Ebac
HEATPUMPS

AIR SOURCE HEAT PUMP UNIT

5 & 9kW
Installation and Service Manual

MCS CERTIFIED

UK CA

MADE IN BRITAIN

www.ebac.com

Safety Precautions and Warnings

IMPORTANT

Before installing the unit make sure you read all the “Safety precautions”. After installation work has been completed, explain the “Safety Precautions,” use, and maintenance of the unit to the customer according to the information in the Installation Manual and perform the test run to ensure normal operation. Please leave this manual with the customer for future reference

Symbol Meanings

WARNING
(Risk of fire)

This mark is for R32 refrigerant only. Refrigerant type is written on nameplate of outdoor unit. In case that refrigerant type is R32, this unit uses a flammable refrigerant. If refrigerant leaks and comes in contact with fire or heating part, it will create harmful gas and there is risk of fire.

Read the INSTALLATION MANUAL carefully before operation.

Service personnel are required to carefully read the INSTALLATION MANUAL before operation.

Further information is available in the INSTALLATION MANUAL, and the like.

Safety Precautions and Warnings

WARNING

- The unit must be installed according to the instructions in order to minimize the risk of damage from earthquakes, tornados, or strong winds. An incorrectly installed unit may fall down and cause damage or injuries.
- The unit must be securely installed on a structure that can sustain its weight. If the unit is mounted on an unstable structure, it may fall down and cause damage or injuries.
- All electric work must be performed by a qualified technician according to local regulations and the instructions given in this manual. The units must be powered by dedicated power lines and the correct voltage and circuit breakers must be used. Power lines with insufficient capacity or incorrect electrical work may result in electric shock or fire.
- Use only specified cables for wiring. The wiring connections must be made securely with no tension applied on the terminal connections. Also, never splice the cables for wiring (unless otherwise indicated in this document). Failure to observe these instructions may result in overheating or a fire.
- The appliance shall be installed in accordance with national wiring regulations.
- When installing or relocating, or servicing the outdoor unit, use only the specified refrigerant (R32) to charge the refrigerant lines. Do not mix it with any other refrigerant and do not allow air to remain in the lines. If air is mixed with the refrigerant, then it can be the cause of abnormal high pressure in the refrigerant line, and may result in an explosion and other hazards. The use of any refrigerant other than that specified for the system will cause mechanical failure or system malfunction or unit breakdown. In the worst case, this could lead to a serious impediment to securing product safety.
- Use only accessories authorized by Ebac Ltd and ask a dealer or an authorized technician to Install them. If accessories are incorrectly installed, water leakage, electric shock, or fire may result.
- The user should never attempt to repair the unit or transfer it to another location. If the unit is installed incorrectly, water leakage, electric shock, or fire may result. If the outdoor unit must be repaired or moved, ask a dealer or an authorized technician.
- Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.
- The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).
- Do not pierce or burn.
- Be aware that refrigerants may not contain an odour.
- Compliance with national gas regulations shall be observed.
- Keep any required ventilation openings clear of obstruction.
- This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved.
- Children shall not play with the appliance.
- Cleaning and user maintenance shall not be made by children without supervision.

Safety Precautions and Warnings

Installation

WARNING

- If the outdoor unit is installed in areas exposed to steam, volatile oil (including machine oil), sulfuric gas, or areas where the unit will be covered by snow, the performance can be significantly reduced and the internal parts can be damaged.
- Coastal erosion protection be used in areas exposed to high salt content such as the coast
- Do not install the unit where combustible gases may leak, be produced, flow, or accumulate. If combustible gas accumulates around the unit, fire or explosion may result.
- The outdoor unit produces condensation during the heating operation. Make sure to provide drainage around the outdoor unit if such condensation is likely to cause damage or freezing over of walkways etc.
- When the unit is running, vibrations or the noise of refrigerant running may be heard from the extension piping. Try to avoid installing the piping to thin walls, etc. as much as possible and provide sound insulation with the piping cover, etc.

CAUTION

- Be extremely careful when transporting or installing the units. Two or more persons are needed to handle the unit, as it can weigh over 100 kg. Do not grasp the packaging bands. Wear protective gloves to remove the unit from the packaging and to move it, as you can injure your hands on the fins or the edge of other parts.
- Be sure to safely dispose of the packaging materials. Packaging materials, such as nails and other metal or wooden parts may cause cuts or other injuries.

Before Electrical Work

CAUTION

- Be sure to install circuit breakers. If not installed, electric shock may result.
- For the power lines, use standard cables of sufficient capacity. Otherwise, a short circuit, overheating, or fire may result.
- When installing the power lines, do not apply tension to the cables. If the connections are loosened, the cables can snap or break and overheating or fire may result.
- The base and attachments of the outdoor unit must be periodically checked for looseness, cracks or other damage. If such defects are left uncorrected, the unit may fall down and cause damage or injuries.
- Do not clean the outdoor unit with water. Electric shock may result.

Where you see this symbol on any of our electrical products or packaging, it indicates that the relevant electrical products should not be disposed of as general household waste in Europe. To ensure the correct waste treatment of the product, please dispose of it in accordance with any applicable local laws or requirements for disposal of electrical and electronic equipment in so doing, you will help to conserve natural resources and improve standards of environmental protection in treatment and disposal of electrical waste.

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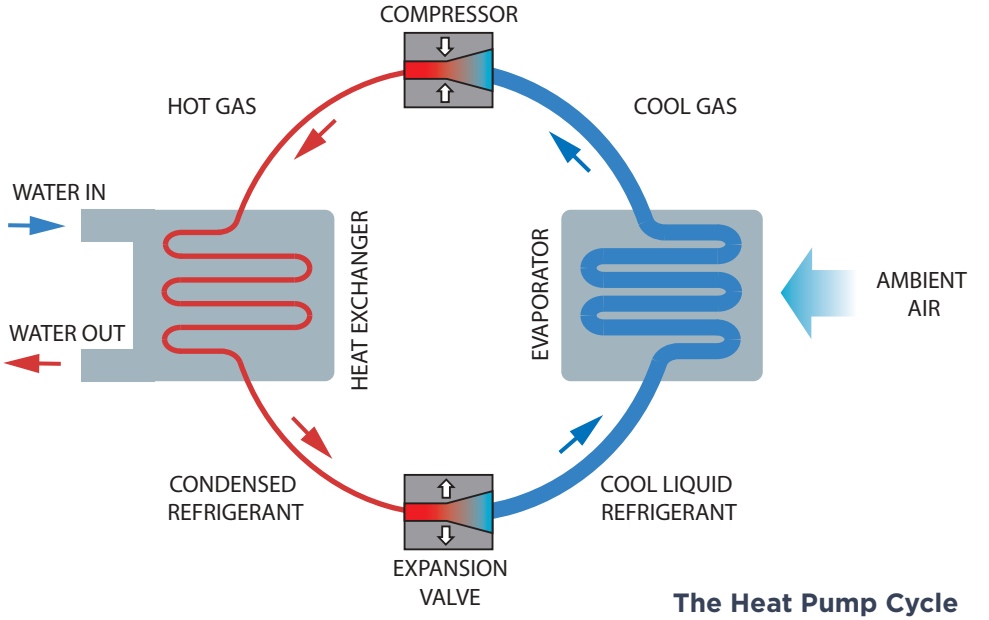
1.0

Product Description

1.1 Function

- Liquid refrigerant (R32) passes through an expansion device, changing it into a low pressure liquid / vapour mix.
- It then passes through an evaporator coil. The liquid absorbs the heat from the air being passed over the coil by means of a fan. The temperature of the refrigerant rises and it boils changing it to a low temperature vapour.
- The vapour then passes through a compressor, reducing its volume and causing it to heat.
- The reversing valve sends the hot gas into the heat exchanger. The heat from the hot gas is transferred to the water.
- Once the refrigerant has given up its heat it condenses back to a liquid. The liquid returns to the expansion device and the cycle is repeated.
- The heat pump is fitted with a series of sensors to monitor its performance. The intelligent defrost system will operate at the optimum time to reduce the build up of ice on the evaporator and minimise any disruption to the output of the heat pump.



The Heat Pump Cycle

1.0

Product Description

1.2 Features

- Available in 5kW and 9kW
- Low noise unit
- Designed for the UK climate
- High efficiency, ERP of A+++
- R32 Refrigerant
- Compact, stylish design

1.3 Box Contents

- Heat Pump Unit
- Heat Pump Controller
- Drain Outlet
- Flow Meter & cable
- Temperature Sensor
- Lifting Straps
- Installation Manual

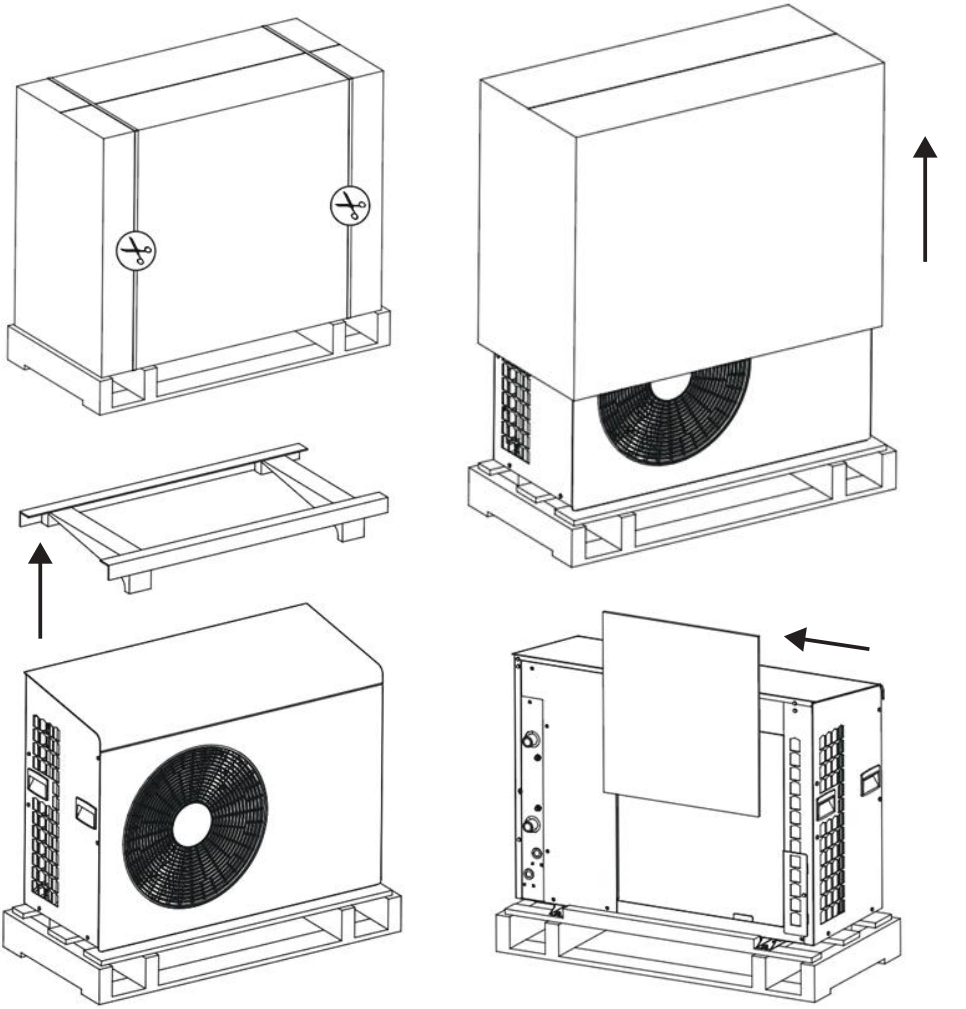
2.0

Unit Installation

2.1 Initial Setup

2.1.1 Unboxing of Unit

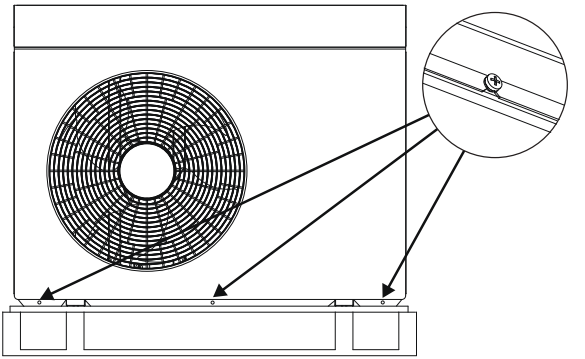
To unbox the unit cut the straps and slide up the carton sleeve. Remove the top packing pieces and rear coil cover. These parts are all made from carboard and can be recycled accordingly.

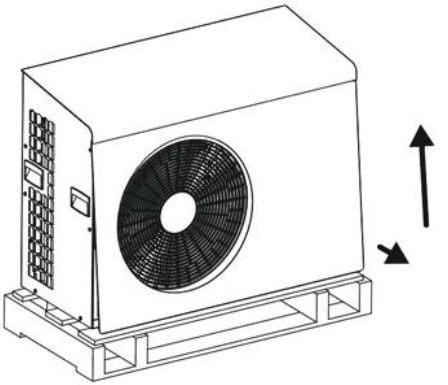


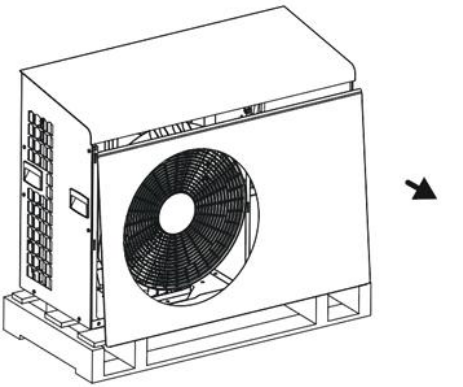
Unit Installation

2.1.2 Removal of Front Panel

Loosen the 3 panel fixing screws located under the front lip of the heat pump using a 8mm socket or spanner. Pull the bottom of the front panel out slightly. Push the panel up on both sides and it will unclip as you pull it towards you.



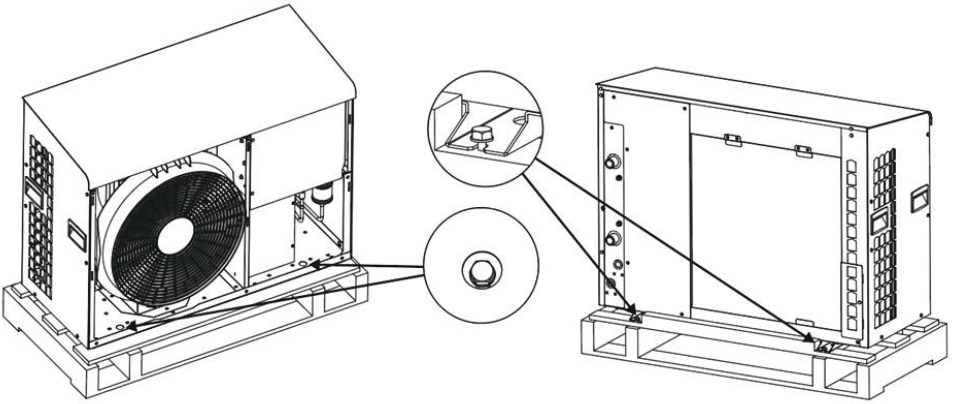




Unit Installation

2.1.3 Remove from Pallet

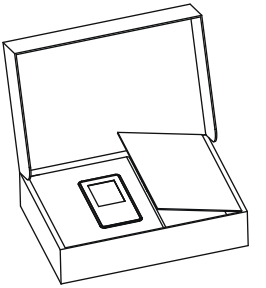
To remove the heat pump from the pallet unscrew the coach screws (x4) using 13mm socket or spanner.



2.1.4 Open Installation Kit

The installation kit (including controller) will be shipped in a seperate box from the heat pump. It contains the following Items:

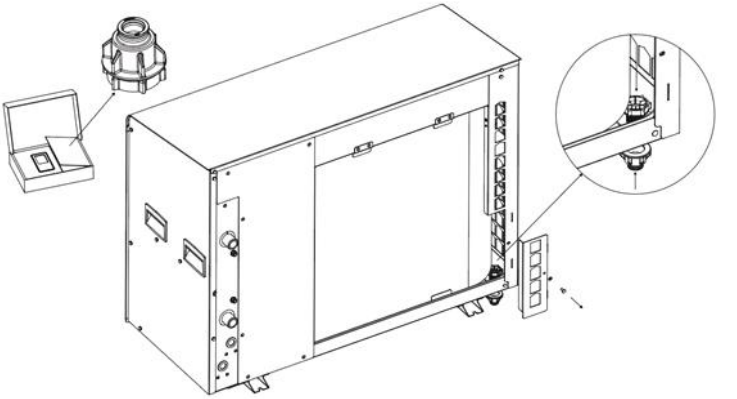
- Installation Manual
- Drain Outlet
- Flow Meter & cable
- Heat Pump Controller
- Lifting Straps
- Temperature Sensor



Unit Installation

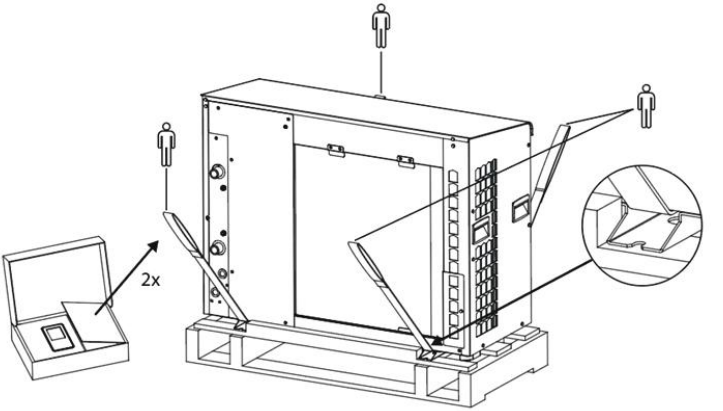
2.1.5 Install Drain Outlet

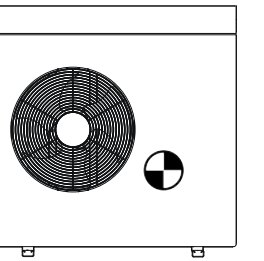
The drain outlet is located in the installation pack. Unscrew and remove the drain outlet cover as shown to gain access. Unscrew the flare nut from the drain outlet body. Install the drain outlet body into the drain tray hole and screw on the flare nut by hand from below. Replace and secure the drain outlet cover.



2.2 Positioning

The lifting straps are located in the installation kit. Thread the lifting straps through the feet as shown so that there is an equal length on each side. 2 persons should lift the heavy compressor side of the unit and 1 person the back. Wear gloves and take care not to damage the rear coil when moving the unit.





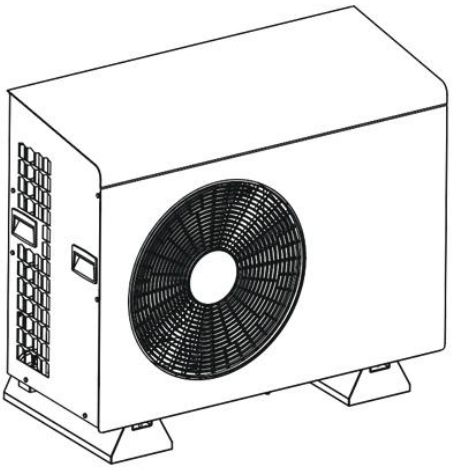
Unit Installation

2.2 Positioning

The heat pump should be kept upright at all times, as oil from the compressor could flow into the refrigeration circuit and cause damage to the unit.

Care must be taken when installing the Ebac heat pump to ensure that the unit operates effectively. The following variables need to be taken into consideration when positioning the unit:

- The heat pump emits cool air from the front through the fan, this should be taken into consideration before installation so as not to cause a problem.
- All heat pumps do produce some noise. The potential nuisance factor should be discussed with the end user when considering the position of the heat pump. The planning standard limit is 42dBA. A calculation should been made, taking into account positioning and distance from neighbouring properties (use MCS standard MCS020).
- Select a location where easy wiring and pipe access is available.
- If the heat pump is to be installed in a costal location the unit must be protected against corrison. For the warranty to not become void the rear coil and pipework must have an additional protective coating applied, contact Ebac for for details.
- When installing the unit in a location where it is exposed to strong wind, do not face the air outlet of the unit directly into the prevailing winds.
- Strong wind entering the air outlet may impede the normal airflow and it may affect performance. Position the unit so that the air outlet blows perpendicular to the seasonal wind direction if possible.

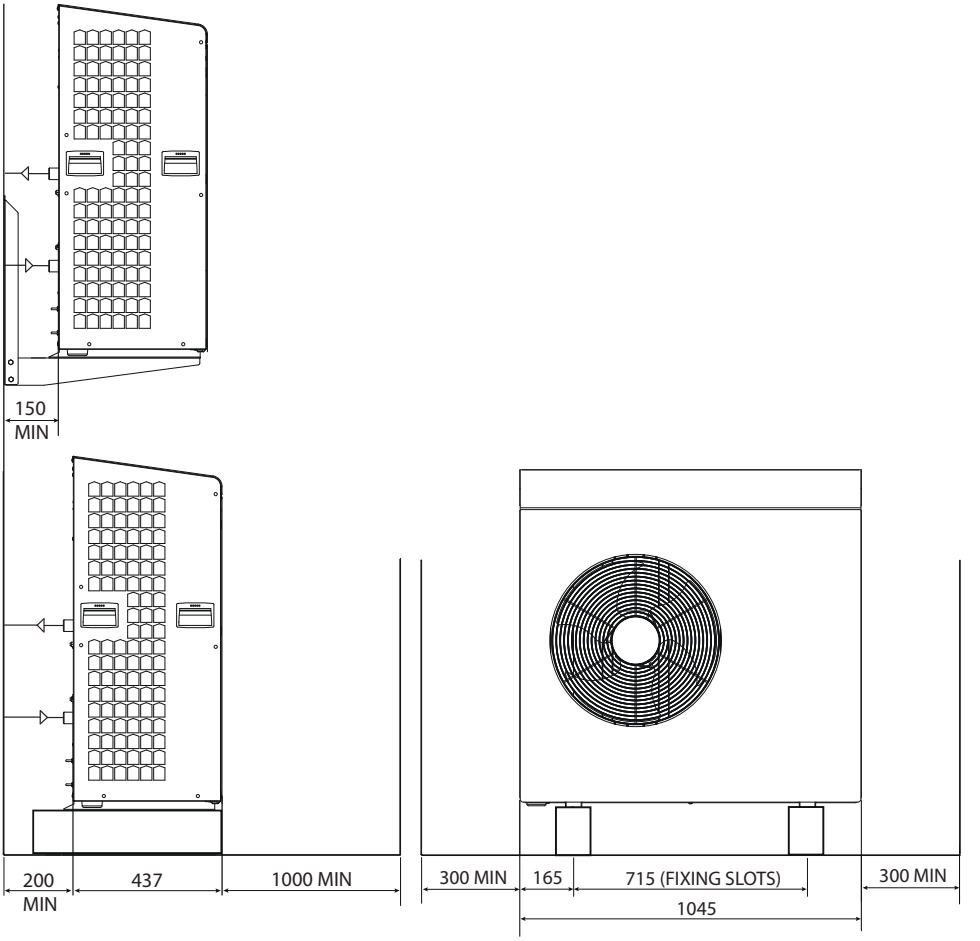


2.0

Unit Installation

2.2.1 Clearances

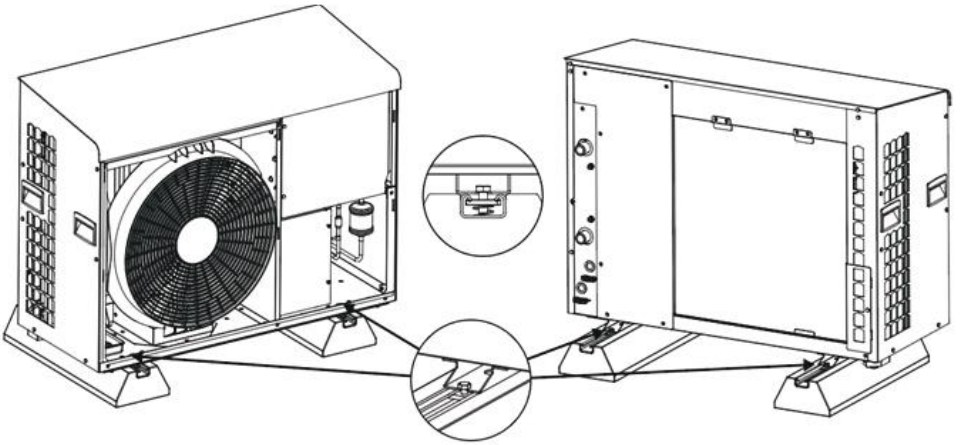
- If floor mounted there should be a minimum clearance behind the unit of 200mm.
- If wall mounted then this clearance can be reduced to 150mm.
- There should always be a minimum clearance in front of the unit of 500mm and 300mm to the sides.



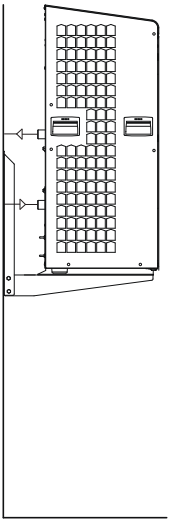
Unit Installation

2.2.2 Floor Installation

The unit should be installed on a flat, stable base, with adequate provision for the condensate to drain away. To prevent the possibility of the unit vibrating and causing annoyance, the unit should be fitted on anti-vibration mounts. The heat pump should be fixed to the mounts using the supplied fixings in the positions shown.



2.2.3 Wall Installation



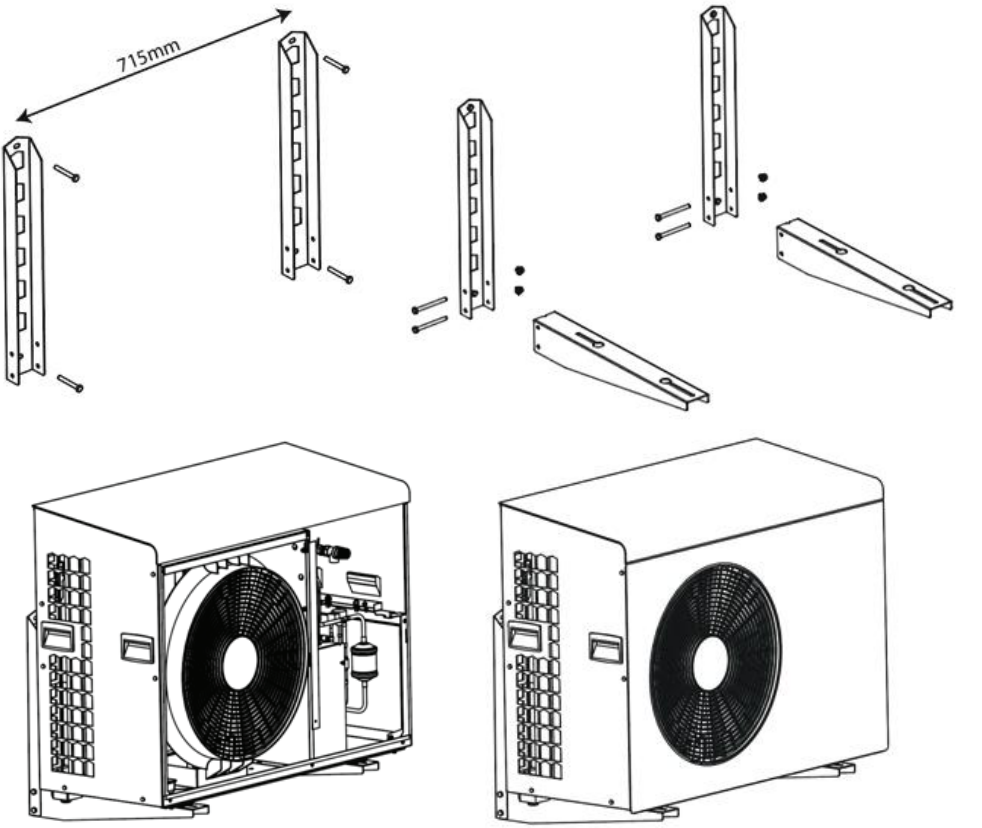
It is not recommended that the heat pump is mounted higher than necessary as maintenance is harder and exposure to the wind is more likely to affect performance.

If wall mounting the heat pump it is recommended that you use the Ebac support bracket kit.

Unit Installation

2.2.4 Support Brackets

Follow the support bracket kit instructions to install. The support brackets should be mounted using the anchor bolts supplied. The brackets should be level and the fixing holes drilled 715mm apart in order to align with the heat pump feet. The support arms can then be attached to the brackets using the fixings supplied.



Unit Installation

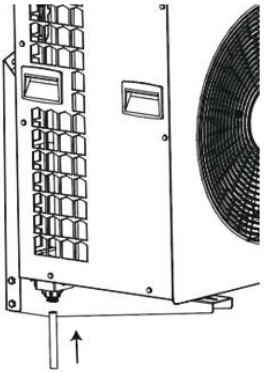
2.3 Preparation

Prior to installing the heat pump, the primary heating circuit should be cleansed using a suitable cleaning agent, to clear any contaminants such as flux residue or installation debris out of the circuit. This is also vital when fitting to an existing heating system. Failure to comply could result in poor efficiency or damage to components within the heat pump.

The Ebac heat pump delivers lower temperature water than a conventional boiler, therefore the heat emitters need to have a larger surface area or be fitted with an integral fan. (For a heat emitter sizing guide visit the MCS website).

An accurate heat loss calculation must be made for the property, then the size of the heat pump required can be established.

2.3.1 Condensate Drainage

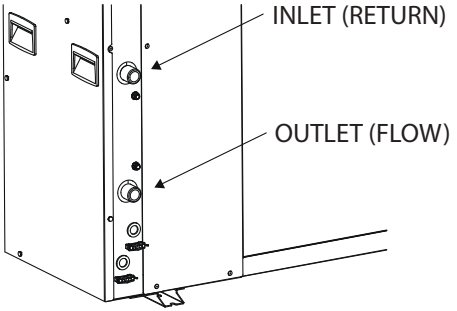


The underside of the heat pump has a drain outlet that allows any condensate to drain from the heat pump. Provision must be made to dispose of the condensate.
The push fit connection in the drain outlet is suitable for 15mm drainage pipe to form a condensate disposal system into which the condensate can flow into a suitable rainwater gulley or soak away.
If running drainage tube horizontally ensure there is a slope to allow the condensate to drain away.

2.4 Plumbing Work

Connect the water pipes to the outlet and inlet pipes. (Parallel male screw for 1-inch water pipe (ISO 228/1-G1B).

- Inlet and outlet pipes positions are as shown.
- Install the hydraulic filter at the water intake.
- Maximum allowable torque at the water piping connection is 50 N/m.
- Check if water leaks after installation.
- Inlet water gauge pressure must be between 0-0.3 MPa.
- The minimum water operating temperature is 5˚C.
- Use inlet water with a temperature lower than 55˚C.



2.0

Unit Installation

- When connecting metal pipes made of different materials, be sure to insulate the joint to prevent electrolytic etching.
- Set up a field system so that the inlet water temperature and water flow rate can be within the allowable range specified in our technical data, etc. If the unit is used out of the allowable range, the parts of unit might be damaged.
- Anti-vibration hoses should be fitted to the flow and return to prevent excessive noise or any joints being broken due to vibration.
- Always cover the end of the pipe when inserting through the wall, to avoid contaminants getting inside.
- All external pipe work and connections should be well insulated to ensure optimum performance and to prevent freezing. *Minimum insulation thickness should be 19mm*.

2.4.1 Connection

- Ensure the fibre washer is fitted to the flexible hose.
- Screw the hose to the fitting on the rear of the unit.
- Ensure any pipework is insulated.

CAUTION DO NOT OVERTIGHTEN FITTINGS

WARNING THE OUTLET PIPEWORK TEMPERATURE CAN REACH 60 DEGREES C. DO NOT TOUCH WITH BARE HANDS.

Unit Installation

2.4.2 Water Condition

- The water in a system should be clean and with a pH value of 6.5-8.0. The following are the maximum values:
  Calcium : 100 mg/L
  Chlorine : 100 mg/L
  Iron/manganese : 0.5 mg/L.

2.4.3 Anti-freeze / Filter

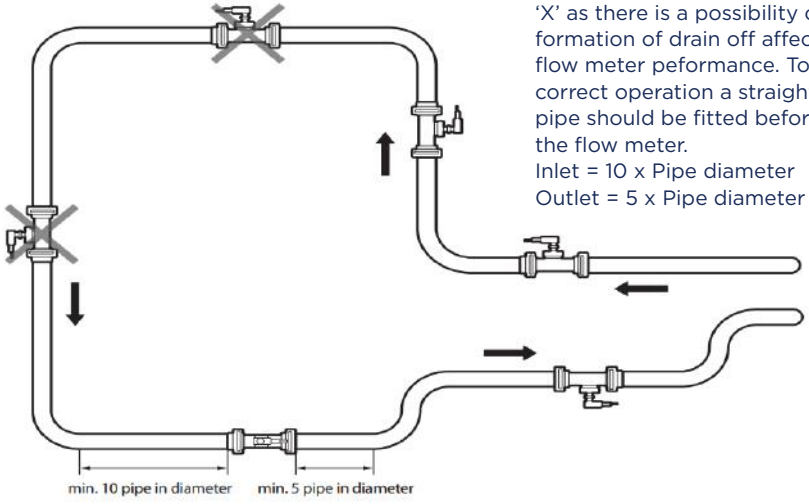
- The outdoor unit, connections and any external pipe work must be protected from freezing. An anti-freeze additive (such as Tyfocor L) of the correct quantity (see manufacturer's guidelines) should be added to prevent any internal damage being sustained by the unit.

- A magnetic filter / strainer must be fitted in the return line of the primary circuit to prevent any contaminants from the circuit reaching the heat pump and potentially damaging components. The filter must be cleaned periodically according to the instructions of the manufacturer.

2.4.4 Flowmeter

- The flow meter is not an integrated part of the heat pump but is essential to its operation. It should be fitted to the main water circuit as shown in the diagram below. Ensure the 'o' rings are fitted and ensure that a 1" female to 28mm compression fitting is used for connecting the flow meter to the pipe work.

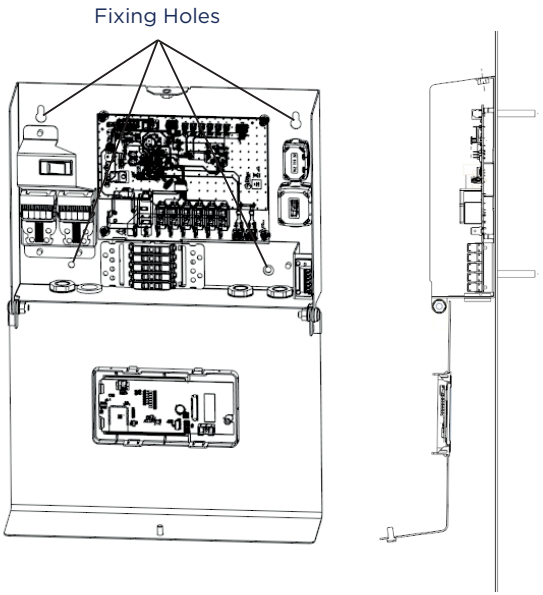
Do not install in the positions marked 'X' as there is a possibility of bubble formation of drain off affecting the flow meter peformance. To ensure correct operation a straight section of pipe should be fitted before and after the flow meter.
Inlet = 10 x Pipe diameter
Outlet = 5 x Pipe diameter



Unit Installation

2.5 Controller Installation

The Auxiliary control board is powered by the outdoor unit. It should be located inside the property, near to the control equipment (zone valves, pump, heating controller).
Do not position the control unit outdoors as it is designed for indoor installation only.
Avoid locations where the unit is exposed to direct sunlight or other types of heat or humidity. Select a location where easy wiring access to the power is possible.
Remove the top cover screw and hinge down the cover. Position the controller in the chosen position. Ensure it is level and that there is adequate clearance for the lid to hinge down.
Mark the positions of the four fixing holes shown and drill for suitable screw fixings. Use the screws to fix the controller into position. Wire the unit as shown in the electrical schematic in section 2.8.



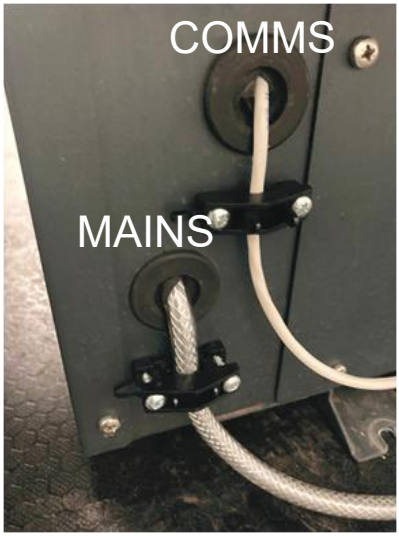
Unit Installation

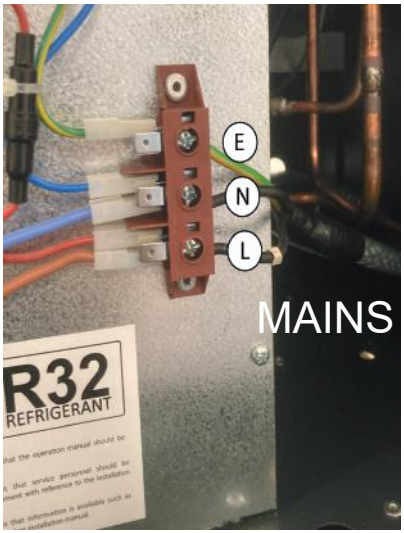
2.6 Electrical Work

The wiring must be performed by professional technicians in accordance with national wiring regulation and the circuit diagram. An all-pole disconnection device which has at least 3mm seperation distance in all pole and a residual current device (RCD) with the rating not exceeding 30mA RCD shall be incorporated in the fixed wiring in accordance with the wiring rules. The appliance requires a suitable mains supply rated for the units capacity, an isolator should be placed in close proximity (1.5 m) of the unit and easily accessible. This appliance MUST BE EARTHED.

Model	5kW	9kW
Maximum Overcurrent Protector (MOP) (A)	20	25
Wiring Size (mm^2)	2.5	4

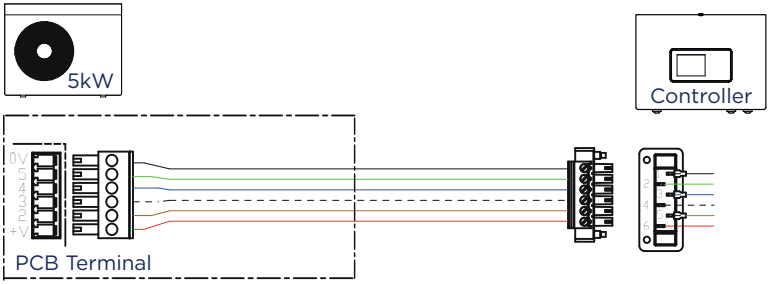
- Wiring sizes must comply with the applicable local and national codes and must be suitably protected from damage.
- All electrical work carried out should comply with IEE wiring regulations.
- In the event of an electrical fault after installation of the appliance, the heat pump MUST BE
- DISCONNECTED BEFORE any tests are carried out.
- The 6 core (min 0.25mm^2) interconnecting cable between the Auxiliary board and heat pump does not carry 240V potential.
- Care should be taken not to run communication cables (flow sensor, interconnecting cable) close to or with mains 240 volt cables. Control equipment (pumps, zone valves, thermostats etc) must have a separate circuit from the actual Ebac heat pump system and should be protected by the required fuse rating.
- Wiring should enter the unit and terminate as shown below.



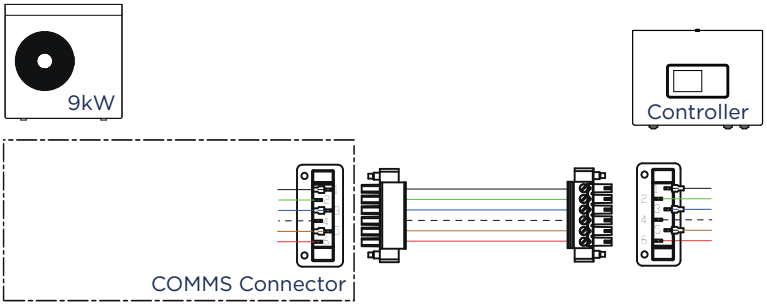


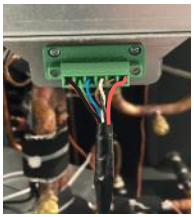
Unit Installation

2.6.1 Wiring of Communications Cable



The communications cable is longer on the 5kW unit as it is wired directly into the auxilliary PCB terminal as shown.





The communications cable on the 9kW unit is wired into the female comms connector located on the bracket at the front of the unit as shown.

Unit Installation

2.7 Wiring of 5kW Unit

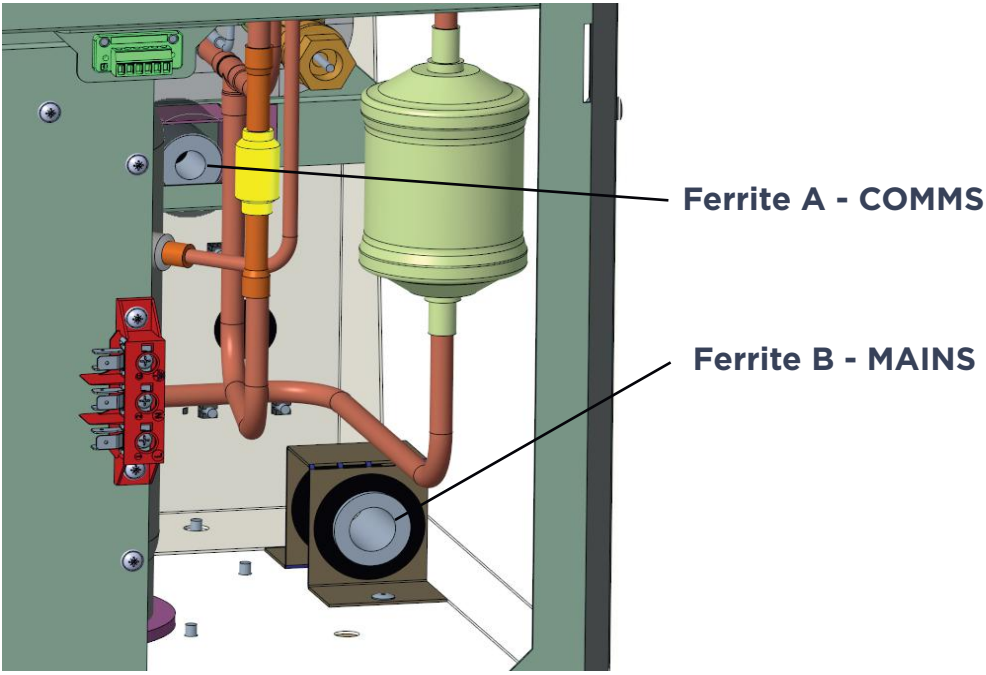
The 5kW unit has 2 extra ferrite ring components through which the incoming wires must be routed before they are connected:

Communications cable

The communications cable must be routed through Ferrite ‘A’ which is located close to the comms wire inlet at the back of the unit.

Mains cable

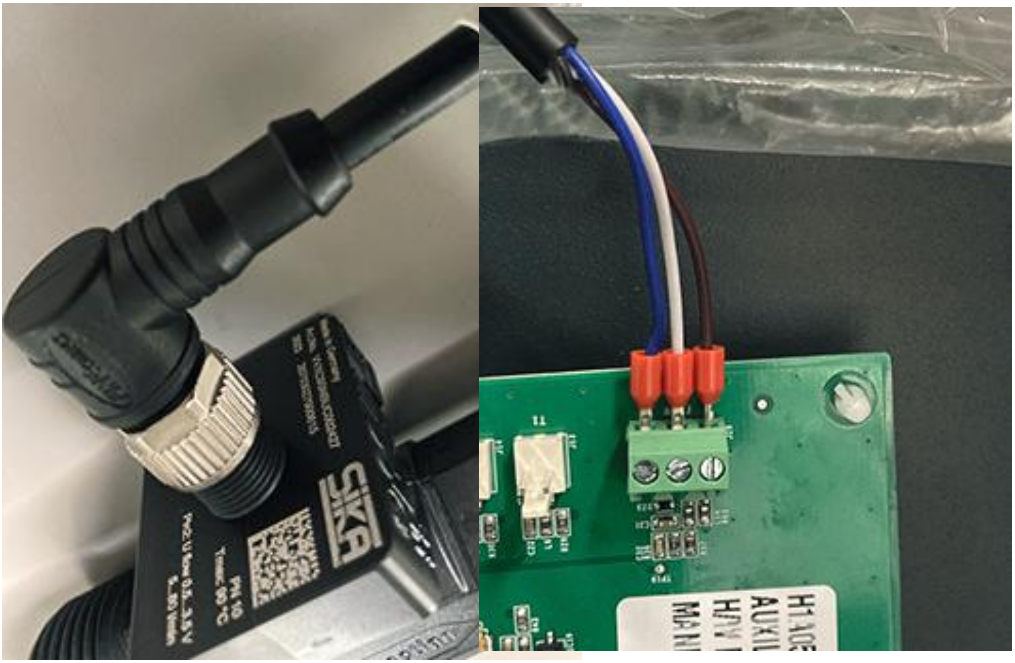
The mains cable must be routed through Ferrite ‘B’. Ferrite ‘B’ is located on the floor of the unit close to the mains inlet.



Unit Installation

2.8 Flowmeter Wiring

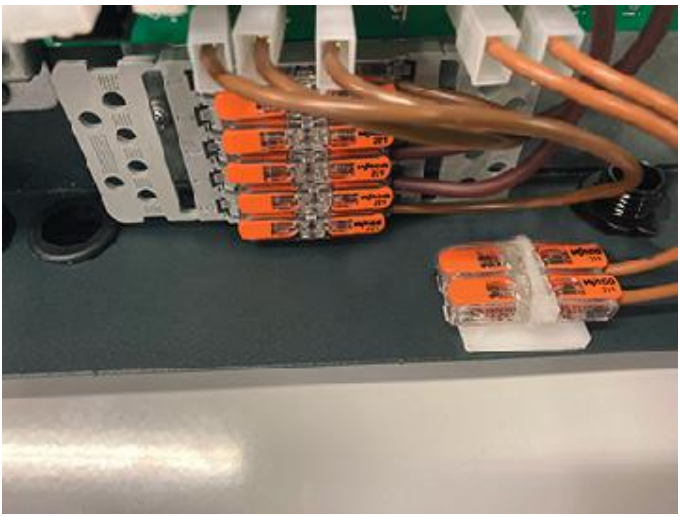
The flowmeter is supplied with its own cable. The threaded connector is attached to the flowmeter. The 3 crimped wires at the other end are wired into the screw terminals as shown.

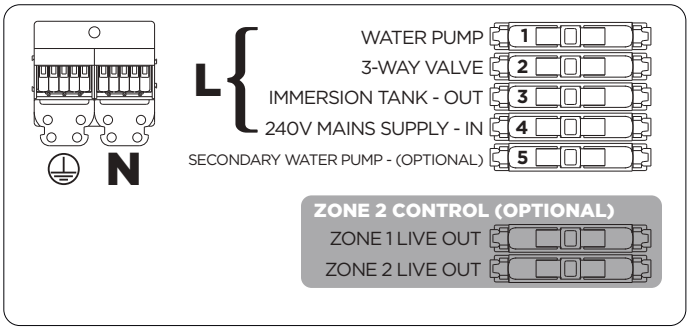


Unit Installation

2.9 Two Zone Control

If two zones are to be controlled two connections are available for the live inputs for zones 1 and 2. A connection is also available for a secondary pump to be used. These optional connections are shown below.





3.0

Commissioning & Setup

3.1 Unit Commissioning/ Calibration

The Ebac Heat pump and Controller use conventional controls. There are 3 options to run the heatpump for space heating:
Homely smart controller - this is the most efficient way to run the heat pump.
Room thermostat.
Timer with the Ebac temperature sensor.

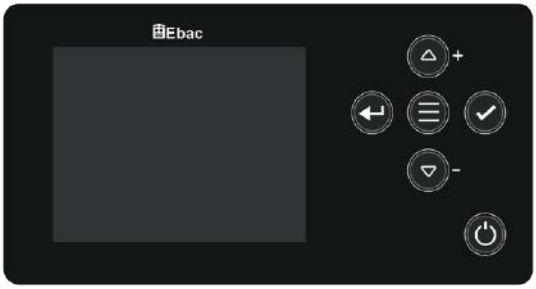
A hot water programmer is required for domestic hot water.

Connections between the heat pump and internal auxiliary control board should contain no intermediate connections, as this may result in communication errors.

Calibration period.
Note that on power up the heatpump enters a 10 minute rest period. The heatpump will appear to be inactive during this phase as it calibrates its sensors. If the heatpump is powered off it will always enter this calibration period on power up.

If the system is to be filled after power up it is recommended that the middle (white) flowmeter wire be disconnected to allow the pump/s to run during the calibration period.

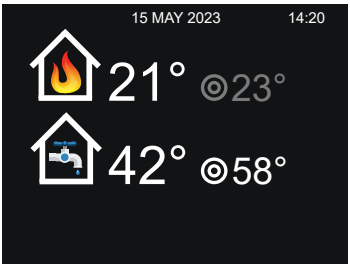
3.2 Controller Interface



Power on
Scroll/adjust down
Scroll/ adjust up
Back
Menu
Select/ return

Commissioning & Setup

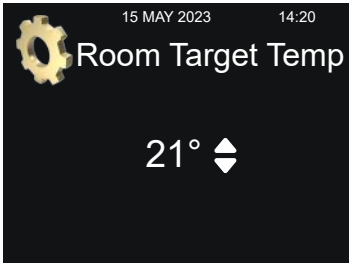
3.3 User Menu



1

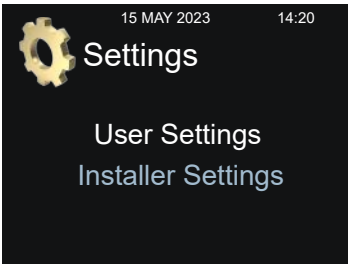
Press the power on button to activate the home screen. The display shows current temperatures and target temperatures for heating and water. The white target icon indicates which target temperature can be adjusted with the up and down keys and this can be altered with the tick button to enter the target temperature menu.

Note: *If an external thermostat is used to control the temperature the temperatures will not be shown.*



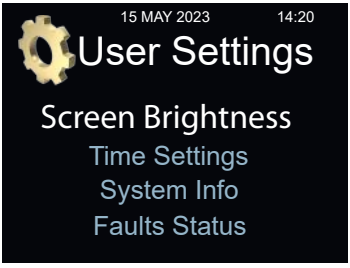
2

Up and down keys can be used to adjust the target temperature. The select button can be used to confirm it and back can be used to return from the menu.



3

Highlight and select user settings to enter the menu.



4

Highlight and select to enter each menu

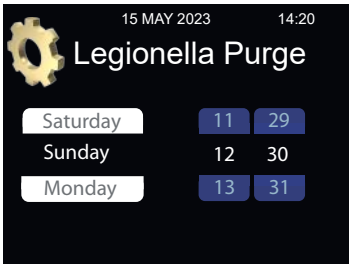
Commissioning & Setup

5

Screen brightness can be adjusted as necessary by using the up and down arrows. Use the select button to confirm and back to return from the menu.

6

On first setup the time will need to be set in the clock settings menu. Scroll to adjust, select to set and back to return from the menu.



7

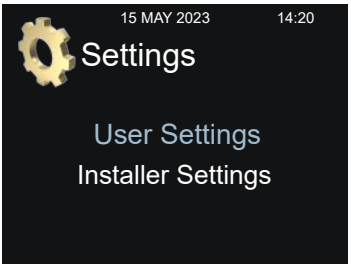
The Legionella Purge screen is used to choose the weekday and time when the purge cycle will take place. Scroll to adjust and select to set the values.

8

The Faults Status screen displays any fault conditions active at the time of selection. If none are active then 'No Fault' is displayed. Select back to return to the User Settings menu.

Commissioning & Setup

3.4 Installer Setup Menu

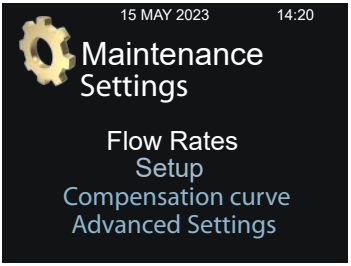


1

After pressing the menu button highlight installer settings.

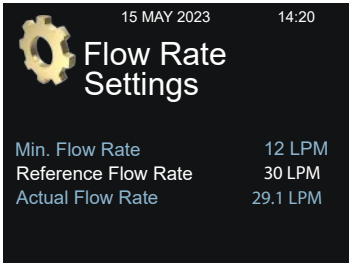
2

Enter the 4 digit access code.



3

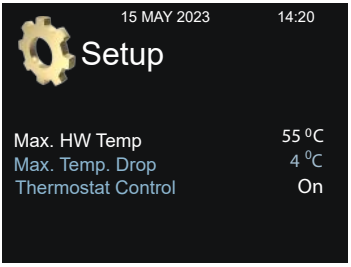
To set flow rates highlight and select the flow rates menu.



4

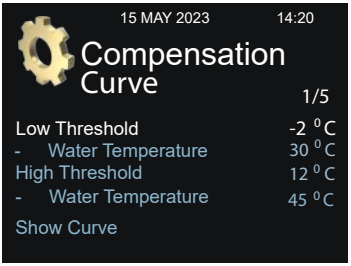
Modify the reference flow rate (flow rate on setup) as required and return. This can be used to check for deterioration in flow.

Commissioning & Setup



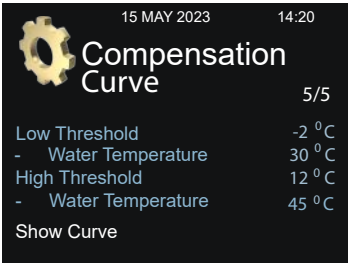
5

Enter the setup menu to modify hot water settings and return.
Thermostat control. If an external thermostat or timer is to be used this should be set to On.
If temperature probes are to be used to regulate the unit this should be set to Off.



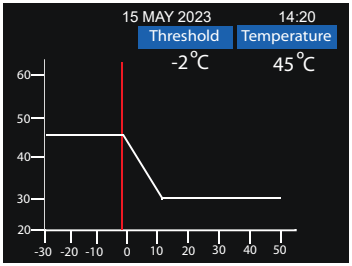
6

Enter the compensation curve menu and modify the temperatures as required. .



7

Select the 'Show Curve' option to display the compensation curve.

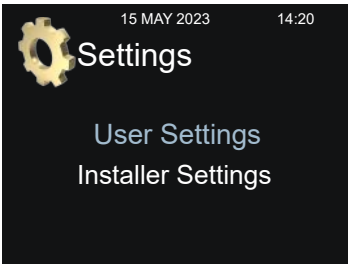


8

The current compensation curve profile is displayed.
Scroll to see the threshold values displayed

Commissioning & Setup

3.5 Advanced Settings Menu

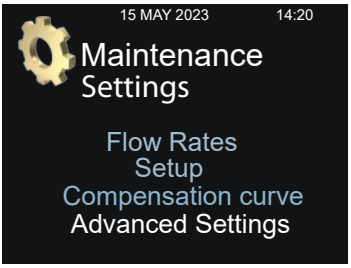


1

After pressing the menu button highlight installer settings.

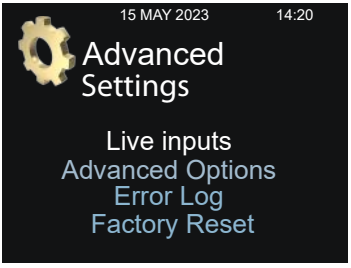
2

Enter the 4 digit access code:



3

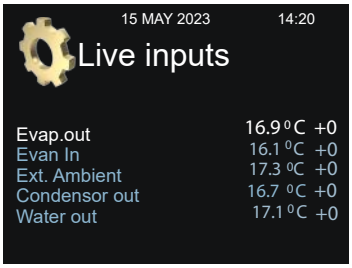
Select advanced settings and enter the 4 digit advanced access code:



4

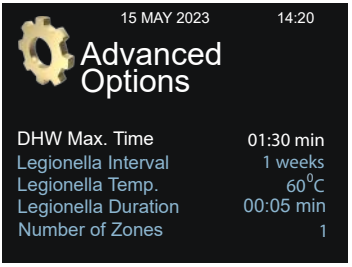
Select live inputs.

Commissioning & Setup



5

All live inputs are displayed in this section. Those with an option to offset can be adjusted if necessary.



6

Go back to select Advanced Options. The DHW max time, legionella settings and number of zones have default settings but can be adjusted if necessary.

7

The error log menu displays events with timings and is a useful troubleshooting tool.

8

The factory reset option allows the user to return the heat pump to default settings.

Commissioning & Setup

3.6 Flow Rate

Flow rate is the most important factor when installing a heat pump system.
A difference between flow and return temperatures of 5°C is required on the primary circuit to ensure that the required heat capacity and efficiency is achieved. Correctly sized circulation pumps and primary and secondary pipe work are essential when installing the heat pump.

- Minimum flow rate 10 l/min, Maximum flow rate 40 L/min.
- Optimum flow rates: 5kW – 18 l/min, 9kW - 28 l/min. A general rule of thumb is 3x the output of the heat pump.

3.7 Mass Flow Rate Calculation

Using the equation below, the power output of the system can be calculated.

HEAT POWER OUTPUT(kW) = MASS FLOW RATE(l/s) x SPECIFIC HEAT CAPACITY(4.186) x TEMP DIFFERENCE(k)

By understanding how each factor is influenced we can ensure the designed heating capacity is achieved. The equation can be transposed to calculate the flow rate of a system where the rated power is known.

Mass Flow Rate (l/s) = Heat Output (kW) / Specific heat capacity (for water 4.186 J/kg°C) x Temp difference (Target 5°C)

For example: The 9kW Ebac heat pump designed to run with a 5°C temperature difference.

Flow rate = 9kW / (4.186 x 5) = 0.43 litres per second
0.43 x 60 = 25.8 litres / min

Note, the SHC of water will reduce if anti freeze is added.

Commissioning & Setup

3.8 System Water Volume

Ebac heat pumps require a minimum of 20 litres primary open water volume (un-valved) for both 5kW and 9kW.

Ebac recommend that either a suitably sized buffer tank or low loss header/ volumiser be included in the circuit with an additional pump to enable hydraulic seperation between the primary and secondary sides of the system.

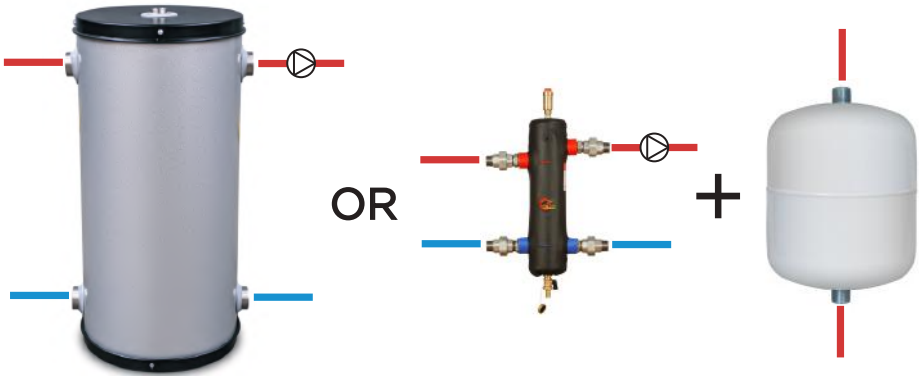
Advantages of hydraulic seperation:

- Flow rates of the primary heat pump circuit and secondary system circuit can be controlled independently.
- Discomfort during the heat pump defrost cycle is reduced.
- A pressure bypass is not required.
- Heating is more instantaneous.

An automatic air vent should also be installed at the highest point of the system as air in the system significantly reduces the performance of the heat pump.

The integrated Pressure Relief Valve can also be opened to remove air from the system. System pressure should be set at 1.5 - 2 bar and the PRV is designed to open at 3 bar.

Any components already installed in an existing system should be checked for integrity and suitability before being used.

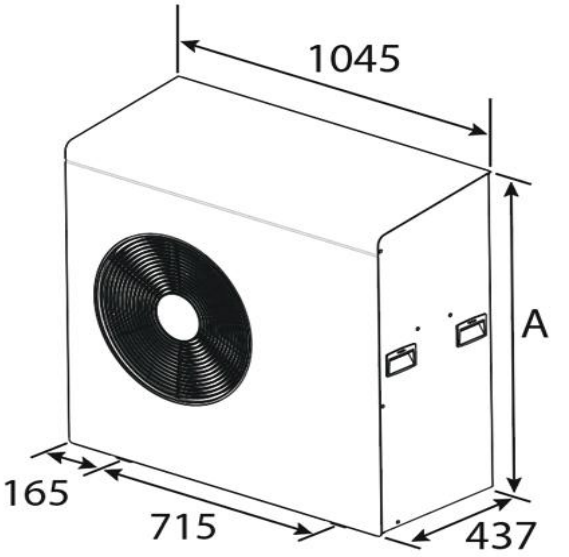


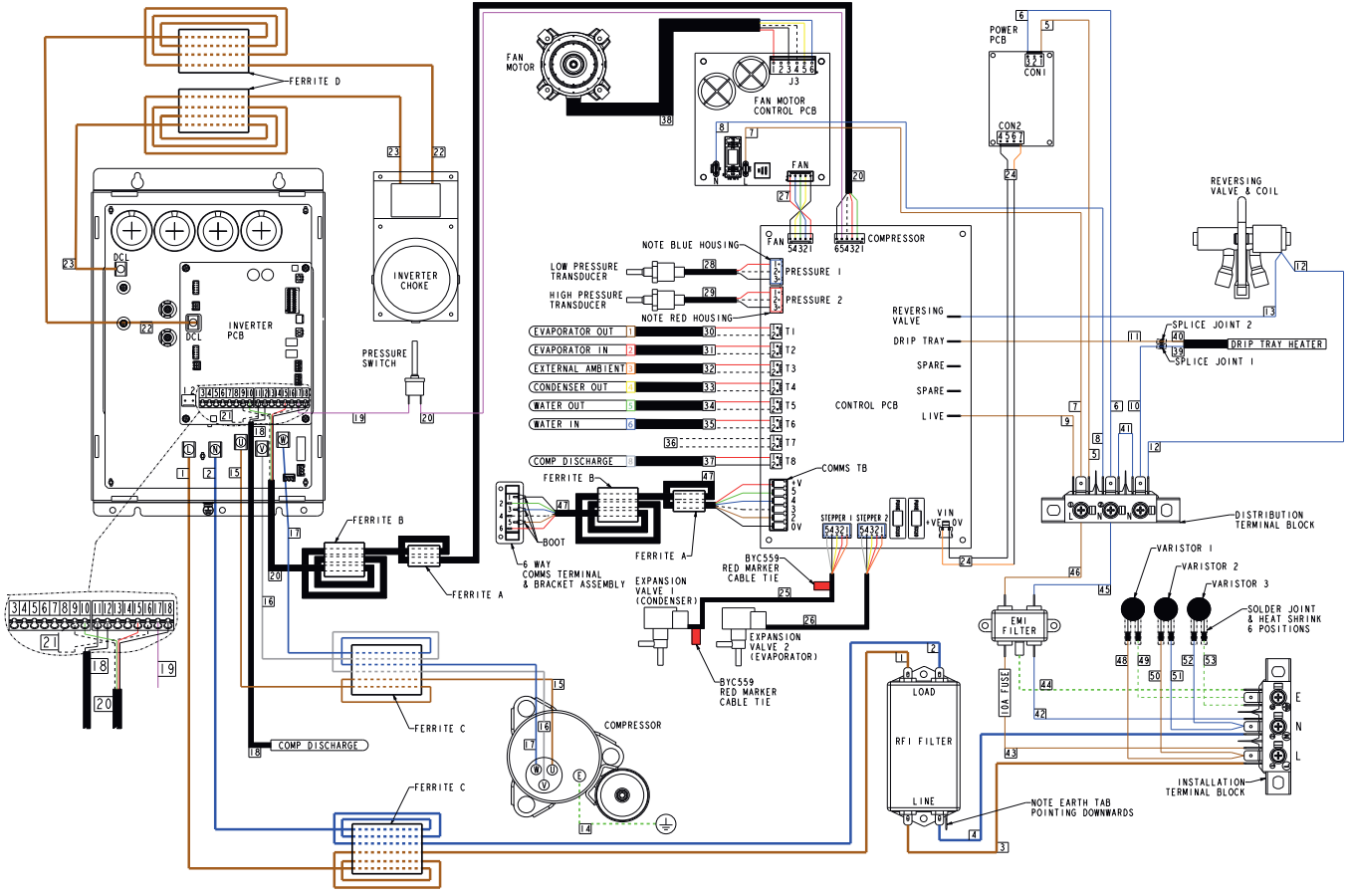
Hydraulic Separation

Technical Data

4.1 Technical Data

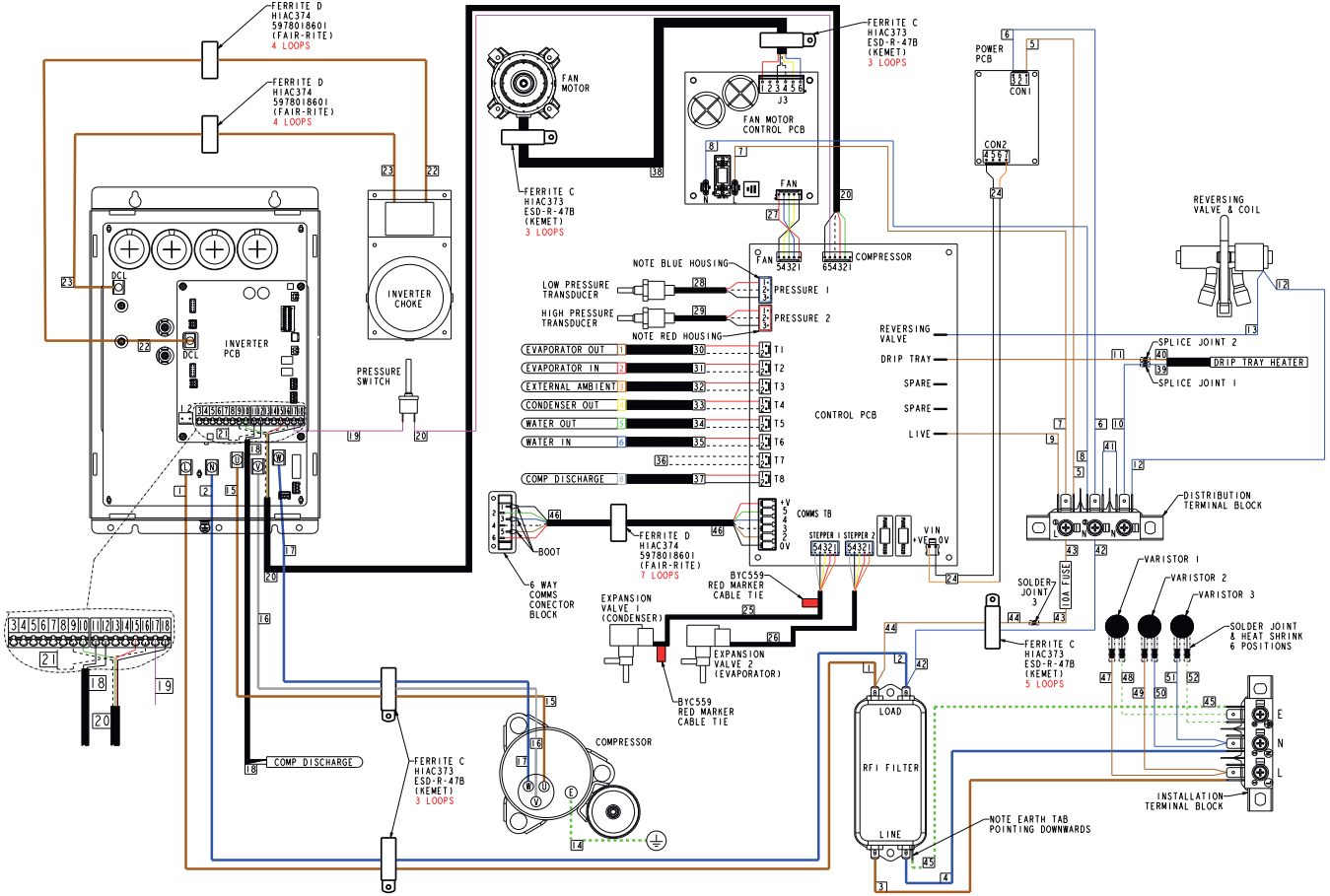
		Ebac 5	Ebac 9
DIMENSIONS	Width (mm)	1042	1042
	Depth (mm)	437	437
	Height (mm) 'A'	800	1030
WEIGHT (Kg)		90	115
ELECTRICAL DATA	Electrical Supply	220-240v, 50Hz	220-240v, 50Hz
	Phase	Single	Single
	Nominal Running Current (MAX)(A)	15	22
REFRIGERANT CHARGE (Kg) / CO_2 EQUIVALENT	R32 (GWP: 677)	2.0 / 1.36	2.2 / 1.50
OPERATING AMBIENT TEMP RANGE		-20°C - +35°C	-20°C - +35°C
WATER DATA	Pipework Size (mm)	28	28
	Flow Rate Max / Min (l/min)	40/10	40/10
	Flow Temperature Max / Min (°C)	60/15	60/15

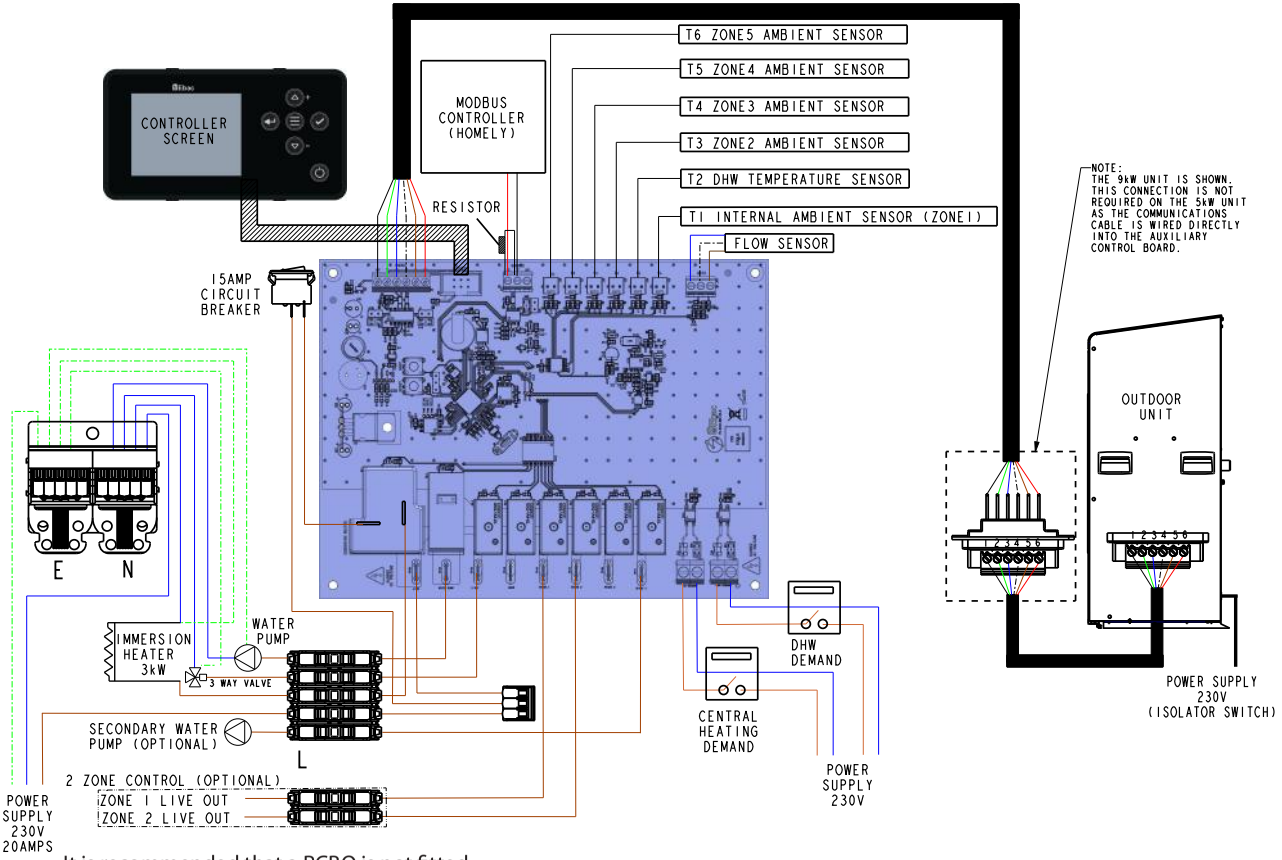



FERRITE D
INVERTER PCB
INVERTER CHOKE
PRESSURE SWITCH
FERRITE B
FERRITE A
FERRITE C
COMP DISCHARGE
COMPRESSOR
FAN MOTOR
FAN MOTOR CONTROL PCB
J3
FAN
NOTE BLUE HOUSING
LOW PRESSURE TRANSDUCER
HIGH PRESSURE TRANSDUCER
PRESSURE 1
PRESSURE 2
NOTE RED HOUSING
EVAPORATOR OUT
EVAPORATOR IN
EXTERNAL AMBIENT
CONDENSER OUT
WATER OUT
WATER IN
COMP DISCHARGE
T1
T2
T3
T4
T5
T6
T7
T8
COMPRESSOR
REVERSING VALVE
DRIP TRAY
SPARE
SPARE
LIVE
CONTROL PCB
COMMS TB
6 WAY COMMS TERMINAL & BRACKET ASSEMBLY
BOOT
BYC559 RED MARKER CABLE TIE
EXPANSION VALVE 1 (CONDENSER)
EXPANSION VALVE 2 (EVAPORATOR)
STEPPER 1
STEPPER 2
VIN
POWER PCB
CON1
CON2
REVERSING VALVE & COIL
SPLICE JOINT 2
DRIP TRAY HEATER
SPLICE JOINT 1
DISTRIBUTION TERMINAL BLOCK
VARISTOR 1
VARISTOR 2
VARISTOR 3
SOLDER JOINT & HEAT SHRINK 6 POSITIONS
EMI FILTER
10A FUSE
LOAD
RFI FILTER
LINE
NOTE EARTH TAB POINTING DOWNWARDS
INSTALLATION TERMINAL BLOCK
E
N
L

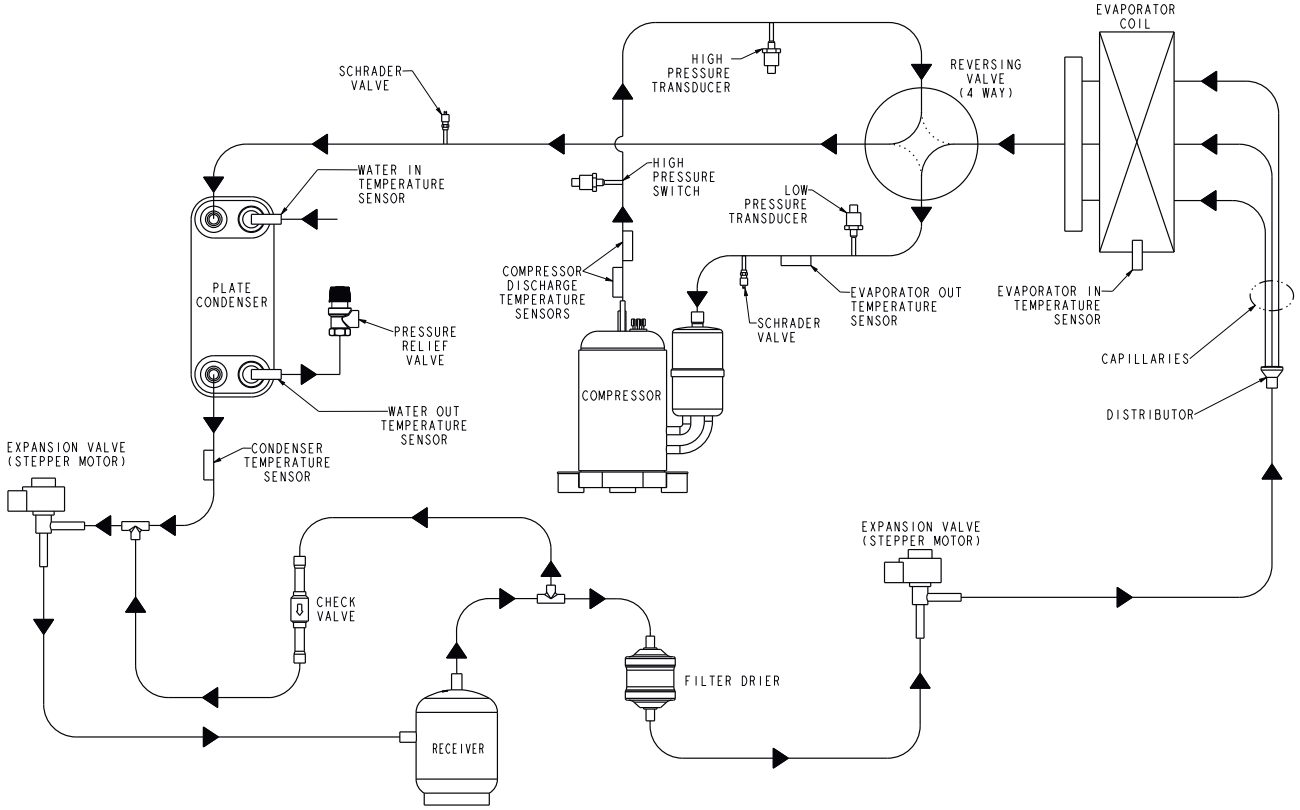
4.0 Technical Data

4.2.2 Electrical Schematic - 5kW

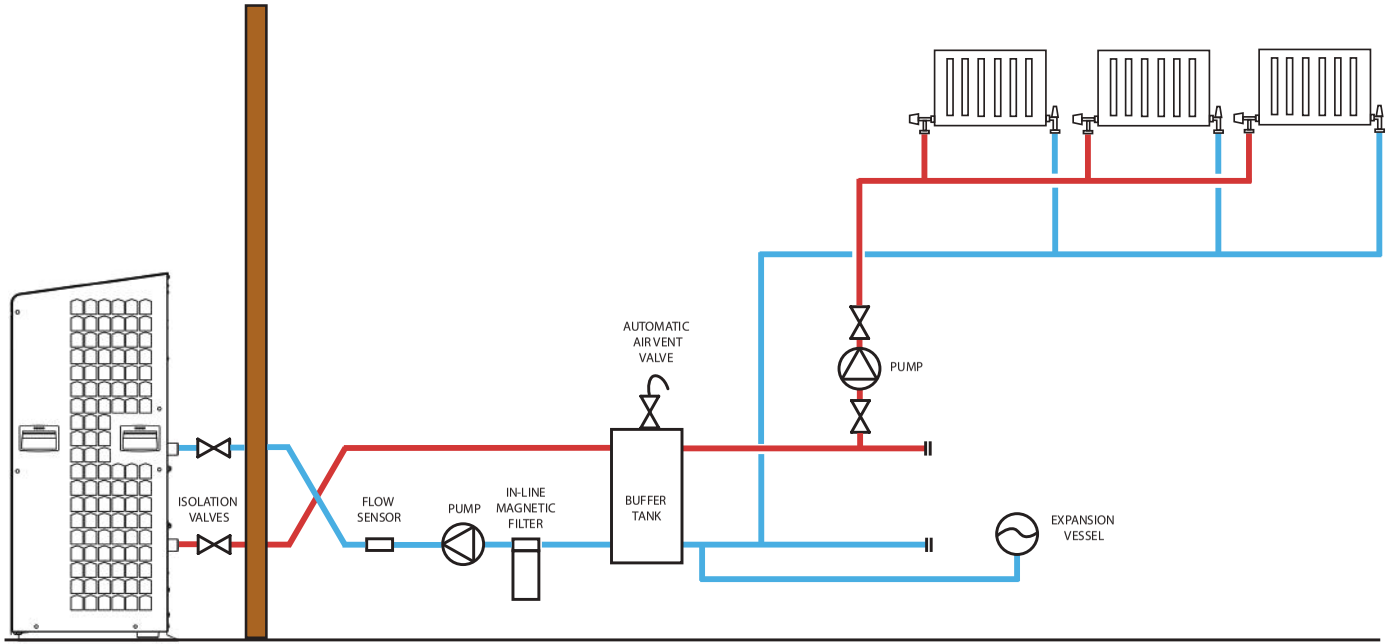




It is recommended that a RCBO is not fitted due to the shared neutrals

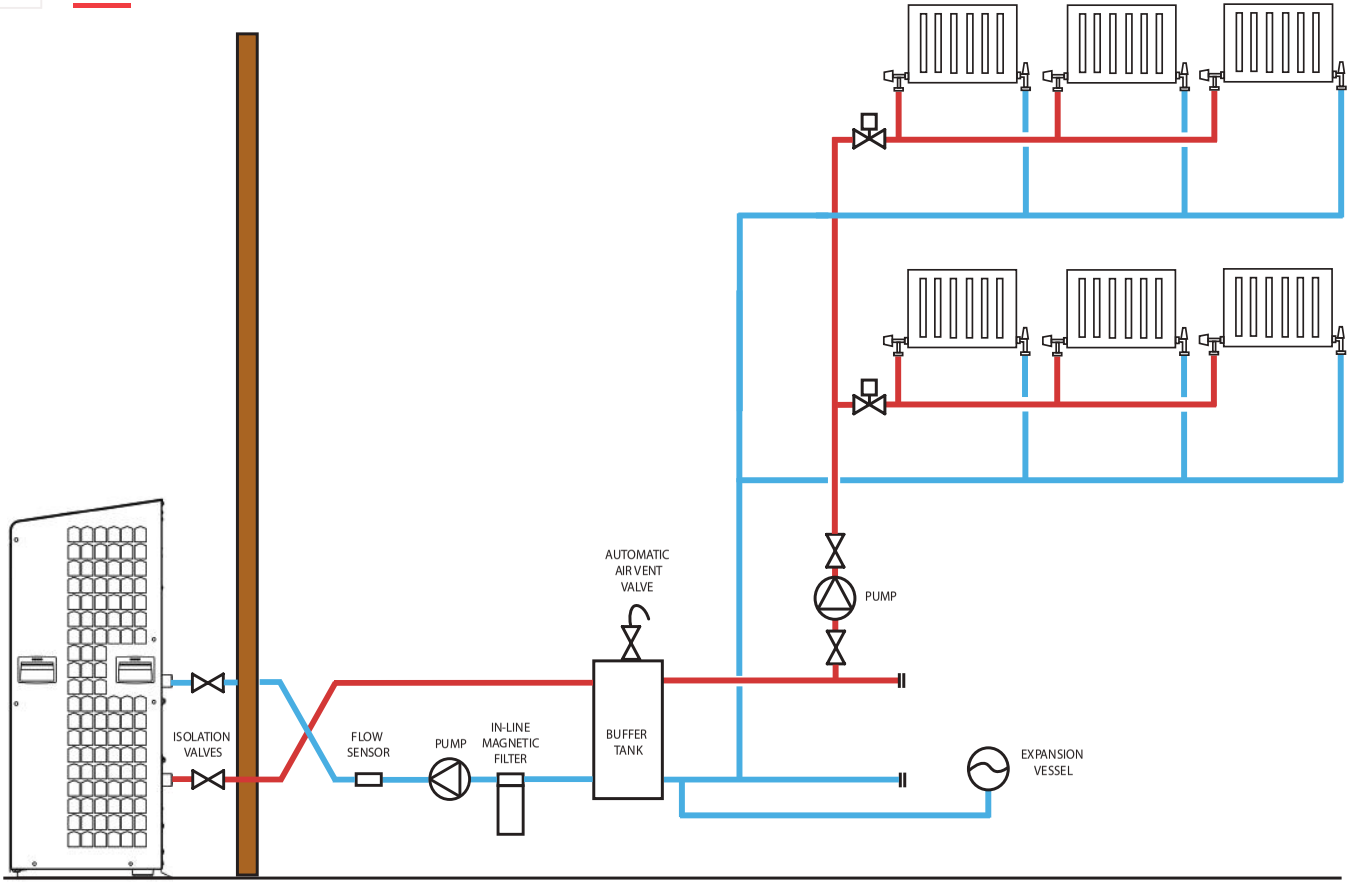

SCHRADER VALVE
HIGH PRESSURE TRANSDUCER
REVERSING VALVE (4 WAY)
EVAPORATOR COIL
WATER IN TEMPERATURE SENSOR
HIGH PRESSURE SWITCH
LOW PRESSURE TRANSDUCER
PLATE CONDENSER
COMPRESSOR DISCHARGE TEMPERATURE SENSORS
EVAPORATOR OUT TEMPERATURE SENSOR
EVAPORATOR IN TEMPERATURE SENSOR
PRESSURE RELIEF VALVE
SCHRADER VALVE
CAPILLARIES
COMPRESSOR
WATER OUT TEMPERATURE SENSOR
DISTRIBUTOR
EXPANSION VALVE (STEPPER MOTOR)
CONDENSER TEMPERATURE SENSOR
EXPANSION VALVE (STEPPER MOTOR)
CHECK VALVE
FILTER DRIER
RECEIVER

4.5.1 Pipework Schematic - Single Zone Heating



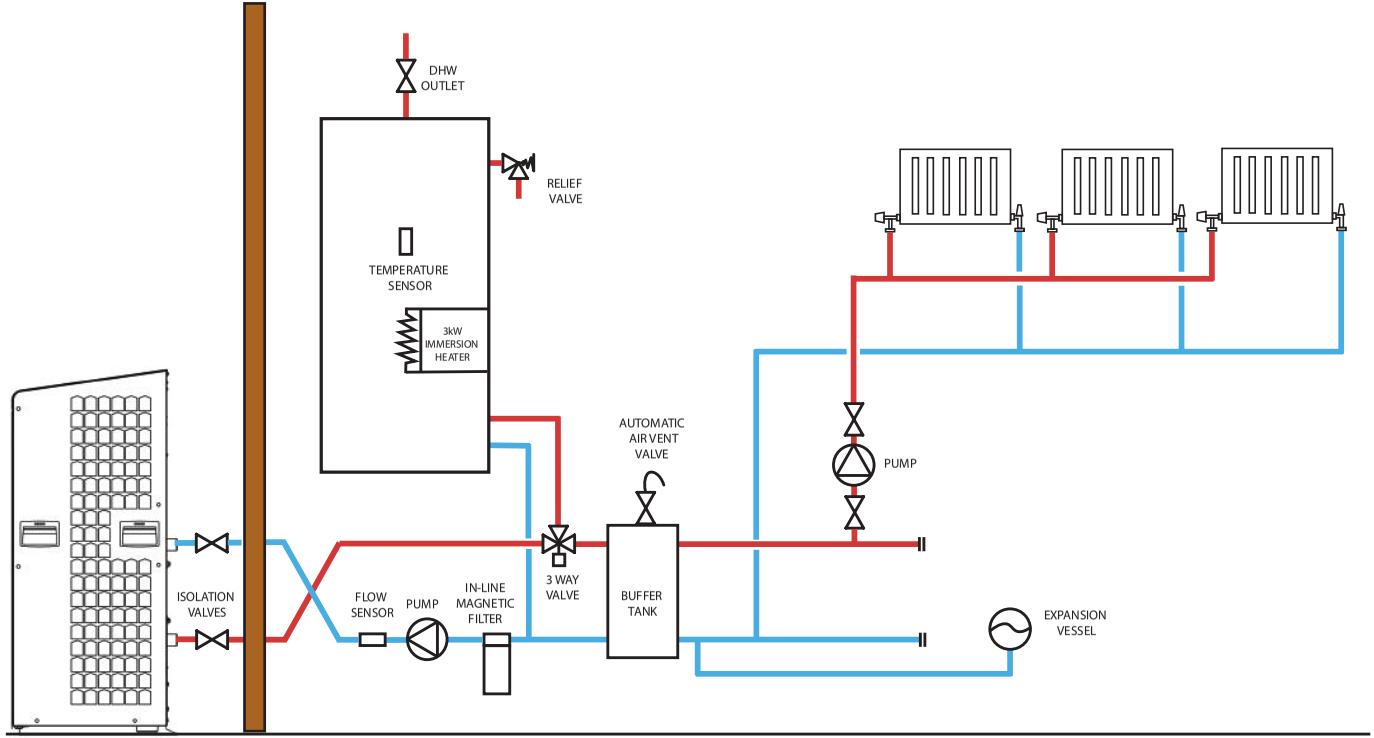
IMPORTANT: *The above system is a concept drawing and not a detailed engineering drawing. It is not intended to describe a particular system*

4.5.2 Pipework Schematic - Two Zone Heating



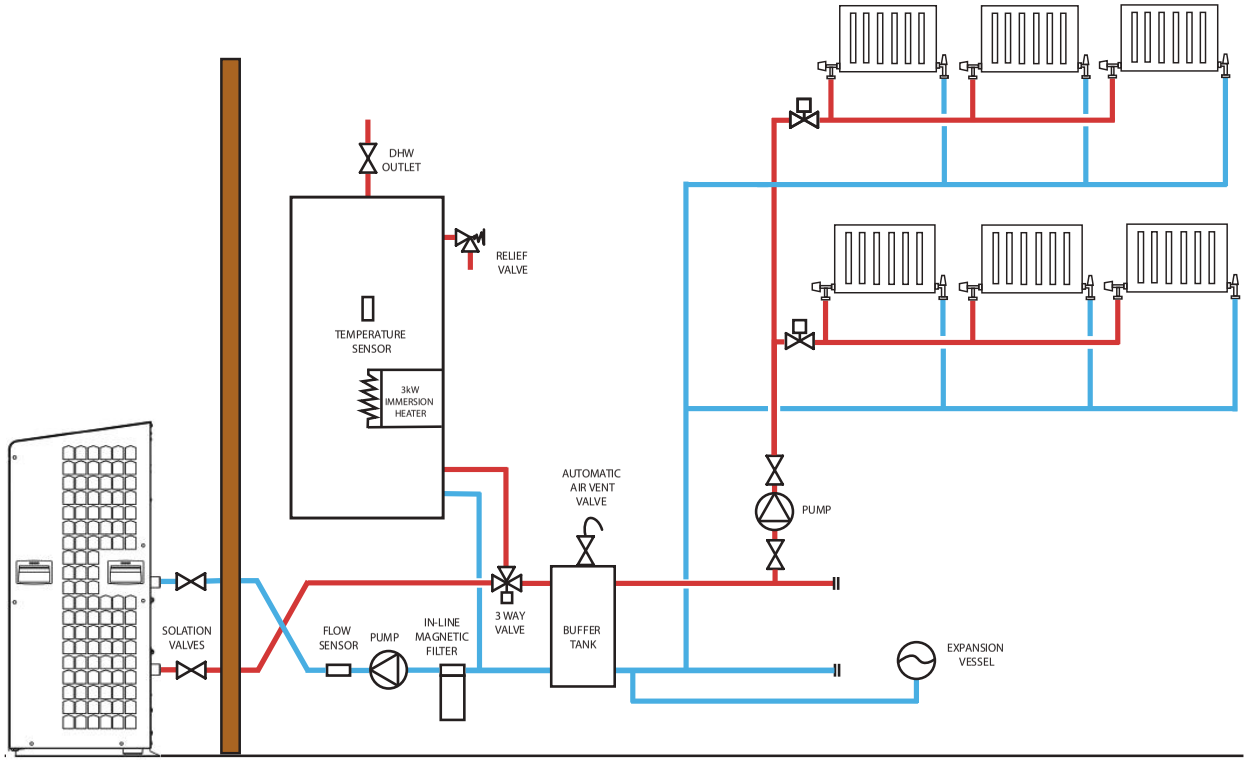
IMPORTANT: *The above system is a concept drawing and not a detailed engineering drawing. It is not intended to describe a particular system*

4.5.3 Pipework Schematic - Single Zone with Hot Water



IMPORTANT: *The above system is a concept drawing and not a detailed engineering drawing. It is not intended to describe a particular system*

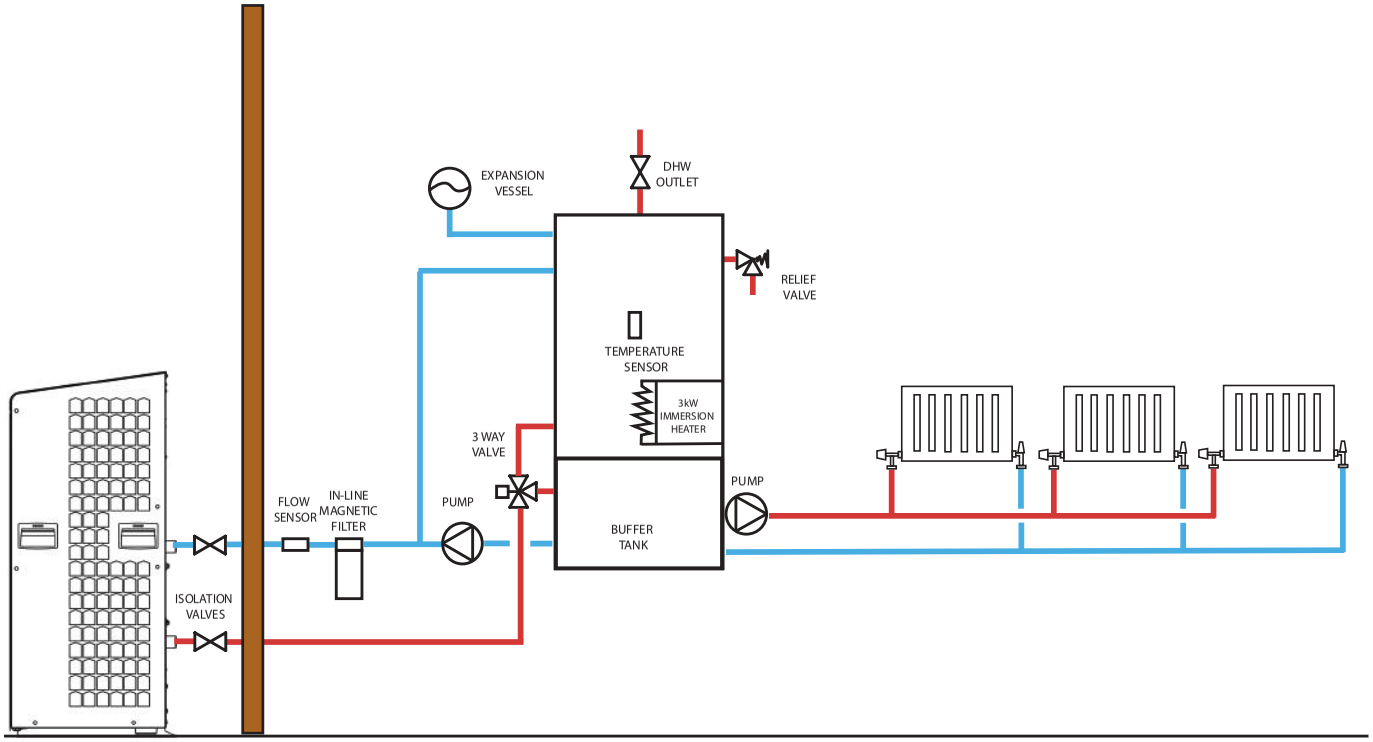
4.5.4 Pipework Schematic - Two Zones with Hot Water



IMPORTANT: *The above system is a concept drawing and not a detailed engineering drawing. It is not intended to describe a particular system*

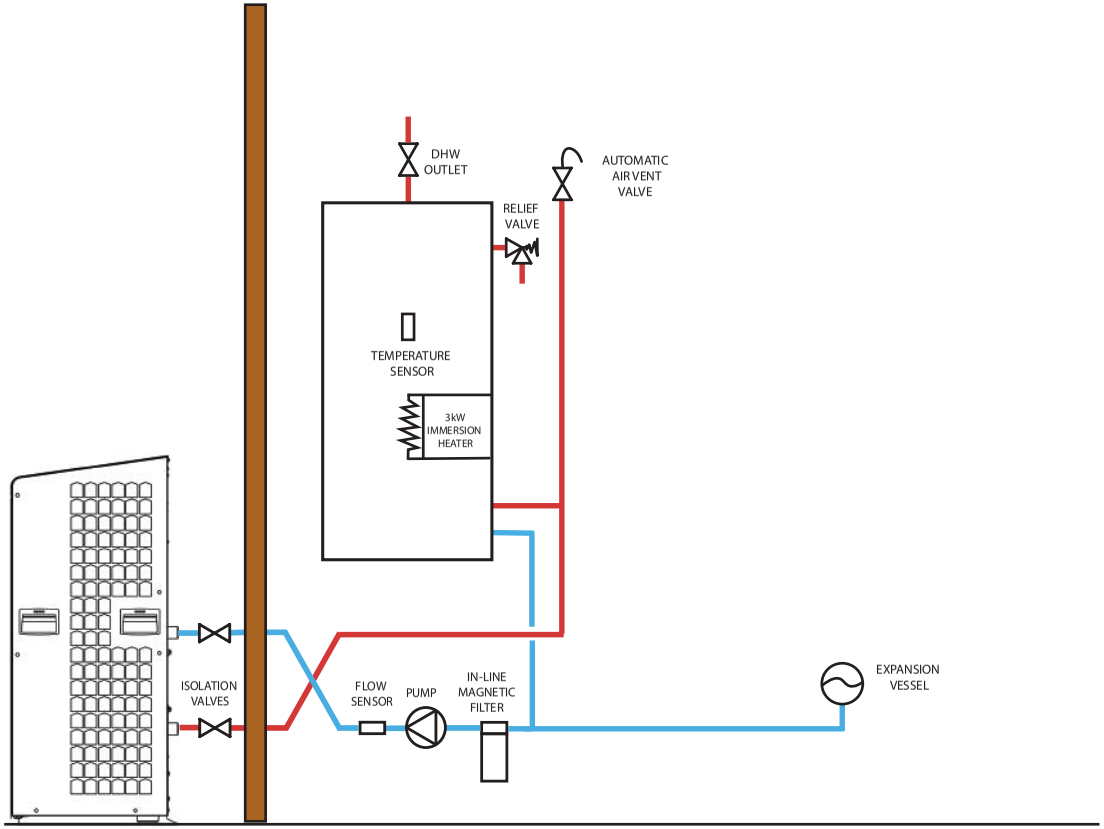
Two heating zones can be connected to the Ebac unit in the same way as a conventional system. The control equipment will automati cally switch between hot water and heating zones as required. Ensure the Domestic hot water zone valve is connected to the correct port on the Auxiliary board.

4.5.5 Pipework Schematic - Single Zone with Hot Water using a Preplumbed Cylinder/ Buffer



IMPORTANT: *The above system is a concept drawing and not a detailed engineering drawing. It is not intended to describe a particular system*

4.5.6 Pipework Schematic - Domestic Hot Water Only



IMPORTANT: *The above system is a concept drawing and not a detailed engineering drawing. It is not intended to describe a particular system*

5.0

Troubleshooting

5.1 Troubleshooting at Installation

Problem	Possible reasons	Troubleshooting
Heat pump fails to start	No power supply	
	Insufficient flow	Ensure flow meter is wired correctly and reading a value in on the screen when checked
		Check system for pressure. Flow meters are expecting to see 1.5Bar
		Ensure there is no air in the system, disconnecting the middle connector on the floe meter can trick the unit into not starting and allow the pump to run indefinitely and
	No demand from thermostats	Check for demand in the live inputs option, ensure control board sees 230VAC when demand is required.
	Incorrect settings for thermostat type	If thermostat mode is set to "off" then the room sensor will need to be below the set point to create demand
		If thermostat mode is set to "on" then the thermostat demand alone will trigger the unit to operate
	Water / room already too warm	Increase the set point to trigger demand
		Increase the flow temperature to allow the unit to turn on, if the water temperature is within 5°C of the required flow temperature then the unit will not start
	Delay due to rest phase	Following a shut down phase or initial turn-on the unit will undergo a rest phase to ensure equilibrium and calibration are correct, normal rest is 3 minutes. Check Fault log in advanced menu to see current unit status
Water is not hot enough	The heat pump is not constantly running	Check for any errors and for the current unit status. If running and stopping in short windows then look at system volume and heat emitters
	Insufficient flow	Ensure the current flow rate is still at the commissioning level proving no blockages
		Keep automatic vents open and keep primary system pressure at 1.5Bar-2.0Bar
	Unit is defrosting	Unit should resume normal operation following the defrost, if not then check fault status
	Set points incorrect / not set	Ensure the flow compensation curve is set correctly for the property
		Increase the heating or hot water set point to a comfortable temperature
	Low air flow	Check for obstructions around the heat pump to ensure nothing is preventing airflow
		If there is a fan stall error on screen then shut down the unit and check for obstructions in the fan blades and grille

5.0

Troubleshooting

Problem	Possible reasons	Troubleshooting
RCD trips	RCD too small	Ensure the installation guide has been followed for the correct sizing of RCD
	Cable too small	Ensure the installation guide has been followed for the correct sizing of cables
	Damage to cable or components	Check cables for damage and replace as necessary
	A component is leaking to earth	Earth bond test
	Terminals not correctly tightened	Ensure the gates on the terminal block were opened prior to feeding in the cable and tightened sufficiently, cable should withstand a light pull when fitted correctly
Water coming from outdoor unit	Condensation	Condensation is expected. Ensure it's draining and not blocked
Ice build-up on outdoor unit	Condensation & cold conditions	This is expected. Unit will defrost once ice build-up limits performance
Unit is not performing anti-legionella purge cycle.	Settings are incorrect	If there is no fault code, then the unit will be set to perform no cycles, change interval from 0 to 1 or more and check the day/time for carrying out the cycle
Unknown state of unit	Not obvious what the heat pump is doing	Check fault status in advanced menu, here it is possible to see the current state of operation for the heat pump
Error code on screen	If error is not written out then it could be more complicated	Check fault status in user menu for a more in-depth description.
		Check fault status in advanced menu for more information about specific issues on a component level

5.2 Operating States

Operating State	Description	Detail
Resting	Unit is undergoing recalibration and achieving pressure equilibrium following a shutdown	Resting phase will last a minimum of 3 minutes
Idle	unit is ready to receive a demand but there is currently no demand	-
Manual operation	only used for testing functions, wont be seen in field	-
Starting up	unit is going through start-up procedure attempting to reach target values as quickly as	Unit cannot be shut down during this mode and will reach running state as soon as basic values have been met within refrigeration circuit
Running	Unit is operational and running at steady state.	minimum running phase time is 10 minutes prior to shut down if demand is removed
Shutting down	unit will safely shut down following a pre-defined order of events. The final function to turn off will be the	-
Defrosting	Unit will enter defrost mode when it is recognised that the steady state operation has degraded	Defrost lengths will vary as they terminate based on program criteria, the method for defrosting will also vary and the unit will learn between defrosts

Troubleshooting

5.3 Faults and Solutions

If a fault develops the home screen indicates 'fault present - check fault status'. The fault type can be checked by entering the 'Faults Status' section in the User Settings menu. When selected the page shows a list of the fault conditions which are active at the time of selection.

Fault Status	Possible reasons	Troubleshooting
Compressor discharge temperature over limit	Surface temperature sensor on discharge pipe has seen too high a temperature due to rapidly changing settings or ambient	Ensure minimum water volume in system is sufficient and allow the unit to cool down and restart
High pressure temperature over limit	Internal pressure too high due to rapid changes in ambient conditions or very high sustained output usage	Ensure minimum water volume in system is sufficient and allow the unit to cool down and restart, check for leaks in DHW system increasing demand and check tank sensor/stat are working correctly
Low pressure temperature under limit	Ambient conditions are extremely low	-
	Unit is not initiating defrost	Check other sensors for any logged failures
	Unit is low on refrigerant charge	Check system pressure when idle and charge if necessary
Low pressure temperature too far below ambient	Unit is not initiating defrost	Check other sensors for any logged failures
	Water flow temp changing too frequently	Check thermostat settings and compensation curve
	Unit is low on refrigerant charge	Check system pressure when idle and charge if necessary
Water flow below safe limit	Water volume is low in system	Top up system and ensure primary circuit is between 1.5Bar & 2.0Bar
	Pump is undersized	Ensure pump is sized correctly for the head required if primary circuit is large
	Pump is working incorrectly	check troubleshooting guide for pump and replace if necessary
	Blockage in system	Check filter and clean if necessary
High pressure sensor failure	Sensor is working incorrectly inside unit and cannot safely operate	Check wiring from sensor to control board ensuring there are no breakages and the sensor is plugged in correctly. Replace sensor if necessary
Low pressure sensor failure	Sensor is working incorrectly inside unit and cannot safely operate	Check wiring from sensor to control board ensuring there are no breakages and the sensor is plugged in correctly. Replace sensor if necessary
Evaporator inlet temperature sensor failure	Sensor is working incorrectly inside unit and cannot safely operate	Check wiring from sensor to control board ensuring there are no breakages and the sensor is plugged in correctly. Replace sensor if necessary
Compressor discharge temperature sensor failure	Sensor is working incorrectly inside unit and cannot safely operate	Check wiring from sensor to control board ensuring there are no breakages and the sensor is plugged in correctly. Replace sensor if necessary

5.0

Troubleshooting

Fault Status	Possible reasons	Troubleshooting
Water out temperature sensor failure	Sensor is working incorrectly inside unit, The unit will still operate at the last known settings to attempt to maintain heat until	Check wiring from sensor to control board ensuring there are no breakages and the sensor is plugged in correctly. Replace sensor if necessary
Water out temperature sensor failure	Sensor is working incorrectly inside unit, The unit will still operate at the last known settings to attempt to maintain heat until	Check wiring from sensor to control board ensuring there are no breakages and the sensor is plugged in correctly. Replace sensor if necessary
Communication to control board lost	Damage to coms cable between indoor and outdoor unit	Check the cable for continuity and damage, ensure wiring has been done according to manual
Sensor fault	Any of the low-impact sensors could be reading a minor fault which could impede the operations of the unit and prevent it from reaching maximum	Check the fault status in the advanced menu and click on the sensor fault, this will identify the failing sensor as it will be in red with the working sensors in green. Check the sensor for damage and replace if necessary

6.0

Maintenance

6.1 Annual Service

POWER OFF THE POWER SUPPLY PRIOR TO OPENING OR REMOVING THE FRONT PANEL FOR SERVICE/ MAINTENANCE

The Ebac Air Source heat pump must be maintained on an annual basis.

The basic requirements are:

- Remove obstruction from evaporator coil/fan
- Visual inspection for leaks
- Check integrity of pipe work insulation
- Check for loose electrical connections
- Stop the unit and clean the magnetic filter in accordance with manufacturer's instructions
- Test the concentration of anti freeze and acidity level of fluid in system

System checks can be carried out via the dashboard.

Unvented cylinders should be serviced annually, as per manufacturer's instructions

Servicing should only be carried out by competent installers and any spare parts must only be purchased from Ebac

NEVER bypass safety devices or operate the unit without them being fully operational.

Maintenance

6.2 Commissioning Report

CUSTOMER NAME	
SITE ADDRESS	
HEAT PUMP ID	
INSTALLATION CONTRACTOR	
COMMISSIONING ENGINEER	
COMMISSIONING DATE	
EBAC APPROVED INSTALLER NO	

BEFORE RUNNING THE HEAT PUMP CHECK THE FOLLOWING POINTS
Ensure antifreeze is added in accordance with manufacturer's instruction.
Check air charge is in expansion vessel.
Pressurise primary circuit to 1.5 bar.
Open all isolating valves.
Bleed ALL air from the system.

COMMISSIONING ENGINEER'S COMMENTS

Maintenance

6.3 Pre-commissioning Check sheet

System Checks	PASS	FAIL	Comments
Installation Location (Outdoor unit)			
Maintenance Access (Outdoor unit)			
Maintenance Access (Cylinder)			
Acceptable air flow (Outdoor unit)			
Standard of Pipework			
Standard of Insulation			
Standard of Electrical Installation (Auxiliary PCB and Outdoor unit			
Flow meter fitted on main circuit			
Electrical Isolation 1.5 m from Heat Pump			
Connection to mains power source			
	Type		
	Size		
Connection of Control wiring (Outdoor unit)			
Connection of Control wiring (Auxiliary board)			
Control wire	Type		
Commission and setup menus complete			
Magnetic filter fitted in system			
Anti-vibration mounts fitted			
Flexible hoses fitted to flow and return			
Flow setting device fitted to main circuit			
Anti-freeze added to system			
Check air charge in expansion vessel			
Bleed air from system			
Pressurise primary circuit to 1.5 bar			

Operation Status						
Heat Pump Model No.						
Serial No.						
	PASS	FAIL	COMMENTS			
Noise level from compressor excessive						
Noise level from Fan excessive						
Provision made for condensate removal						
Legionella settings recorded			Temperature		Duration	

NOTE: if a fail is identified above then the fault should be rectified at the comissioning stage.

Maintenance

6.4 Maintenance Check sheet

Maintenance should be carried out annually. Failure to maintain the system may result in the warranty becoming null and void.

Customer Name	
Site Address	
Installation Contractor	
Heat pump ID	
Serial Number of Unit	
Model Number of Unit	
Commissioning Date	

Brief Description of System

Check expansion vessel charge pressure (top up if required)	
Check and Clean the magnetic filter	
Open primary/ heating safety valve and check it discharges safely	
Check and if necessary top up system inhibitor / glycol antifreeze	
Check and release any air from the system	
Check for loose external electrical connections	
Check correct rating and type of fuse fitted to the electrical supply	
Check the correct setting and operation of thermostats	
Check the operation of motorised valves	
Check and clean the evaporator	
Check for signs of oil leaks indicating a refrigerant leak	
Check integrity of pipework and insulation	
Carry out system checks via the dashboard	

Comments

7.0

Servicing

7.1 Servicing Information

1) Checks to the area
Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimised. For repair to the refrigerating system, the following precautions shall be complied with prior to conducting work on the system.
2) Work procedure
Works shall be undertaken under a controlled procedure to minimise the risk of a flammable gas or vapour being present while the work is performed.
3) General work area
All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. work in confined spaces shall be avoided. The area around the work space shall be sectioned off. Ensure that the conditions within the area have been made safe by control of flammable material.
4) Checks for presence of refrigerant
The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with flammable refrigerants, i.e. no sparking, adequately sealed or intrinsically safe.
5) Presence of fire extinguisher
If any hot work is to be conducted on the refrigeration equipment or a ny associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.
6) No ignition sources
No person carrying out work in relation to a refrigeration system which involves exposing any pipe work that contains or has contained flammable refrigerant shall use any sources of ignition as it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which flammable refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. NO SMOKING signs shall be displayed.
7) Ventilated area
Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.
8) Checks to the refrigeration equipment
Refrigerant components should be changed by an F-Gas qualified engineer using only genuine Baxi parts. At all times the manufacturers maintenance and service guidelines shall be followed. If in doubt consult the manufacturers technical department for assistance. The following checks shall be applied to installations using flammable refrigerants.

- The ventilation machinery and outlets are operating adequately and are not obstructed.
- If an indirect refrigerating circuit is being used, the secondary circuits shall be checked for the presence of refrigerant; marking to the equipment continues to be visible and legible.
- Marking and signs that are illegible shall be corrected.
- Refrigeration pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being corroded.

9) Checks to electrical devices
Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised.
Initial safety checks shall include:

- That capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking.
- That there no live electrical components and wiring are exposed while charging, recovering or purging the system.
- That there is continuity of earth bonding

Servicing

7.1 Servicing Information

10) Repairs to sealed components

a) During repairs to sealed components, all electrical supplies shall be disconnected from the equipment being worked upon prior to any removal of sealed covers, etc. If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.

b) Particular attention shall be paid to the following to ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected. This shall include damage to cables, excessive number of connections, terminals not made to original specification, damage to seals, incorrect fitting of glands, etc.

- Ensure that apparatus is mounted securely.
- Ensure that seals or sealing materials have not degraded such that they no longer serve the purpose of preventing the ingress of flammable atmospheres. Replacement parts shall be in accordance with the manufacturers specifications.

Note: The use of silicon sealant may inhibit the effectiveness of some types of leak detection equipment. Intrinsically safe components do not have to be isolated prior to working on them.

11) Repair to intrinsically safe components

Do not apply any permanent inductive or capacitance loads to the circuit without ensuring that this will not exceed the permissible voltage and current permitted for the equipment in use. Intrinsically safe components are the only types that can be worked on while live in the presence of a flammable atmosphere. The test apparatus shall be at the correct rating. Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere from a leak.

12) Cabling

Check that cabling will not be subjected to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.

13) Detection of flammable refrigerants

Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.

14) Leak detection methods

The following leak detection methods are deemed acceptable for systems containing flammable refrigerants. Electronic leak detectors shall be used to detect flammable refrigerants, but the sensitivity may not be adequate, or may need re-calibration. (detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed and the appropriate percentage of gas (25% maximum) is confirmed. Leak detection fluids are suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work. If a leak is suspected, all naked flames shall be emoved or extinguished. If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system or isolated (by means of shut off valves) in a part of the system remote from the leak. Oxygen free nitrogen (OFN) shall then be purged through the system both before and during the brazing process.

15) Removal and evacuation

When breaking into the refrigerant circuit to make repairs for any other purpose, conventional procedures shall be used. However, it is important that best practice is followed since flammability is a consideration. The following procedure shall be adhered to:

- Remove refrigerant;
- Purge the circuit with inert gas;
- Evacuate;
- Purge again with inert gas;
- Open the circuit by cutting or brazing.

The refrigerant charge shall be recovered into the correct recovery cylinders. The system shall be flushed with OFN to render the unit safe. This process may need to be repeated several times.

Compressed air or oxygen shall not be used for this task.

Servicing

7.1 Servicing Information

Flushing shall be achieved by breaking the vacuum in the system with OFN and continuing to fill until the working pressure is achieved, then venting to atmosphere and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system.
When the final OFN charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. This operation is absolutely vital if brazing operations on the pipe-work are to take place. Ensure that the outlet for the vacuum pump is not closed to any ignition sources and there is ventilation available.

16) Charging procedures

In addition to conventional charging procedures, the following requirements shall be followed:

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- Cylinders shall be kept upright.
- Ensure that the refrigeration system is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigeration system.
- Prior to recharging the system it shall be pressure tested with OFN. The system shall be leak tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

17) Decommissioning

Before carrying out this procedure it is essential
that the technician is completely familiar with the equipment and all its details. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken.
In case analysis is required prior to re-use of reclaimed refrigerant. It is essential that electrical power is available before the task is commenced.

a) Become familiar with the equipment and its operation.
b) Isolate system electrically.
c) Before attempting the procedure ensure that:
Mechanical handling equipment is available if required for handling refrigerant cylinders.
All personal protective equipment is available and being used correctly.
The recovery process is supervised at all times by a competent personnel.
Recovery equipment and cylinders conform to the appropriate standards.
d) Pump down refrigerant system, if possible.
e) If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
f) Make sure that cylinder is situated on the scales before recovery takes place.
g) Start the recovery machine and operate in accordance with manufacturers instructions.
h) Do not overfill cylinders. (No more than 80% volume liquid charge).
i) Do not exceeed the maximum working pressure of the cylinder, even temporarily.
j) When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
k) Recovered refrigerant shall not be charged into another refrigeration system unless it has been cleaned and checked.

18) Labelling

Equipment shall be labelled stating that it has been de-commissioned and emptied of refrigerant. The label shall be dated and signed. Ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.

19) Recovery

When removing refrigerant from a system either for service or decommissioning, it is recommended good practice that all refrigerants are removed safely. When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct numbers of cylinders for holding the total system charge are available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i.e special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and if possible cooled before recovery occurs. The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of flammable refrigerants. In addition, a set of calibrated weighing scales shall be available and in good working order.

7.0

Servicing

7.1 Servicing Information

Hoses shall be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult manufacturer if in doubt. The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder and the relevant Waste Transfer Note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.
If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The evacuation process shall be carried out prior to returning the compressor to the suppliers. Only electric heating to the compressor body shall be employed to accelerate this process. When oil is drained from a system it shall be carried out safely.

20) Transportation, marking and storage for units

Transport of equipment containing flammable refrigerants

Compliance is required with the applicable transport regulations. The maximum number of pieces of equipment permitted to be transported together will also be determined by applicable transport regulations.

Marking of equipment using signs

Compliance is required with the local regulations which give the minimum requirements for the provision of safety and/or health signs for a work location. All required signs are to be maintained and employers should ensure that employees receive suitable and sufficient instruction and training on the meaniing of appropriate safety signs and the actions that need to be taken in connection with these signs. The effectiveness of signs should not be diminished by too many signs being placed together. Any pictograms used should be as simple as possible and contain only essential details.

Disposal of equipment using flammable refrigerants

Compliance is required with national regulations.

Storage of equipment/appliances

The storage of equipment should be in accordance with the manufacturer's instructions.

Storage of packed (unsold) equipment. Protection should be provided such that mechanical damage to the equipment inside the package will not cause any leak of the refrigerant charge.
The maximum number of pieces of equipment permitted to be stored together will be determined by applicable transport regulations.

8.0

End of Life Information & Liabilities

8.1 End of Life Information

The heatpump contains components contaminated by the refrigerant and oil contained in the compressor. In order for the heatpump to be recycled or disposed of it must be taken to a suitably licenced waste facility. You can contact a qualified refrigeration engineer to do this for you.

WARNING

Disassembly
This heat pump unit may only be disassembled by a suitably qualified (F-gas) refrigeration engineer.
Under no circumstances can the refrigeration contained within the heat pump be released into the atmosphere.

8.2 Liabilities

Manufacturer's liability
Our products are manufactured in compliance with the requirements of various regulations. They are therefore delivered with the marking and any documents necessary. In the interests of the quality of the products, we strive constantly to improve them. We therefore reserve the right to modify the specifications given in this document. Our liability as manufacturer may not be invoked in the following cases.

- Failure to abide by the instructions on installing the appliance.
- Failure to abide by the instructions on using the appliance.
- Faulty or insufficient maintenance of the appliance.

Installer's liability
The installer is responsible for the installation and initial commissioning of the appliance. The installer must observe the following instructions:

- Read and follow the instructions given in the manuals provided with the appliance.
- Install the appliance in compliance with prevailing legislation and standards.
- Carry out initial commissioning and any checks necessary.
- Explain the installation to the user.
- If maintenance is necessary, warn the user of the obligation to check the appliance and keep it in good working order.
- Give all the instruction manuals to the user.

User's liability
To guarantee optimum operation of the system, you must abide by the following instructions:

- Read and follow the instructions given in the manuals provided with the appliance.
- Call on a qualified professional to carry out installation and initial commissioning.
- Get your installer to explain your installation to you.
- Have the required inspections and maintenance carried out by a qualified installer.

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