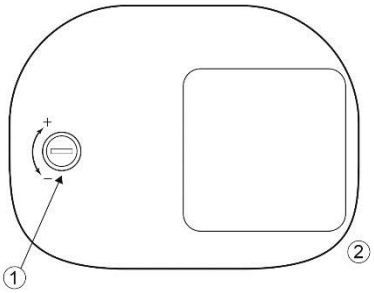
Pressure changes per turn of adjusting screw:

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

R407C: 275-280 psig (18.9-19.6barg) 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 bar