

Ecodan Air Source Heat Pump



A CLASS
BoilerMate HP-DEM-A

A complete package to provide hot water and heating in domestic housing from an air source heat pump

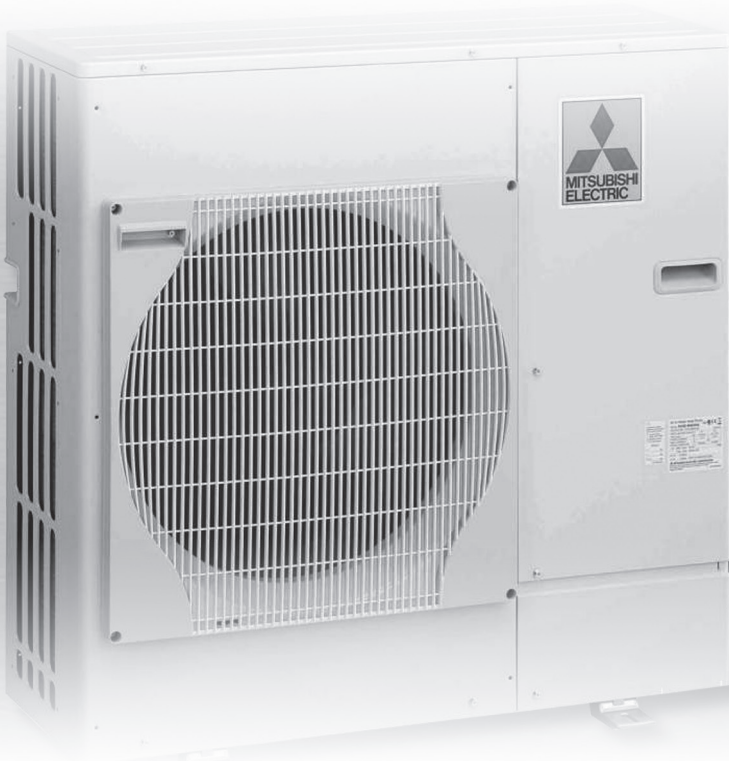
Design, Installation & Servicing Instructions

BoilerMate Model Numbers

BMA 180 HP-DEM-A
BMA 210 HP-DEM-A
BMA 240 HP-DEM-A

Ecodan Air Source Heat Pump Model Number

PUHZ-W50VHA
PUHZ-W85VHA
PUHZ-W140VHA





Building Regulations and Benchmark Commissioning

The Building Regulations (England & Wales) require that the installation of a heating appliance be notified to the relevant Local Authority Building Control Department. From 1st April 2005 this can be achieved via a Competent Person Self Certification Scheme as an option to notifying the Local Authority directly. Similar arrangements will follow for Scotland and will apply in Northern Ireland from 1st January 06.

CORGI operates a Self Certification Scheme for gas heating appliances.

These arrangements represent a change from the situation whereby compliance with the Building Regulations was accepted if the Benchmark Logbook was completed and this was then left on site with the customer).

With the introduction of a self certification scheme, the Benchmark Logbook is being replaced by a similar document in the form of a commissioning check list and a service interval record is included with all gas appliance manuals. However, the relevant Benchmark Logbook is still being included with all Thermal Storage products and unvented cylinders.

Gledhill fully supports the Benchmark aims to improve the standards of installation and commissioning of central heating systems in the UK and to encourage the regular servicing of all central heating systems to ensure safety and efficiency.

Building Regulations require that the heating installation should comply with the manufacturer's instructions. It is therefore important that the commissioning check list is completed by the competent installer. This check list only applies to installations in dwellings or some related structures.

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This product is manufactured under an ISO 9001:2000 Quality System audited by BSI.

Patents Pending.

The Gledhill's first priority is to give a high quality service to our customers.

Quality is built into every Gledhill product and we hope you get satisfactory service from Gledhill.

If not please let us know.

Summary Checklist for Mitsubishi Ecodan and Gledhill BoilerMate A-Class HP Installation

This checklist has been created to help you understand the differences from other types of heating systems that you will have installed. We suggest you use this checklist as a helpful summary of the main differences from conventional heating systems, but you will also need to understand and comply with all of the technical details contained within this document to ensure a successful installation.

BoilerMate A-Class HP-DEM-A

- Is normally mounted in the airing cupboard internal to the property. As it is based on an unvented cylinder, suitable provision needs to be made for the P&T discharge pipework.
- A 32A electrical power supply with a local isolator is needed to allow the Switch emergency electrical back-up to operate.

Primary System Circuit

- It is very important that the primary system is cleansed using a suitable cleansing agent such as Fernox F3 to ensure that any flux residues / installation debris is removed.
- **The heat pump and external connecting pipework require protection against freezing. For this reason a combined anti-freeze and inhibitor product such as Fernox Alpha-11 must be used in the correct quantity.**
- The Fernox Boiler Buddy should be fitted internally on the heat pump return to help protect the heat pump from any heating system contamination and provide an ongoing visual indication of the system water condition.

Interconnection Between Ecodan and BoilerMate A-Class HP

- **A four core signal cable is needed to be run between the internal BoilerMate and the external Ecodan. This cable is polarized and must be connected correctly.**

Externally Mounted Temperature Sensor

- An externally mounted temperature sensor is provided as part of the equipment package. This should be mounted in a suitable location on a north facing wall external to the property.

Radiator System Circuit

- As the heat pump generates lower temperatures than a conventional boiler the radiators should have been designed to suit the lower mean temperature. Normally this will need an increase of emitter size, but this will depend on the design heat loss of the building.

Underfloor Heating Circuit

- The BoilerMate contains a pre-fitted pump for the heating circuit(s). When using an underfloor heating circuit, the manifolds should be of the non-pumped type. The blending valve should be set at the design temperature of the underfloor circuit.

Room Thermostat

- A 2 channel digital programmer is fitted to the front of the BoilerMate A-Class HP appliance. A separate room thermostat will normally be required.

KEY DIFFERENCES FROM CONVENTIONAL HEATING SYSTEMS

Mitsubishi Ecodan Air Source Heat Pump

- Is to be mounted external to the property in a suitable location using the detail provided in the manual and with a minimum distance of 300mm from the nearest wall.
- Cold air is blown from the front of the unit - it should be positioned in a location where this will not cause a nuisance.
- It should be mounted on anti-vibration mounts using eg.TICO® material.
- The anti-vibration flexible hoses supplied should be fitted to the flow /return pipework.
- Under some operating conditions, condensate water may be produced which will drain away from the unit. If this is likely to cause a problem (eg. due to freezing on a pathway), we suggest incorporating a 150mm wide by 50mm deep gravel filled channel as a soakaway, or a similar arrangement to suit the location.
- The external flow / return pipework needs to be insulated and waterproofed to prevent freezing using Armaflex grade 'O' pipe insulation.
- For the PUHZ-W50 a 16amp MCB is required, the W85 model requires a 25amp MCB, and the W140 model requires a 40amp MCB. All models need to be fitted with a local external isolator fitted in accordance with IEE wiring regulations.

Incoming Water Supply

- As the performance of hot and cold water systems is totally reliant on the incoming mains cold water supply, check that the pressure will be a minimum of 2 bar at times of maximum simultaneous use and that the flow rate is a minimum of 30 litres/minute. (For optimum performance this will need to be 50 litres in larger properties.)

Hard Water Considerations

- A factory fitted scale inhibitor can be provided and should be specified at the time of order for hardness levels above 200 and up to 300 ppm(mg/l). Where the water is very hard ie above 300 ppm (mg/l) an optional polyphosphate type inhibitor should be ordered and fitted separately by the installer.

Special Considerations In Retrofit Situations

- **The heat exchanger in the heat pump must be protected from particulate contaminants in the water circuit. When fitting in a retrofit situation the existing radiator circuit MUST be chemically cleaned and thoroughly flushed by a competent person before installation.**

The BoilerMate A-Class HP-DEM-A is designed to be sold as part of a package with the Mitsubishi Electric Ecodan air source heat pump. The combination of the BoilerMate A-Class HP-DEM-A and the Mitsubishi Electric Ecodan air source heat pump has been the subject of independent testing by BRE and a report is available on request.

Any water distribution and central heating installation must comply with the relevant recommendation of the current version of the Regulations and British Standards listed below:-

Building Regulations
I.E.E. Requirements for Electrical Installations (BS7671)
Water Regulations
Manual Handling Operations Regulations

British Standards
BS6798, BS5449, BS5546, BS5440:1, BS5440:2, CP331:3, BS6700, BS7593 and BS7671.
Health and Safety Document No 635

A competent person as stated in the Building Regulations must install the BoilerMate heating system. The manufacturer's notes must not be taken as overriding statutory obligations.

The BoilerMate A-Class HP-DEM-A model is based on an Accolade unvented hot water storage appliance and therefore is covered by section G3 of the Building Regulations. Unless the installer is part of an approved competent installer scheme the installation is notifiable to Building Control prior to commencement. An annual inspection is recommended to ensure safe, long term operation.

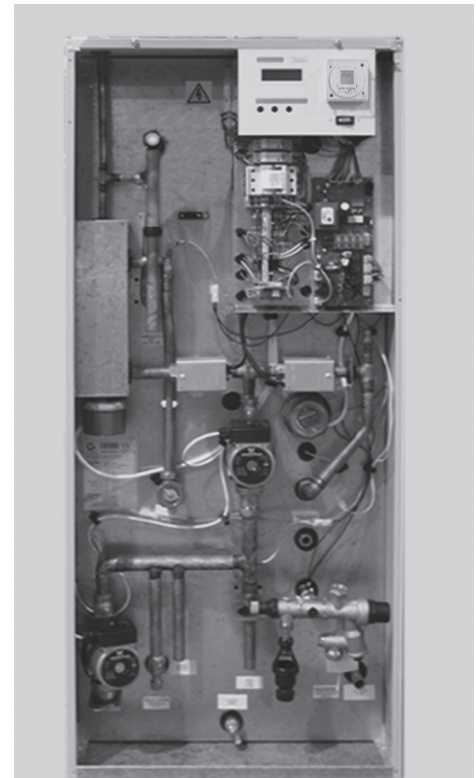
This appliance must only be used with suitable heat pumps and is not suitable for use with any uncontrolled energy source such as solid fuel/steam. It should not be installed where the annual inspection is likely to be neglected.

The information in this manual is provided to assist generally in the selection of equipment. The responsibility for the selection and specification of the equipment must however remain that of the customer and any Designers or Consultants concerned with the design and installation.

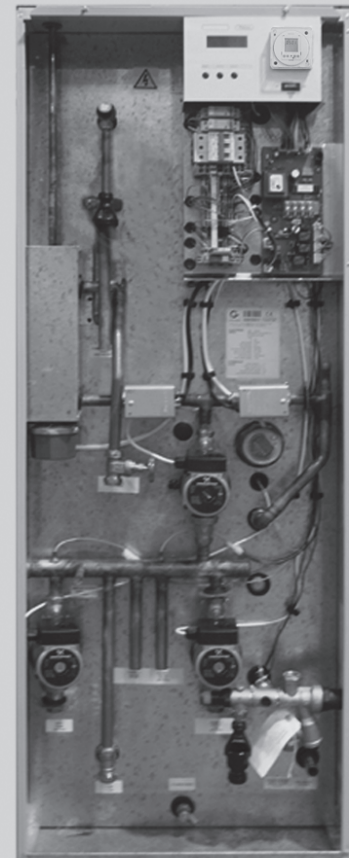
Please note: We do not therefore accept any responsibility for matters of design, selection or specification or for the effectiveness of an installation containing one of our products unless we have been specifically requested to do so.

In the interest of continuously improving the BoilerMate range, Gledhill Building Products Ltd reserve the right to modify the product without notice, and in these circumstances this document, which is accurate at the time of printing, should be disregarded. It will however be updated as soon as possible after the change has occurred.

Modifications **must not** be made to this appliance. If any components are replaced in the field, they must be obtained from Gledhill Spares to ensure continued safe operation and must not be tampered with. This applies particularly to the immersion heaters which incorporate a pre-set overheat thermostat.



BMA 180 HP-DEM-A



BMA 210/240 HP-DEM-A

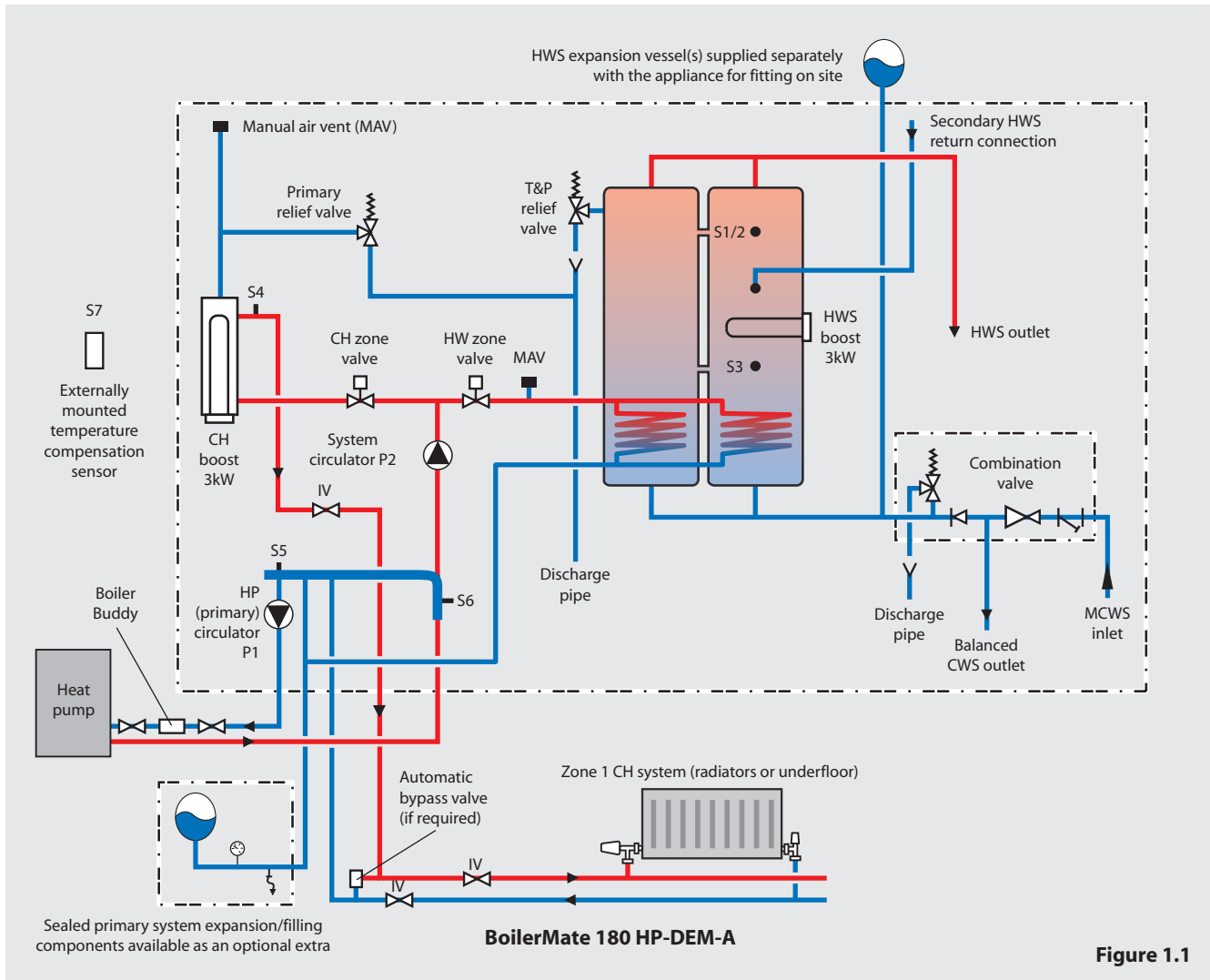


Figure 1.1

A BoilerMate A-Class HP-DEM-A is a floor standing packaged mains pressure unvented hot water appliance designed for use with the Mitsubishi Electric Ecodan air source heat pump. All models are factory fitted with all the necessary safety and control equipment for connecting to the domestic water systems, heat pump and the heating system as can be seen from figures 1.1, 1.2, 1.3 and 1.4.

The appliance has been specifically designed to maximise the efficiency of the heat pump and use the energy to provide improved space heating and mains pressure hot water performance.

The built in controls monitor the demands for heat ensuring that the low cost energy from the heat pump is used whenever possible and top up from the conventional heat source is only initiated when the flow temperature from the heat pump is not sufficient to meet the demands. The controls are set to provide hot water priority, i.e. if there is a demand at S3, any heating demands will be suspended until the store temperature reaches the point where S3 is satisfied.

All models are designed to heat the domestic hot water indirectly up to the maximum temperature possible with the heat pump and then boost the temperature by means of a 3kW immersion heater up to the required set temperature. All models have connections for zone 1 central heating circuit, however the 210 and 240 models also have connections for zone 2 central heating circuit. This enables separate radiator and underfloor heating circuits to be provided, operating at different design temperatures if required.

The BoilerMate A-Class HP-DEM-A is supplied with an outside temperature compensation sensor which needs to be mounted externally and wired back to the connection terminals provided in the appliance. This will then automatically adjust the operation of both zone 1 and zone 2 heating circuits to take account of the external temperature and reduce the running costs.

The most economical way of designing the heating systems is to utilise the temperature available from the heat pump itself. For this reason, underfloor/low temperature radiator systems should be chosen where possible. In these situations.

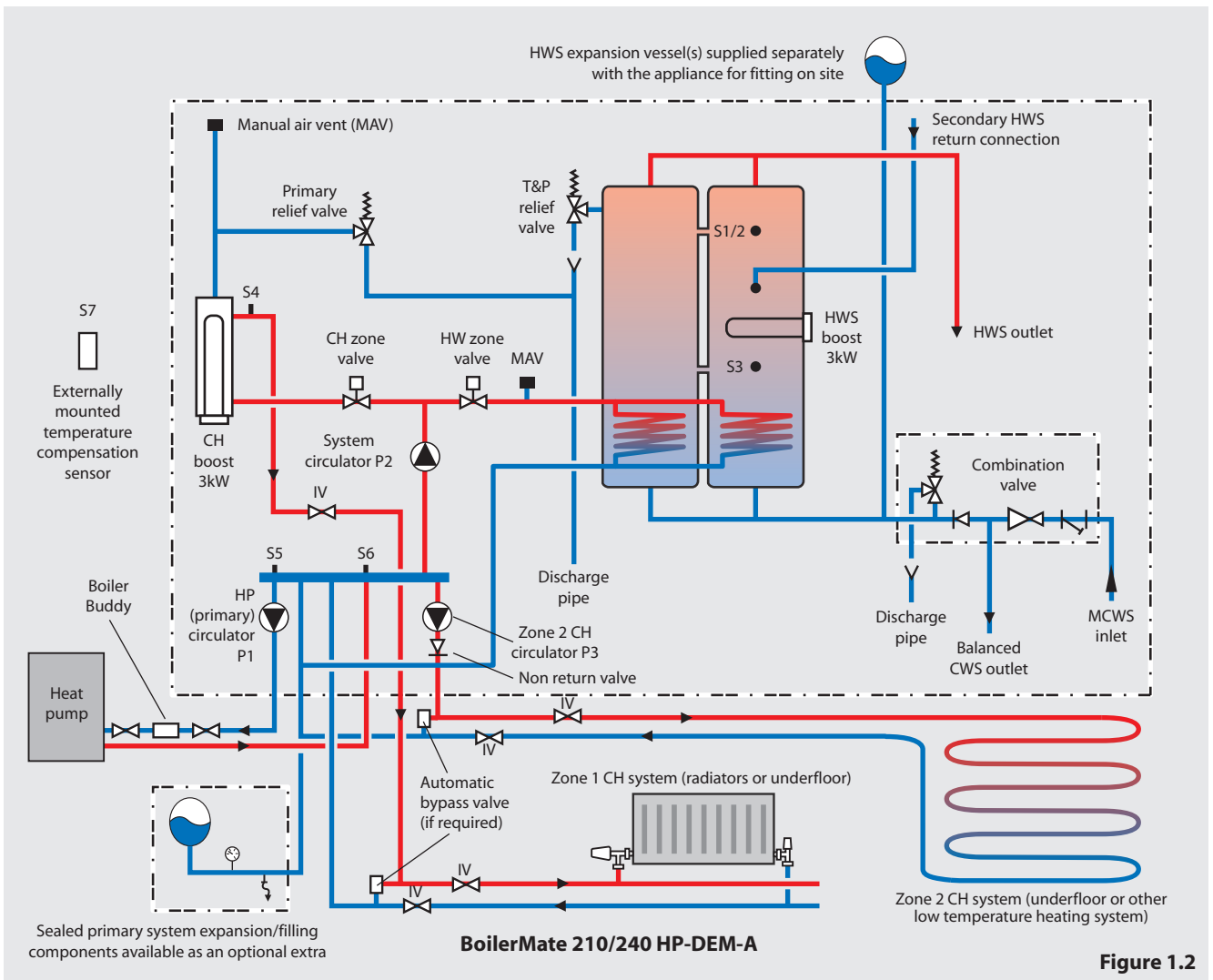


Figure 1.2

Once installed and commissioned, the integration of all the heat pump, domestic hot water and central heating functions will be automatically controlled by the PCB built into the BoilerMate A-Class HP-DEM-A appliance. However, the temperature of the central heating will need to be controlled by remote room thermostat(s)/thermostatic radiator valves.

In the event the heat pump fails, both the domestic hot water and central heating (partial only) can be heated using the built in electric heaters. This manual emergency heating mode can be selected by pressing the button labelled 'switch' on the appliance front panel for 5 seconds. Even in this mode the controls will give priority to the hot water. However, the appliance should only be operated in this mode for the short period of time required for the problem to be resolved.

The BoilerMate A-Class HP-DEM-A is designed to be sold as part of a package with the Mitsubishi Electric Ecodan air source heat pump. The combination of the BoilerMate A-Class HP-DEM-A and the Mitsubishi Electric Ecodan air source heat pump has been the subject of independent testing by BRE and a report is available on request. To allow a visual indication of system water quality and to protect the waterways of the heat pump from contamination a Fernox Boiler Buddy is provided as part of the package.

Scale Protection

The Building Regulations L1A: New dwellings/ L1B: Existing dwellings and the requirements set out in the Domestic Heating Compliance Guide specify that "where the mains water hardness exceeds 200ppm provision should be made to treat the feed water to water heaters and the hot water circuit of combination boilers to reduce the rate of accumulation of lime scale".

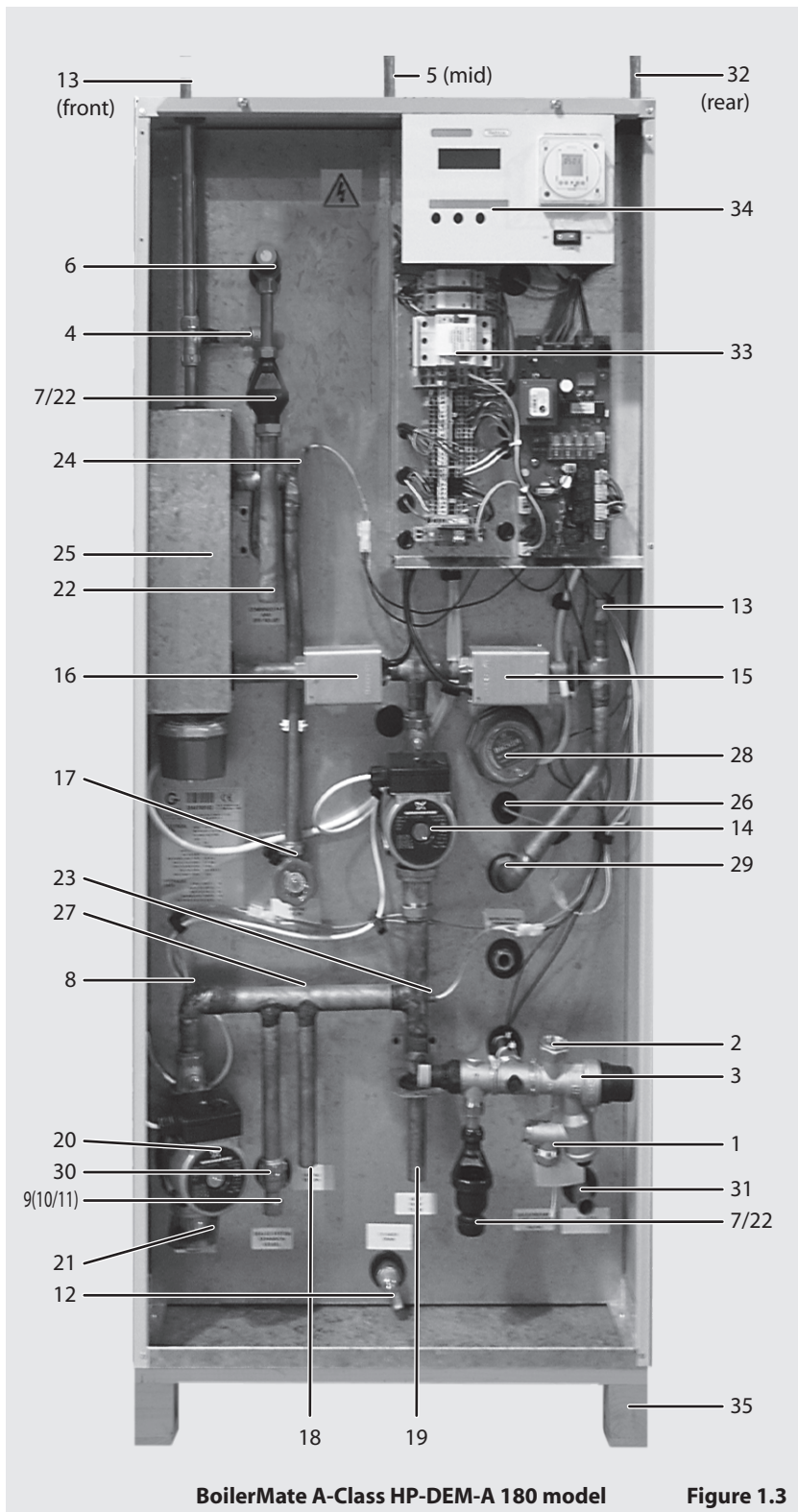
To comply with this requirement the hardness of the mains water should be checked by the installer and if necessary the optional factory fitted in-line scale inhibitor should be specified at the time of order for hardness levels between 200 and 300 ppm (mg/l).

Where the water is very hard ie 300ppm (mg/l) and above the optional polyphosphate type, inhibitor should be specified at the time of order. However, this will need to be fitted by the installer at a suitable point in the cold water supply to the appliance.

180 model

Factory Fitted/Supplied Components

- 1 Domestic mains cold water inlet connection - **see notes on page 12**
- 2 Balanced pressure cold water outlet connection
- 3 Combination inlet control valve - unvented store
- 4 Pressure relief (safety) valve - primary system
- 5 Expansion vessel connection - unvented store
- 5a Expansion vessel - unvented store - **see notes on page 12 & Figure 1.7**
- 6 Pressure and temperature relief valve - unvented store
- 7 Tundish
- 8 S5 sensor - heat pump return
- 9 Expansion vessel connection - primary system (Heat pump and heating circuit)
- 10 Expansion vessel/gauge - primary system - **see notes on page 12**
- 11 Temporary filling loop - primary system - **see notes on page 12**
- 12 Drain valve
- 13 Manual air vents - primary systems
- 14 Central heating (Zone 1)/hot water systems circulator (P2)
- 15 D.H.W. zone valve (energy cut out)
- 16 Central heating zone valve (Zone 1)
- 17 Central heating flow connection (Zone 1) - Isolating valve
- 18 Central heating return connection (Zone 1)
- 19 Flow connection (from heat pump)
- 20 Heat pump system circulator (P1)
- 21 Return connection (to heat pump)
- 22 Discharge pipe connection
- 23 S6 sensor - heat pump flow
- 24 S4 sensor - central heating flow (+ boost)
- 25 Electrical temperature boost assembly - central heating (Zone 1 only)
- 26 S3 sensor - hot water boost
- 27 Primary system manifold
- 28 Electrical temperature boost (hot water only)
- 29 Flow to hot water coil - unvented system
- 30 Return from hot water coil - unvented store
- 31 Domestic hot water outlet connection
- 32 Secondary domestic hot water return connection
- 33 Electrical control panel/printed circuit boards and connection terminals
- 34 User control panel and 2 channel clock
- 35 100mm high installation base
- 37 S7 external temperature compensation sensor
- 38 Fernox 'Boiler Buddy' in-line filter - **see notes on page 49**

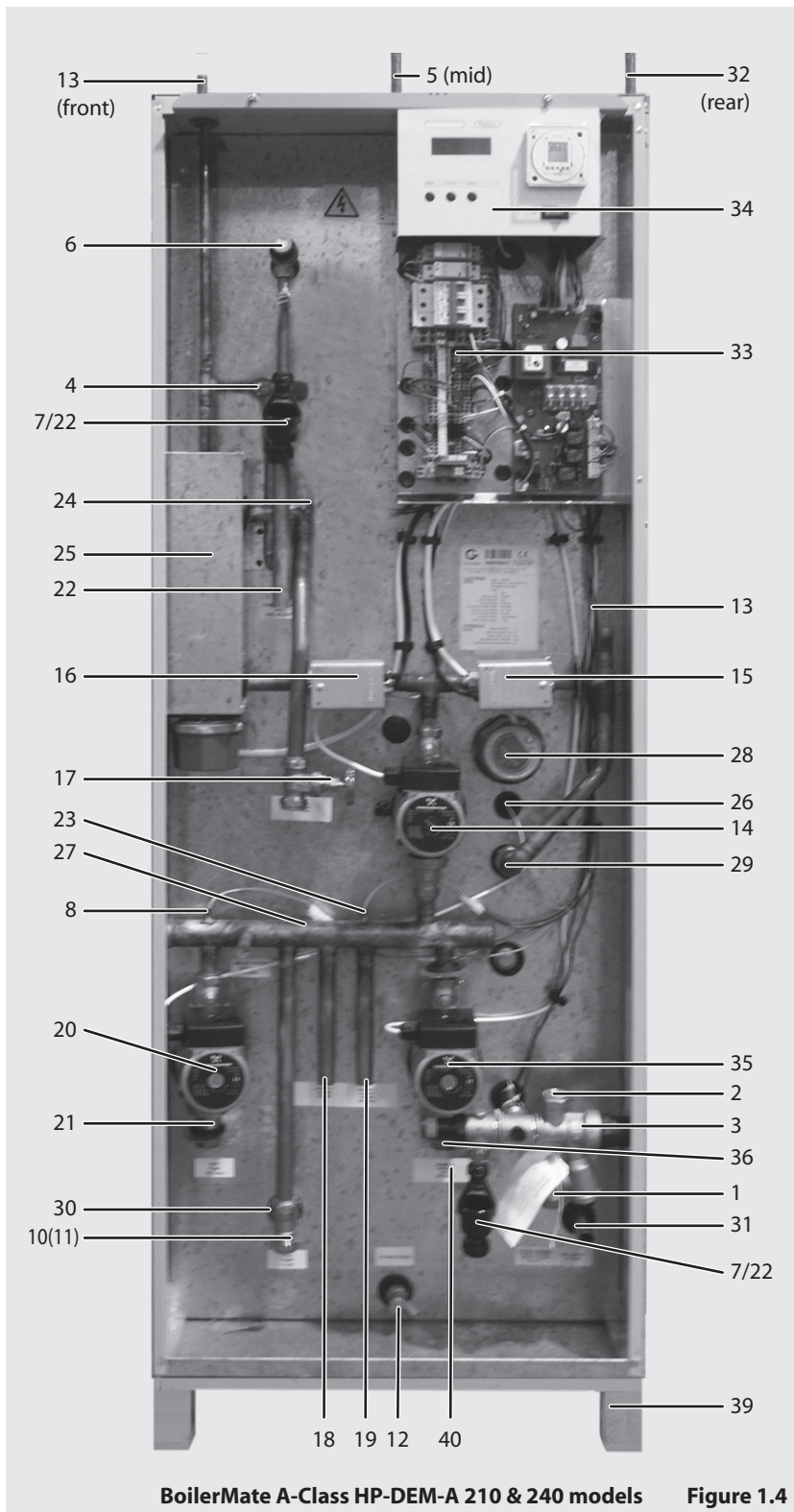


BoilerMate A-Class HP-DEM-A 180 model

Figure 1.3

Other Optional Equipment

- Hot and cold water manifolds for use with plastic pipework (Set 1 or 2).
- Electronic scale inhibitor for mains water services with hardness levels above 200ppm (mg/l) fitted in the appliance.
- Polyphosphate scale and corrosion inhibitor for mains water services with hardness levels above 300ppm (mg/l) for fitting on site by the installer.



BoilerMate A-Class HP-DEM-A 210 & 240 models **Figure 1.4**

210/240 models

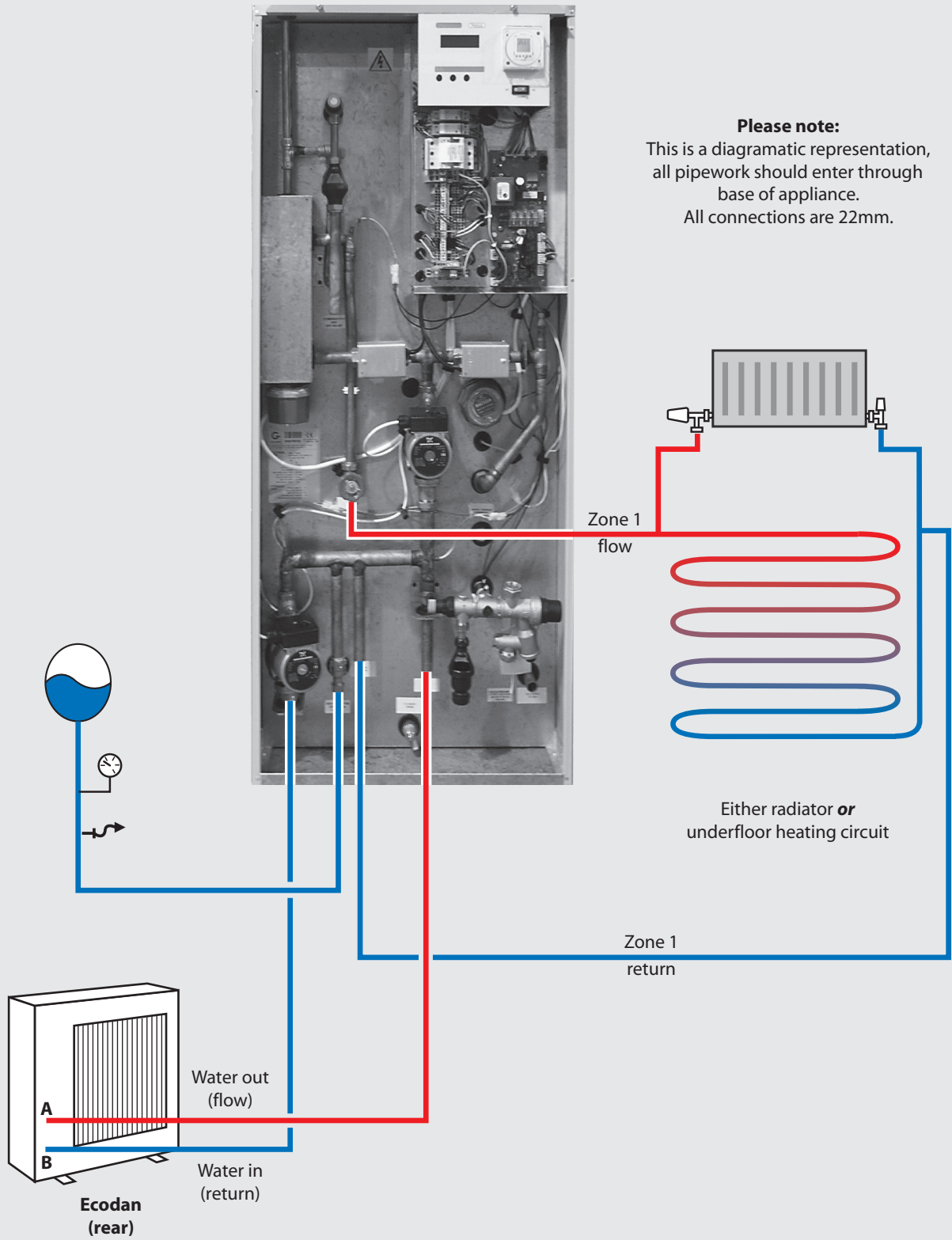
Factory Fitted/Supplied Components

- 1 Domestic mains cold water inlet connection - **see notes on page 12**
- 2 Balanced pressure cold water outlet connection
- 3 Combination inlet control valve - unvented store
- 4 Pressure relief (safety) valve - primary system
- 5 Expansion vessel connection - unvented store
- 5a Expansion vessel - unvented store - **see notes on page 12 & Figure 1.7**
- 6 Pressure and temperature relief valve - unvented store
- 7 Tundish
- 8 S5 sensor - heat pump return
- 9 Not used on this model
- 10 Central heating return (Zone 2) connection - expansion vessel/gauge - primary system - **see notes on page 12**
- 11 Temporary filling loop - primary system - **see notes on page 12**
- 12 Drain valve
- 13 Manual air vents - primary systems
- 14 Central heating (Zone 1)/hot water systems circulator (P2)
- 15 D.H.W. zone valve (energy cut out)
- 16 Central heating zone valve (Zone 1)
- 17 Central heating flow connection (Zone 1) - Isolating valve
- 18 Central heating return connection (Zone 1)
- 19 Flow connection (from heat pump)
- 20 Heat pump system circulator (P1)
- 21 Return connection (to heat pump)
- 22 Discharge pipe connection
- 23 S6 sensor - heat pump flow
- 24 S4 sensor - central heating flow (+ boost)
- 25 Electrical temperature boost assembly - central heating (Zone 1 only)
- 26 S3 sensor - hot water boost
- 27 Primary system manifold
- 28 Electrical temperature boost (hot water only)
- 29 Flow to hot water coil - unvented system
- 30 Return from hot water coil - unvented store
- 31 Domestic hot water outlet connection
- 32 Secondary domestic hot water return connection
- 33 Electrical control panel/printed circuit boards and connection terminals
- 34 User control panel and 2 channel clock
- 35 Central heating circulator (P3)(Zone 2)
- 36 Central heating flow connection (Zone 2)
- 37 S7 external temperature compensation sensor
- 38 Fernox 'Boiler Buddy' in-line filter - **see notes on page 49**
- 39 100mm high installation base
- 40 Non return valve

Other Optional Equipment

- Hot and cold water manifolds for use with plastic pipework (Set 1 or 2).
- Electronic scale inhibitor for mains water services with hardness levels above 200ppm (mg/l) fitted in the appliance.
- Polyphosphate scale and corrosion inhibitor for mains water services with hardness levels above 300ppm (mg/l) for fitting on site by the installer.

Primary System Pipework Connections for BoilerMate A-Class HP-DEM-A 180 Model Only



TECHNICAL DATA

Figure 1.5

Primary System Pipework Connections for BoilerMate A-Class HP-DEM-A 210 & 240 Models Only

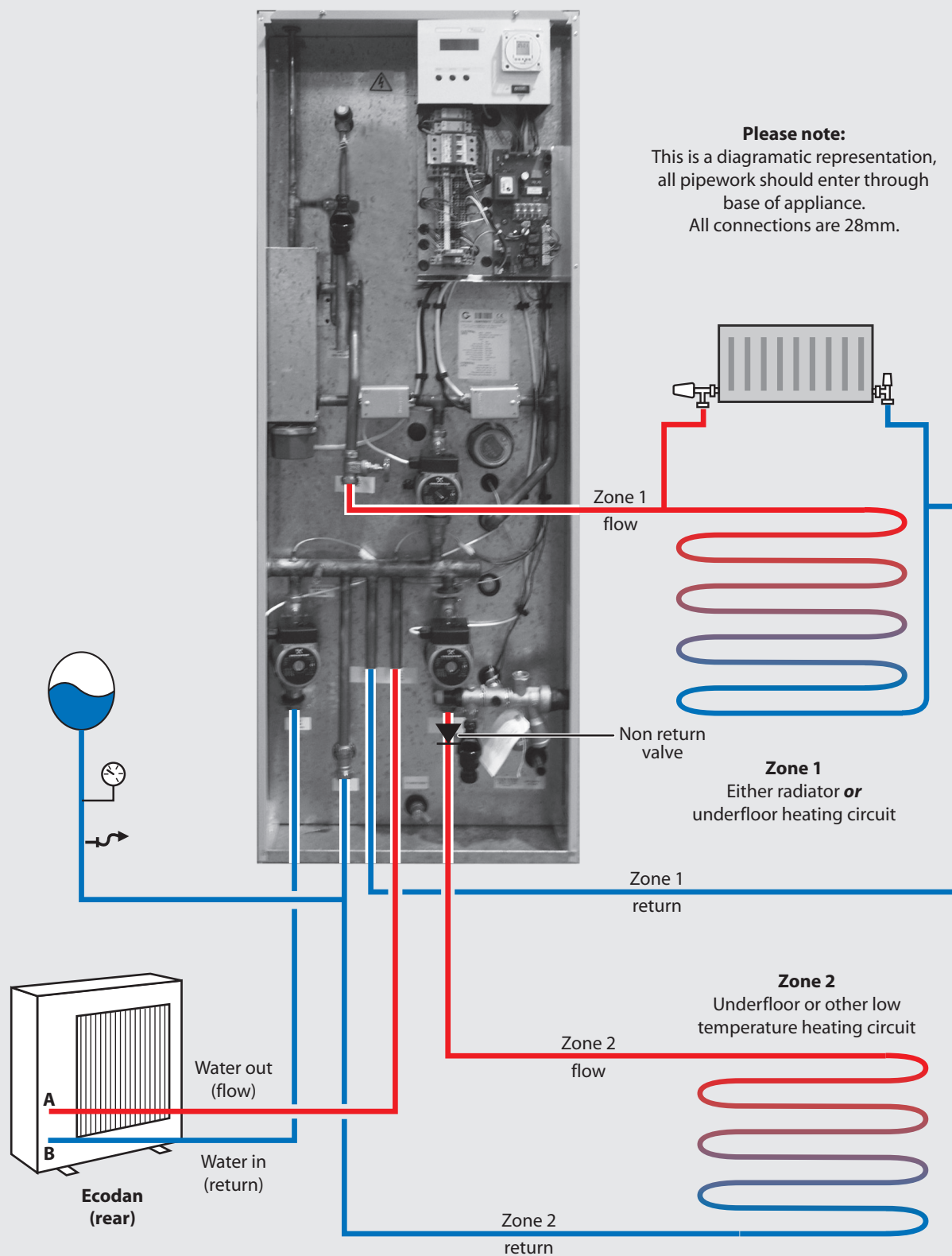


Figure 1.6

DESIGN

Notes:

Item 5a is supplied separately with the appliance (see Figure 1.7 and Table 1.1 below for details), complete with a fixing bracket.

Items 10 and 11 are available as an optional Primary Sealed System Kit at extra cost. If required, this should be ordered at the same time as the appliance (see Table 1.1 below for details). The expansion vessels are provided with a suitable fixing bracket.

Item 38 is supplied separately with the air source heat pump package for fitting internally in the heat pump return as near as possible to the heat pump, fully in accordance with the manufacturers instructions included later in this manual.

The appliance is available with the option of a factory fitted scale inhibitor, at extra cost. In this case the aerial is fitted on the 22mm cold inlet and the scale inhibitor PCB is fitted in the electrical panel/PCB area.



Figure 1.7

Primary and unvented store expansion vessel

Table 1.1

Expansion Vessels				
Model	Primary Expansion Vessel (Optional Extra)		Unvented Store Expansion Vessel (Supplied)	
	Capacity (l)	Size-each (mm) LxDiam	Capacity (l)	Size-each (mm) LxDiam
BMA 180 HP-DEM-A	12	270 x 270	18	400 x 270
BMA 210 HP-DEM-A	12	270 x 270	18	400 x 270
BMA 240 HP-DEM-A	18	400 x 270	25	440 x 290

The size of the primary system expansion vessel has been calculated using typical design criteria for the maximum recommended heating load shown in Table 1.2. However, the size should be checked and confirmed as being accurate by the system designer/installer.

TECHNICAL DATA

Table 1.2

Technical Data				
Model		BMA 180 HP-DEM-A	BMA 210 HP-DEM-A	BMA 240 HP-DEM-A
Nominal domestic hot water storage volume (litres)		145	171	215
Overall app. dimensions (mm)	(Height x Width x Depth)	1370 x 595 x 595	1600 x 595 x 595	1950 x 595 x 595
Minimum recommended cupboard dimensions (mm)	(Height x Width x Depth)	1970 x 700 x 600 ⁽¹⁾	2200 x 700 x 600 ⁽¹⁾	2250 x 700 x 600 ⁽¹⁾
Weight (kg)	(Empty / Full)	87 / 232	103 / 274	114 / 329
Unvented store expansion vessel	Type: Varem	1 Off ⁽²⁾		
	Total nominal volume (litres)	18		25
	Charge pressure (bar)	1.5		
Heat pump circuit circulating pump P1		Grundfos UPS 15-50		
System circulating pump P2 (HW and Zone 1 CH)		Grundfos UPS 15-50		
Circulating pump P3 (Zone 2 CH)		---	Grundfos UPS 15-50	
HW circuit zone valve - type Honeywell V4043		22mm		
CH circuit zone valve - type Honeywell V4043		22mm		
Electrical data for BoilerMate HP-DEM-A	Supply: 230V AC, 50Hz rated at	6.5kW		
	Main supply circuit breaker	32A type B		
	Internal protection: Immersion heaters	2 x 16A MCBs (Type B)		
	Internal protection: Control circuit	1 x 6A MCB (Type B)		
	Internal protection: Heat pump L.V. control signal (12VDC signal)	1 x 100mA 20mm glass cartridge fuse (+ spare)		
Control & overheat safety thermostat temperature settings	HW boost immersion heater	S1/S2 safety sensors ⁽³⁾		
	P & T valve	90°C		
	CH boost immersion heater	Control thermostat ⁽⁵⁾ : 65°C, Overheat thermostat ⁽⁴⁾ : 85°C		
Control/relief valve pressure set points	Mains inlet pressure regulator	1.5 bar		
	Expansion relief valve (CW)	3.0 bar		
	Expansion relief valve (CH)	3.0 bar		
	P & T valve	4.0 bar		
Maximum hot water flow rate		25-35		
Dwelling type	Bedrooms	2-3	3-4	3-4
	Bathrooms	1	1	2
	En-suite	1	2	1
Maximum design heating load	5.0 kW, PUAZ-W50VHA	5kW	---	
	8.5 kW, PUAZ-W85VHA	8.5kW		
	14.0 kW, PUAZ-W140VHA	---	14kW	
Electrical backup for heating and hot water		6kW		
<p>(1) The sizes shown allow for the unvented store expansion vessel to be fitted above the appliance in the case of the 180 and 210 models, but assume that the optional primary sealed system kit will be fitted elsewhere. The dimensions for the 240 model assume both the unvented store and primary expansion vessels will be fitted elsewhere due to the height of the appliance itself. Clear access 650 deep will be required in front of the whole of the appliance for future maintenance.</p> <p>(2) Supplied loose - To be fitted by installer in a suitably accessible location.</p> <p>(3) Temperature is automatically controlled by the controller sensors S1/S2.</p> <p>(4) Not adjustable - Manual reset type.</p> <p>(5) Temperature is automatically controlled by the controller sensor therefore should not be set lower than 65°C.</p>				

Control Parameters and Sensor Default Temperature Settings

These are shown later in this manual under Front Panel Controls.

Model Selection Data

General guidance is given in Table 1.2.

When checking the suitability of the heat pump we recommend that the heat losses of the external building fabric plus half of the ventilation losses are directly compared to the Ecodan model heat pump output of 5kW, 8.5kW and 14kW.

If design calculations are carried out in the normal way, using the method set out in BS5449. The Ecodan heat pump will cope with heating systems in which boiler sizes calculated in this way are rated at up to a maximum of 6kW, 12kW and 16kW.

As the BoilerMate A-Class HP-DEM-A is a hot water storage appliance, we recommend that the model size of the appliance is chosen by calculating the hot water volume in the normal way using the criteria set out in BS 6700 / NHBC for storage appliances.

Electricity Supply

One mains supply rated at 32A, 230V~, 50Hz is required for the internal BoilerMate HP-DEM-A.

Minimum external fuse rating and the main supply cable ratings are given in Table 1.2 Technical Data section of this manual. This appliance **MUST BE EARTHED**.

All external wiring to the appliance must be in accordance with the latest I.E.E. Wiring Regulation, and any local regulations which may apply.

The appliance shall be supplied from a suitably rated double pole isolator with a contact separation of at least 3mm in both poles.

This must be suitably labelled, provide complete electrical isolation and be within 1 metre of the BoilerMate A-Class HP-DEM-A Unit.

In the event of an electrical fault after installation of the appliance, preliminary electrical checks must be carried out i.e. Earth Continuity, Short Circuit, Polarity, and Resistance to Earth.

Appliance Location

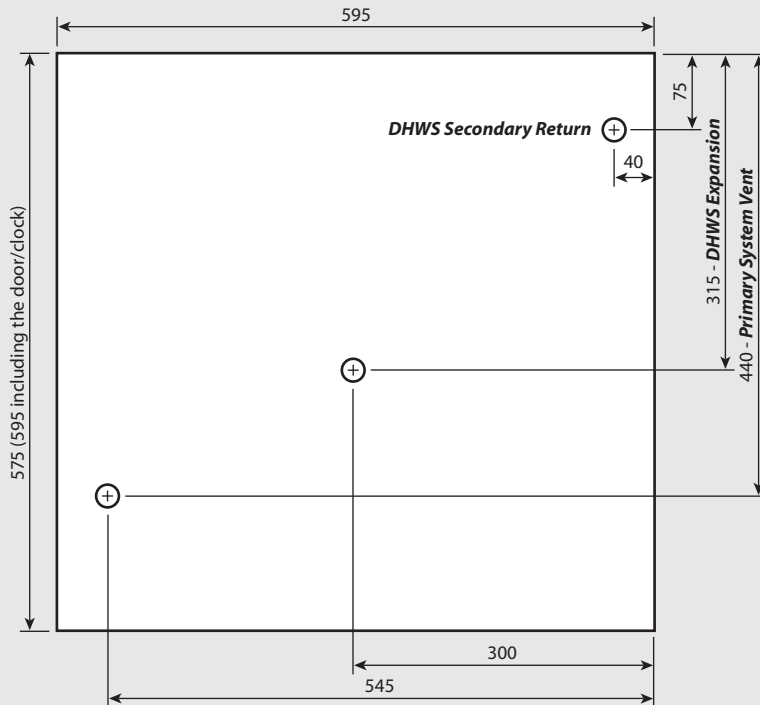
The BoilerMate A-Class HP-DEM-A appliance must be installed on a flat surface which is capable of supporting the weight of the appliance and any other ancillary equipment. (The full weight must be used, see table 1.2 on page 13).

The appliance sizes and the minimum cupboard dimensions are shown in Table 1.2. A minimum of 600mm is required in front of the appliance for maintenance purposes. (See figures 1.3 and 1.4 on pages 8 and 9).

The appliance is designed to be installed on the timber plinth supplied with the appliance.

Details of the various electrical and pipework connections required are shown in Figures 1.3 and 1.4.

180 Model Connection Details/Dimensions - Top



180 Model Connection Details/Dimensions - Bottom

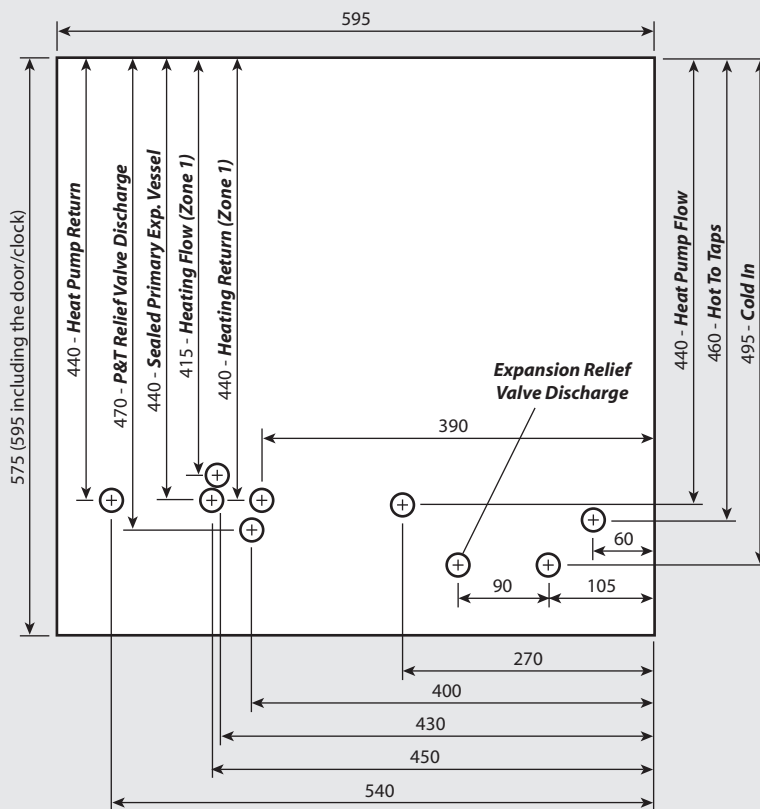


Figure 1.9

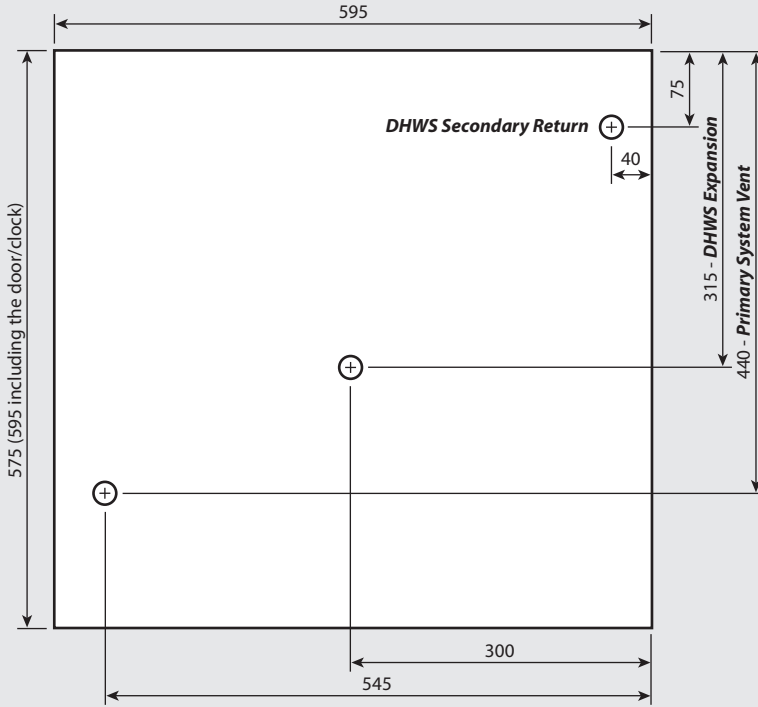
180 Model Connection Details/Dimensions

Diagram opposite show the connection details and dimensions for the BoilerMate A-Class HP-DEM-A 180 model.

The BoilerMate A-Class HP-DEM-A units are supplied on an installation base to allow the pipe runs to connect to the appliance from any direction. It is easier if all pipes protrude vertically in the cut out area shown. Compression or push fit connections can be used. All pipe positions are approximate and subject to a tolerance of +/-20mm in any direction.

Note: All dimensions are shown in mm and are to the centre line of pipework/gland.

210/240 Models Connection Details/Dimensions - Top



210/240 Models Connection Details/Dimensions - Bottom

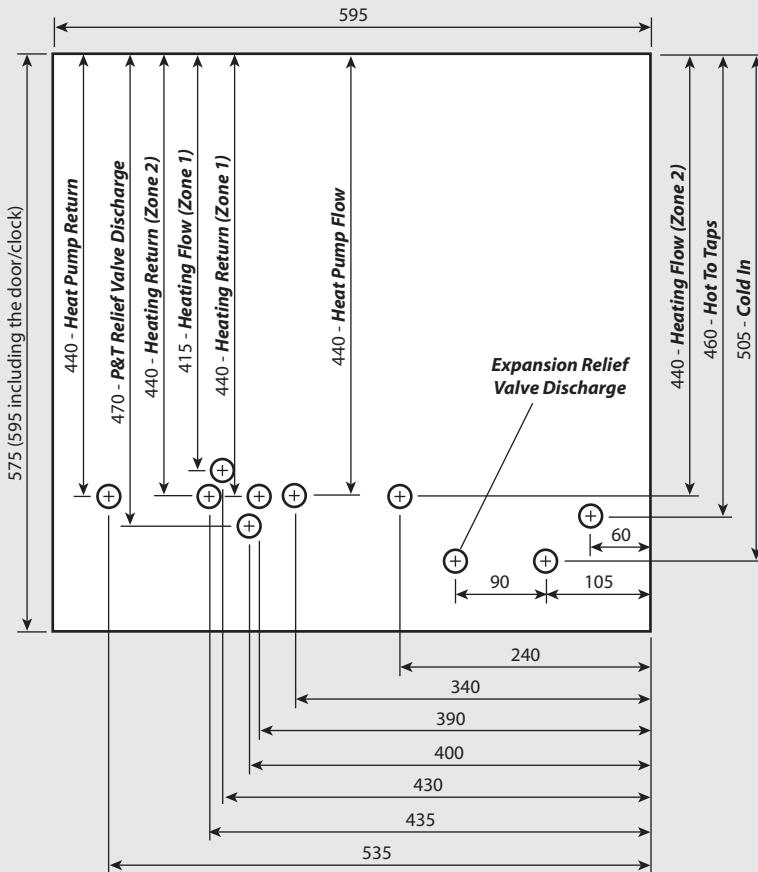


Figure 1.10

210/240 Model Connection Details/Dimensions

Diagram opposite show the connection details and dimensions for the BoilerMate A-Class HP-DEM-A 210/240 models.

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Note: All dimensions are shown in mm and are to the centre line of pipework/gland.

Hot and Cold Water System

All recommendations with regard to pipe work systems in this manual are generally based on the use of BS/EN Standard copper pipework and fittings.

However a plastic pipework system can be used in place of copper internally as long as the chosen system is recommended by the manufacturer for use in cold and hot water systems and is designed and installed fully in accordance with their recommendations.

It is also important that if an alternative pipework material/system is chosen, the manufacturer confirms that the design criteria for the new system is at least equivalent to the use of BS/EN Standard copper pipework and fittings or larger pipe sizes are considered.

In these appliances the mains inlet pressure regulating valve is set to 1.5 bar and this setting **MUST NOT** be adjusted. **Therefore the flow rate from the appliance depends upon the resistance of the hot water supply network, capacity of the incoming mains and the characteristics of the pressure regulating valve**

Mains Cold Water Supply

The BoilerMate A-Class HP-DEM-A appliance is designed to be connected directly to the mains. The combination inlet valve incorporates the required check valve. The hot water flow rate achievable is directly related to the adequacy of the cold water mains serving the property. For this reason the cold water supply to the dwelling must be capable of providing for those services which could be required simultaneously and this maximum demand should be calculated. Also if a water meter is fitted its nominal rating should match the anticipated maximum simultaneous hot and cold water demand calculated in accordance with BS 6700. This could be 60 litres per minute in some properties. 30 litres per minute is the minimum flow rate which is recommended for an adequate mains pressure system to any property.

The Building Regulations L1A: New dwellings/L1B: Existing dwellings and the requirements set out in the Domestic Heating Compliance Guide specify that "where the mains water hardness exceeds 200ppm provision should be made to treat the feed water to water heaters and the hot water circuit of combination boilers to reduce the rate of accumulation of lime scale"

To comply with this requirement the hardness of the mains water should be checked by the installer and if necessary the optional factory fitted in-line scale inhibitor should be specified at the time of order for hardness levels between 200 and 300 ppm (mg/l).

Where the water is very hard ie 300ppm (mg/l) and above the optional polyphosphate type, inhibitor should be specified at the time of order. However, this will need to be fitted by the installer at a suitable point in the cold water supply to the appliance.

The combination valve fitted to the BoilerMate A-Class HP-DEM-A unit incorporates a pressure regulating valve set to provide a static operating pressure of 1.5 bar. On this basis there must be at least 2.0 bar pressure at the inlet to the appliance. This pressure must be dynamic (not static) and be available at the appliance when local demand is at its maximum. For optimum performance, and for larger properties, we would recommend that the dynamic pressure is in the range of 2.5 - 3.5 bar.

The combination valve also incorporates an expansion relief valve. The discharge from this can be connected into the discharge pipe from the P & T valve. Further details of how to treat this discharge are provided later in this manual.

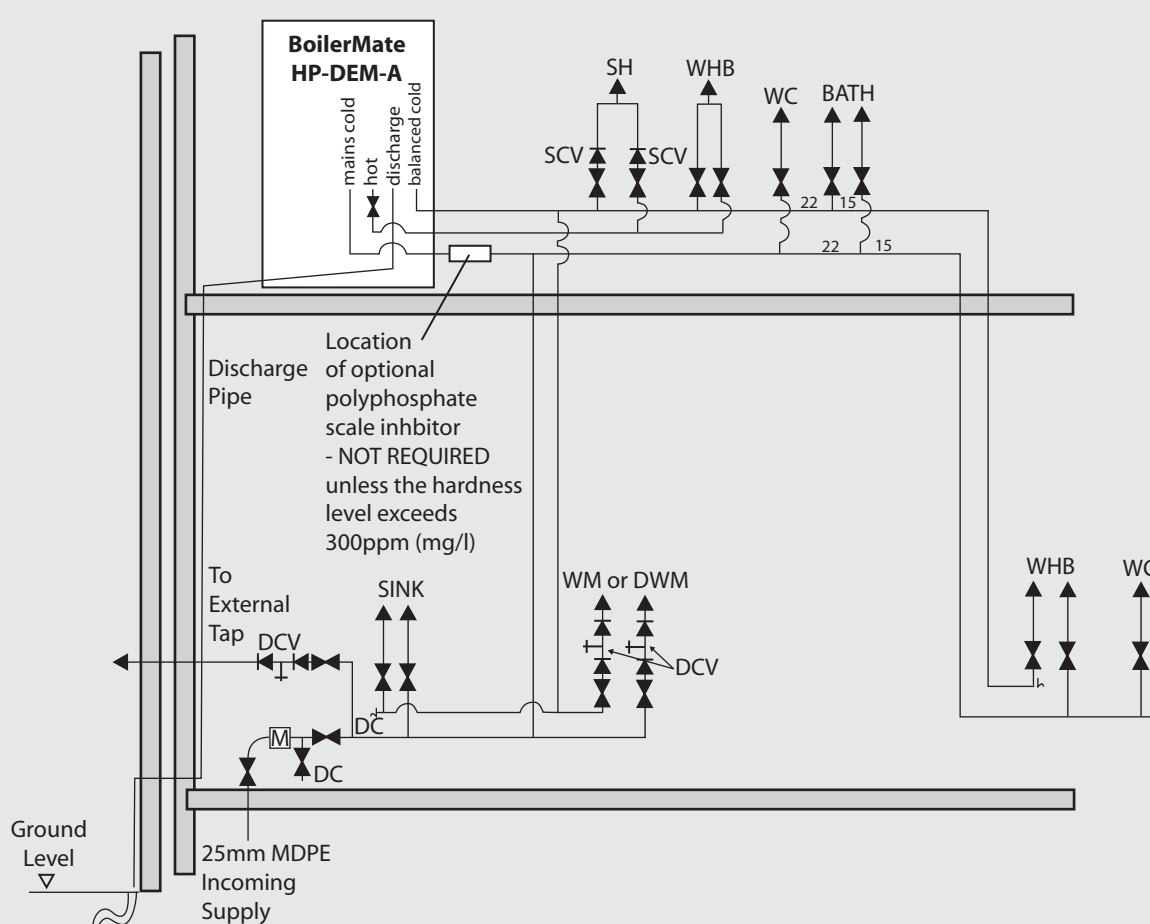
As a general guideline, if a good pressure is available, a 15mm service may be sufficient for smaller dwellings with one bathroom. However a 22mm service (25mm MDPE) is recommended and should be the minimum for larger dwellings, or where only the minimum recommended pressure is available.

If the incoming mains pressure exceeds 6 bar at any time in a 24 hour cycle then a pressure regulating valve set at 3.5 bar should be fitted downstream of the stop tap where the cold supply enters the property.

Equipment used in the system should be suitable for a working pressure of up to 5 bar.

Cold and Hot Water Distribution Network

- As a minimum it is recommended that the cold supply to the appliance internally is run in 22mm copper (or equivalent in plastic) and then from the appliance, hot and cold services are in 22mm past the draw-off to the bath. For large properties bigger sizes will be necessary and these should be proved by calculation in accordance with BS6700. It is recommended that flow regulators are provided in the branch to each terminal fitting (or in the fitting itself) to ensure best use is made of the available pressure/flow.
- The highest hot or cold water draw-off point should not exceed 4 metres above the combination inlet valve fitted to the appliance.
- In average size dwellings, the cold water supply to any mixer fittings (other than dual outlet fittings) should be taken from the balanced cold outlet connection on the combination valve fitted to the appliance. However, in larger dwellings with a number of bathrooms and en-suites and/or long pipe runs, the balanced cold supply must be provided with its own pressure regulating valve (set at the same pressure as the one provided with the appliance ie 1.5 bar static) and not taken from the appliance. When a separate pressure regulating valve is used for the balanced cold water supply, it is recommended that a small expansion vessel (0.25 - 0.5 litre) is fitted after the pressure regulator to accommodate the pressure rise caused by the increase in temperature of the balanced cold water.
- If the supply to the mixer fittings (other than a dual outlet type) is not taken from the balanced supply the system will become over pressurized and cause the pressure relief valve to discharge. Over time this could also cause the premature failure of the appliance itself which will not be covered by the warranty.**
- Whenever possible the hot and cold water supply to a shower-mixing valve should be the first draw-off point on each circuit.
- It is important that the mains cold water pipe work is adequately separated from any heating/hot water pipe work to ensure that the water remains cold and of drinking water quality.



Typical cold and hot water network (to a smaller property)

Cold supplies to single taps taken from the mains cold water system.

Cold supplies to mixer taps only to be taken from the balanced cold water connection on the combination valve or in larger property/minimum pressure situation from a separate pressure reducing valve.

Figure 1.11

Taps and Shower Fittings

- a. Ensure that all terminal fittings are suitable for mains pressure in the range of 0.5 - 1.5 bar. Use aerated taps whenever possible to prevent splashing.
- b. Any type of shower mixing valve can be used as long as both the hot and cold supplies are mains fed. However, all mains pressure systems are subject to dynamic changes particularly when other hot and cold taps/showers are opened and closed, which will cause changes in the water temperature at mixed water outlets such as showers. For this reason and because these are now no more expensive than a manual shower we strongly recommend the use of thermostatic showers with this appliance.
The shower head provided must also be suitable for mains pressure supplies.
If it is proposed to use a 'whole body' or similar shower with a number of high flow/pressure outlets please discuss with the Gledhill technical department.
- c. Note that the shower fittings must comply with the backflow prevention requirements (Para 15, Schedule 2) of the Water Supply Regulations.
- d. A bidet can be supplied from the BoilerMate A-Class HP-DEM-A appliance as long as it is of the over rim flushing type and incorporates a suitable air gap.

Dead Leg Volumes and Secondary Hot Water Circulation

If the dead leg volume of the hot water draw-off pipework is excessive and the delivery time for hot water to be available at the tap is more than 60 seconds you may consider using:-

- a. Trace heating such as the 'Raychem HWAT' system. Please call Gledhill technical department for further details.

OR

- b. A secondary hot water circulation system as shown schematically in figure 1.12.

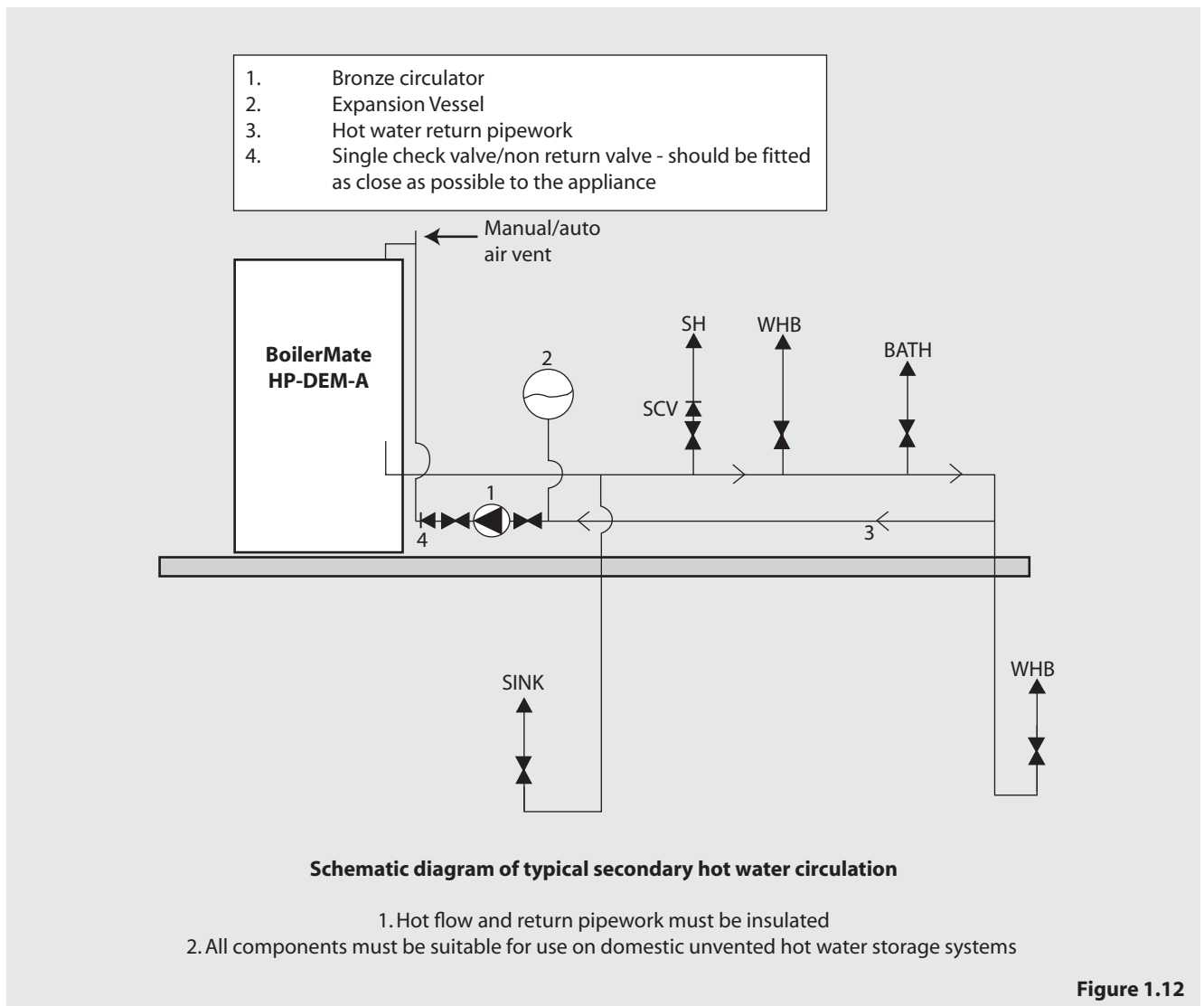


Figure 1.12

Heat Pump/Space Heating System Design

General

Warning: BoilerMate A-Class HP-DEM-A is an unvented hot water storage appliance and therefore it is not suitable for use with a solid fuel boiler, steam or any other uncontrolled heat source.

The BoilerMate A-Class HP-DEM-A is designed to be sold as part of a package with the Mitsubishi Electric Ecodan air source heat pump. The combination of the BoilerMate A-Class HP-DEM-A and the Mitsubishi Electric Ecodan air source heat pump has been the subject of independent testing by BRE and a report is available on request.

The heating system design and installation must comply with the requirements of BS 6798 and BS 5449 for the performance parameters chosen for the system.

Plastic Pipework

All recommendations with regard to pipework systems in this manual are generally based on the use of BS/EN Standard copper pipework and fittings. However plastic pipework can be used in place of copper internally as long as it is recommended by the manufacturer and installed fully in accordance with their recommendations. Barrier type plastic pipework should always be used for these systems.

It is important to ensure that if the system is to be installed using plastic pipework it is designed and sized using the parameters for plastic pipework.

Selection/Heat Pump Sizing

General model selection guidance is given in Table 1.2 Technical Data.

Heat Pump Primary Circuit

The flow and return from the heat pump must run directly to the connections provided on the BoilerMate A-Class HP-DEM-A appliance.

A Fernox Boiler Buddy is provided as part of the package and this **must** be fitted internally on the return circuit as close as practical to the heat pump unit fully in accordance with the manufacturers instructions included later in this manual.

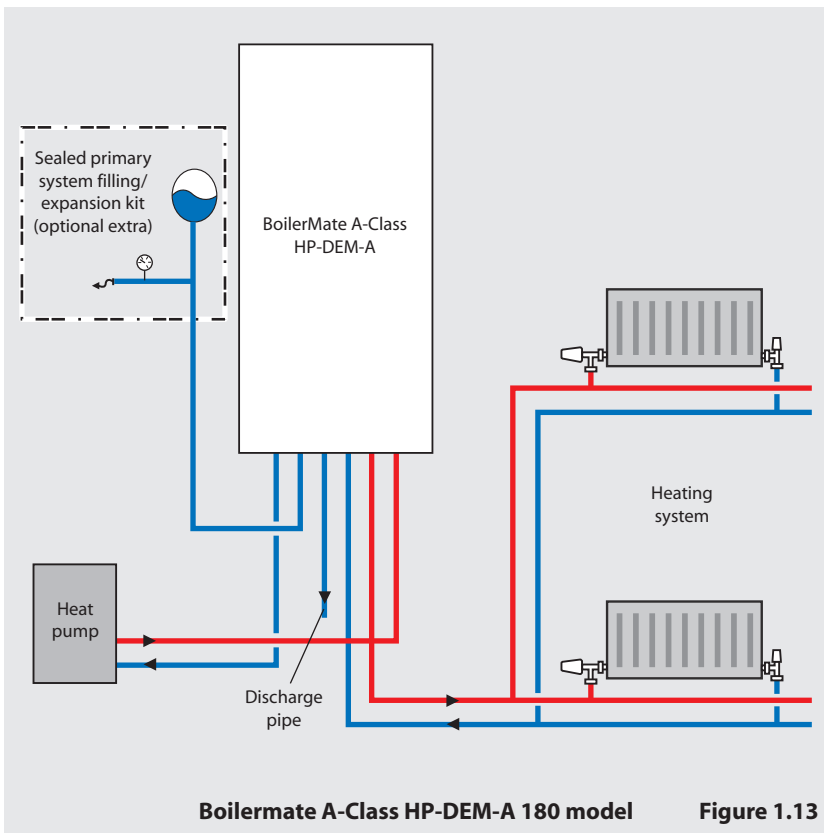
Central Heating Circuits

These should be sized in the normal way to suit the flow and return temperatures for the system chosen. The flow and return pipework should be connected directly to the connections provided.

If the heat pump/BoilerMate A-Class HP-DEM-A appliance is being fitted to an existing heating system, this **must** be thoroughly flushed/cleaned before the appliances are fitted.

Summer Towel Rail Circuit

If a separate summer towel rail circuit is required, this and the zone 1 CH circuit will need to be arranged as separate zones complete with their own time and temperature controls. Channel 2 on the clock provided on the appliance will then need setting to constant (continuous) operation mode. The wiring should be taken from the zone 1 room thermostat terminals. For further details, please contact the Gledhill Technical Helpline on 08449 310000.



Note: With the 210/240 models, the sealed primary system filling/expansion kit will need to be connected to the Zone 2 return connection or branched into the return pipework.

Frost Protection

The BoilerMate A-Class HP-DEM-A appliance should not be installed in a location where the contents could freeze. Suitable precautions should be taken to protect the heat pump/pipework as recommended in the heat pump section of this manual.

User Controls

A 2 channel digital programmer is fitted to the front of the appliance. A separate external room thermostat will normally be required for the central heating.

Heating System Bypass

Automatic bypass valves will be required in the heating systems if it is proposed to fit thermostatic radiator valves (TRV's) to all radiators or fit zone valves to control all the separate heating circuits. To meet the requirements of Building Regulations for a boiler interlock, it is recommended that the radiator in the area where the room thermostat is installed should be fitted with lock shield valves on both connections.

Appliance Primary Pipework/Coil Volumes

When calculating the total system volume, allow 10 litres for the primary pipework/coils within the appliance.

Sealed System Kit For The Central Heating System

An optional sealed system kit as follows can be supplied with the BoilerMate A-Class HP-DEM-A.

- Pressure gauge (0 – 4 bar)
- Primary expansion vessel charged to 1.0 bar, (Size depends upon the model, see Table 1.1)
- WRAS approved primary system filling loop

External Temperature Compensation Sensor

This is supplied connected to 10 metres of cable which is coiled and cable tied to the pipework at high level in the appliance and will need to be mounted on an external wall and wired back to the BoilerMate A-Class HP-DEM-A appliance using the cable supplied. The sensor shall be located in a position which is not unduly affected by wind/direct sunlight etc. On this basis a sheltered location on a north facing wall is recommended.

DESIGN

Front Panel Controls

The front panel user controls are shown in the picture opposite and their functions are described below.

Different windows can be accessed in the visual display panel on the front of the appliance to indicate various temperatures and fault conditions.

2 Channel Clock

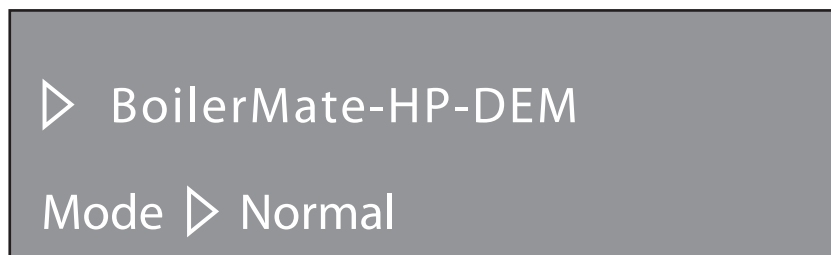
A 2 channel Grasslin clock is provided to allow separate control of the hot water and heating requirements in accordance with the latest Building Regulations. Details of how to set the clock are provided on the User label and in the User Instructions.

Channel 1 controls the operating times for the domestic hot water heating circuit. This should normally be set to constant to allow the hot water to be available 24 hours a day.

Channel 2 controls the operating times for the zone 1 central heating circuit and should be set to suit the householders lifestyle.

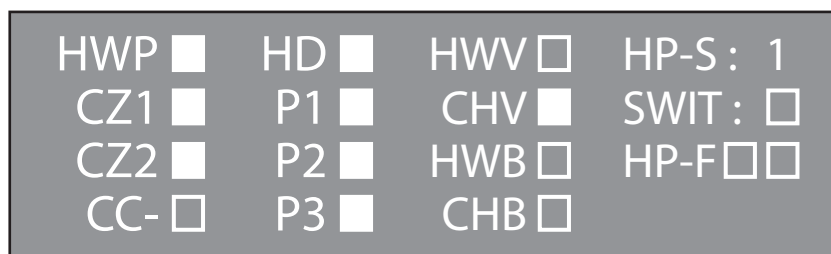
Note: Electrical connections are provided on the terminal strip for a room thermostat. With the two larger models, separate time and temperature controls such as a remote programmable room thermostat will be required for the zone 2 central heating circuit. Electrical connections are also provided for this on the terminal strip.

Normal Operating Display Window (1)



In normal automatic heat pump operation the display will be as shown opposite.

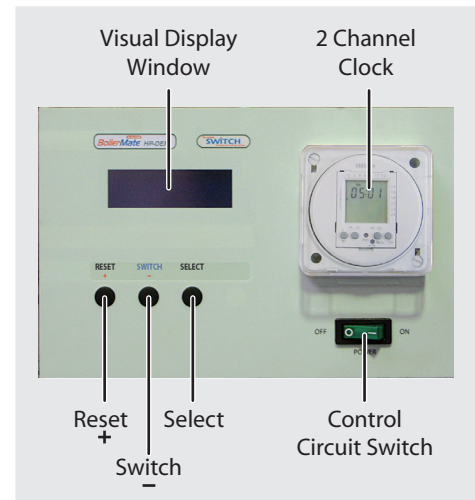
Current System Control/Demand Window (2)



If you need to check the current demands on the system, you can select the above window by pressing the Select button when the Normal Operating Window is displayed. The display will be shown as above.

If there is a demand, the square will be solid. The display opposite shows the condition if the heat pump is providing heat at the hot water store. The only exception to this is HP-F which will indicate a heat pump fault condition. If the square goes solid, a full description of each of the individual displays is as follows.

- HWP** - Hot water - built in clock (channel 1)
- CZ1** - Central heating zone 1 - built in clock (channel 2)



- CZ2** - Central heating zone 2 - remote clock / programmable room thermostat (if provided)
- CC** - Comfort cooling (not currently used)
- HD** - Heat pump demand
- P1** - Heat pump pump
- P2** - System - hot water / zone 1 central heating pump
- P3** - Central heating pump - zone 2
- HWV** - Hot water store zone valve
- CHV** - Central heating zone valve - zone 1
- HWB** - Hot water store boost heater
- CHB** - Central heating boost heater - zone 1
- HP-S** - Heat pump stage (1-7) - increases with power output
- SWIT** - 'Switch' emergency backup system
- HP-F** - Heat pump fault - refer to the trouble shooting section of the manual if one or both of the squares are shown solid

Note: The will show solid when the controls place a call on the appliance or indicates a fault condition in the case of HP-F only.

Current Appliance Condition Window (3)

s1 : 60°C	s5 : 41°C	P1 : 25
s2 : 60°C	s6 : 44°C	P2 : 255
s3 : 54°C	s7 : 4°C	P3 : 255
s4 : 41°C	CH-IH <input type="checkbox"/>	HW-IH <input type="checkbox"/>

The actual temperature at each of the sensors, the condition of the pumps and the boost heaters can be viewed by pressing the select button when the Current System Status Window is displayed (or return to the Normal Operating Display Window and press the Select button twice). The display will be as shown above.

The display shows a typical condition if the heat pump is running to provide hot water to the store and the central heating is not on. A full description of each of the individual displays is as follows.

- S1** - Hot water store overheat sensor
- S2** - Hot water store overheat sensor
- S3** - Hot water store control sensor
- S4** - Central heating control sensor - zone 1
- S5** - Heat pump return control sensor
- S6** - Heat pump flow control sensor
- S7** - External temperature compensation sensor
- CH-IH** - Central heating boost heater - zone 1 - solid when active
- P1** - Heat Pump pump (shows speed 0-255)
- P2** - System pump - hot water store / zone 1 central heating (shows speed 0-255)
- P3** - Central heating pump - zone 2 (shows speed 0-255)
- HW-IH** - Hot water store boost heater - solid when active

Note: The will show solid when the boost heater is on

Active Commissioning / Set Point Display Window (4)

HP : 3	2F : 50	H1 : 50HBY
ST : 8	2R : 45	H2 : 45
1F : 58	TD : 3	HL : 35
1R : 56	DE : 60	HW : 60WBY

The system defaults/set points have been factory set to suit the BoilerMate HP/Ecodan Heat Pump Package and should not normally need changing. However, if this is required to suit unusual system conditions, this can be done in the above window which can be viewed by pressing the Select button when the Current Appliance Condition Window is displayed (or return to the Normal Operating Display Window and press the Select button three times).The display will be shown as above.

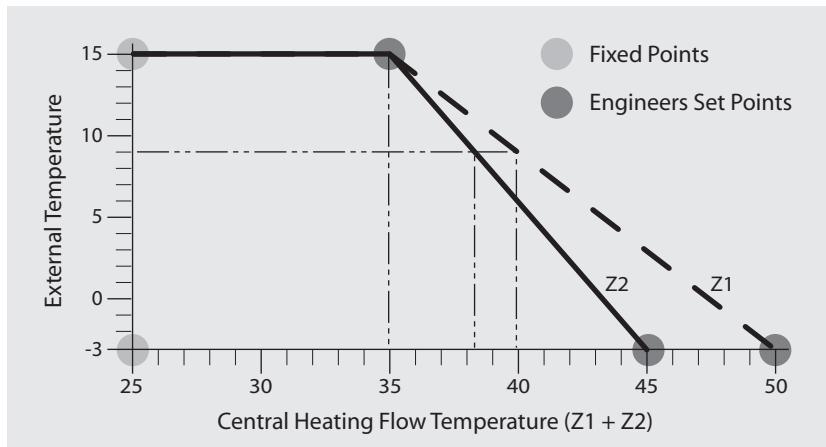
The display shown above shows the factory set default values for the BoilerMate HP/Ecodan package.

- HP3** - Indicates to the BoilerMate HP appliance the type of Heat Pump being used and must show 3 for the Ecodan Heat Pump. (Multistage:3 , two stage:2 and single stage:1).
- ST8** - Indicates the maximum number of stages that the Heat Pump will be allowed to operate at.
- 1F58** - Indicates the control temperature for the Heat Pump flow sensor (S6) for the BoilerMate HP/Ecodan package.
- 1R56** - Indicates the control temperature for the Heat Pump return sensor (S5) for the BoilerMate HP/Ecodan package.
- 2F50** - Indicates the control temperature for the Heat Pump flow when the BoilerMate HP is used with other types of heat pump ie. HP:2 or HP:1 and is therefore not relevant to this package.
- 2R45** - Indicates the control temperature for the Heat Pump return when the BoilerMate HP is used with other types of heat pump ie. this is not relevant to this package.
- TD3** - Indicates the hysteresis of the HP control sensors.This can be increased up to 5°C if necessary to suit site conditions.
- DE60** - Indicates the pump override time in seconds,once the HP control demand is satisfied and should not normally need to be changed.
- H1 50HBY** - Indicates the maximum control temperature for the zone 1 central heating system.'HBY'indicates that the heating boost facility is enabled but this can be disabled by changing this to 'HBN' as described later in this manual.

Note: If zone 1 and zone 2 central heating controls are both calling and the supply temperature to zone 1 is higher than the set point for zone 2, the temperature in zone 2 may become higher than the set point before the zone 2 pump is switched off.

- H2 45** - Indicates the maximum control temperature for the zone 2 central heating system.
- HL 35** - Indicates the lowest control temperature for the zone 1 and zone 2 central heating circuits.This is used in conjunction with the external temperature compensation sensor to modulate the central heating flow temperatures to achieve the maximum COP possible for any given outside air temperature. As can be seen from the graph shown on the opposite page, the maximum zone 1 flow temperature of 50°C will only be possible if the outside temperature is -3°C or below. However, if the outside temperature is, for instance, 9°C the maximum flow temperature will automatically be controlled to 40°C. Similarly with zone 2, at an outside temperature of 9°C, the maximum flow temperature will automatically be controlled at 38°C.

Above an external temperature of 15°C the flow temperature will be at the minimum of 35°C. In practice at these temperatures and above, it is unlikely in modern well insulated properties that any heating will be required.



HW 60HBY- Indicates the control temperature for the hot water store (measured at the top of the store (S1/S2)).

Note: It is recommended in BS 6700 and Section 8 of the NHBC Standards that the hot water is stored at a minimum temperature of 60°C to prevent problems with legionellae. If a lower hot water temperature is required at the terminal fitting, it is recommended that a suitable thermostatic mixing valve is fitted adjacent to the terminal fitting.

'WBY' indicates that the water boost facility is enabled but this can be disabled by changing this to 'WBN' as described later in this manual.

How To Change A Factory Pre-set Default Value

If the factory pre-set default values need to be changed, this can be done as follows:

- Press and hold for 2 seconds the + (Reset) button until the front part of the display (HP:) starts to flash.
- Press the + (Reset) button to move through the display to the one you require. The selected part of the display will flash.
- To change the default value for the selected items, press and hold the + and - buttons simultaneously for 5 seconds. The default value (3) will then flash.
- Press + or - to change the default value up or down.
- Once the correct value has been chosen, press the Select button to commit the change.
- If you need to change the 'Y' in H1:50HBY or in H1:60HBY you will need to scroll until HW: is flashing. Then press the + (Reset) button again and the 'Y' will flash in both the above locations. Once the 'Y' is flashing, pressing the - (Switch) button will allow you to move through a number of options;
 - pressing once will change it to HBN/WBY
 - pressing again will change it to HBY/WBN
 - pressing the + (Reset) will allow you to move back through each of the above to HBY/WBY.

When the required display is shown, press the Select button to commit the change and then press Select again to exit the display window.

Note: Once committed, the values will be retained, but if the circuit board is changed for any reason, this will be provided with the normal factory pre-set values. These will need to be changed as necessary following the procedure outlined above.

If no buttons have been pressed for about 10 minutes, the display will automatically revert to the Normal Operating Display Window.

▶ BoilerMate-HP-DEM

HP-F ■ □

If the fault occurs with the Heat Pump, an indication of this will be shown on the Normal Operating Window. Further details are provided in the trouble shooting section of the manual.

Switch Operating Display Window

▶ BoilerMate-HP-DEM

Mode ▶ Switch

If a fault occurs with the heat pump, the 'Switch' emergency electric back-up system can be selected by pressing and holding the 'Switch' button below the display for at least 5 seconds. The 'Normal' status will change to 'Switch' and will flash.

Once the problem has been resolved, the appliance can be returned to normal operation by pressing and holding the 'Switch' button again for at least 5 seconds.

Fault Condition Display Window

▶ BoilerMate-HP-DEM

Mode ▶ Normal

Fault 10

If a fault occurs with the BoilerMate A-Class HP-DEM-A appliance the window will automatically display the fault condition.

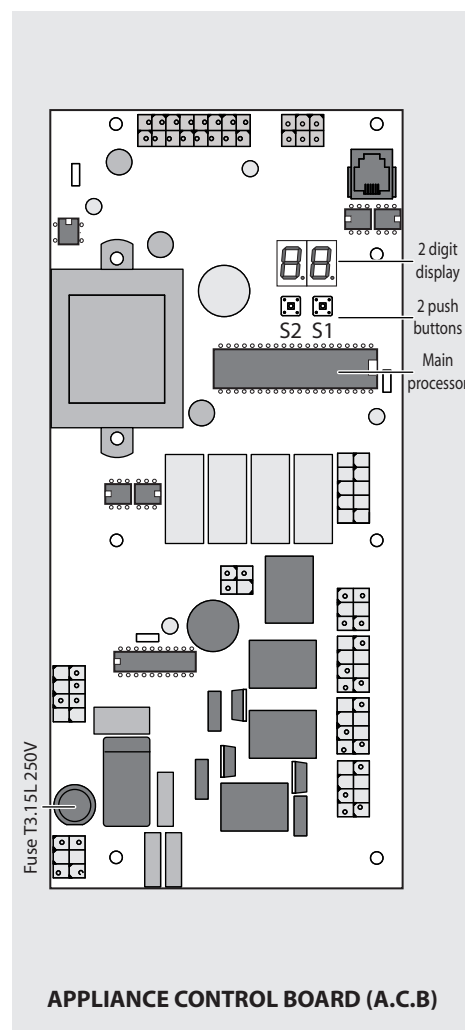
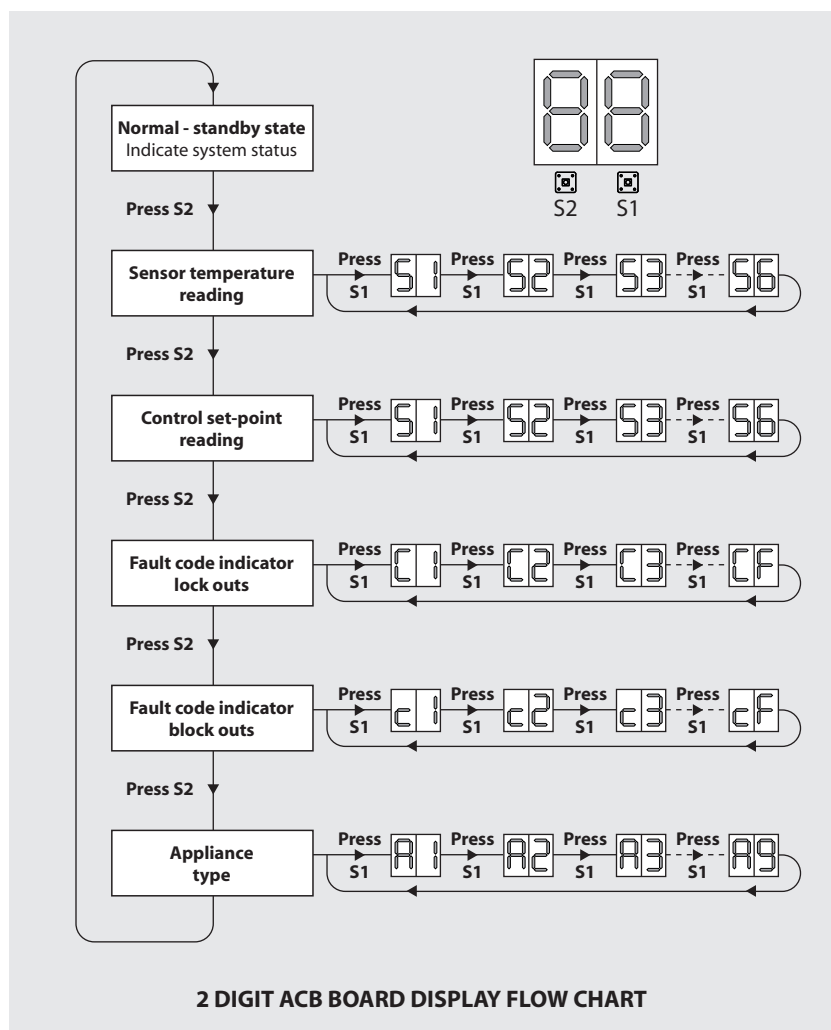
The window shows the fault reference code.

If a fault occurs with the BoilerMate appliance the window will automatically display the fault condition. The fault indication will flash to draw your attention. Please give this code to an Approved Ecodan Installer (AEI). They will have the ability to decode this and ensure the correct parts are obtained prior to a service call out.

Main Appliance Control Board

By pressing S1 and S2 on the main appliance control board, the LED display can be used to read various values as shown below.

However, fault conditions are displayed on the front user panel and normally this board should only need to be used to display the sensor conditions or select the appliance type if the board needs to be changed.



Discharge Arrangements

The Pressure and Temperature Relief Valve (P&T) and Expansion Relief Valve (ERV) are both provided with tundishes. It is normal for these to be connected into a single 22mm discharge pipe but they can be run separately if required. At least the first 300mm of pipework below the tundish should be vertical and not contain any elbows/bends to ensure that if a fault occurs, the water does not back up and discharge from the tundish. All elbows/bends should be large radius wherever possible.

The discharge from the P&T valve under a fault condition will be above 90°C. Because of this, it is a requirement of Building Regulation Approved Document G3 that the discharge from an unvented hot water storage system is conveyed to where it is visible but will not cause danger to persons in or about the building. The discharge pipe from the appliance tundish should be fitted in accordance with these requirements.

The discharge pipe MUST terminate in a SAFE and VISIBLE position. For a 22mm discharge it must have an equivalent length of no more than 9 metres and it must have a continuous fall (1:200 minimum) throughout its length. Above 9 metres equivalent length, the pipe diameter must increase to meet the requirements of the table shown opposite.

An example of how to calculate the size required is as follows:

A G½ temperature relief valve has a discharge pipe with 4 elbows and length of 7m from the tundish to the point of discharge. From the table opposite, maximum resistance allowed for a straight length of 22mm copper discharge pipe from a G½ temperature relief valve is 9.0m. Subtract the resistance for 4 No. 22mm elbows at 0.8m each = 3.2m. Therefore the maximum permitted length equates to 5.8m. 5.8m is less than the actual length of 7m therefore calculate the next largest size. Maximum resistance allowed for a straight length of 28mm pipe from a G½ temperature relief valve equates to 18m. Subtract the resistance for 4 No. 28 elbows at 1.0m each = 4m. Therefore the maximum permitted length equates to 14m. As the actual length is 7m, a 28mm copper pipe will be satisfactory.

In apartment/flat situations the discharge pipes can be connected into a single pipe which is discharged at low level. In this case the number should be limited to 6 to allow the fault to be easily traced. The single pipe should be at least one size larger than the largest individual discharge pipe connected to it.

The discharge can consist of scalding water and steam therefore the pipework should be metal. The following locations for the discharge pipe are acceptable:

Low Level

- Into a gully below the grating but above the water level (see diagram 1).
- Onto the ground (drive, path or garden area). The pipe should discharge downwards and be no more than 100mm above ground level. A wire cage should be provided to prevent people coming into contact with scalding water (see diagram 2).

High Level

High level discharge is only acceptable if it is :

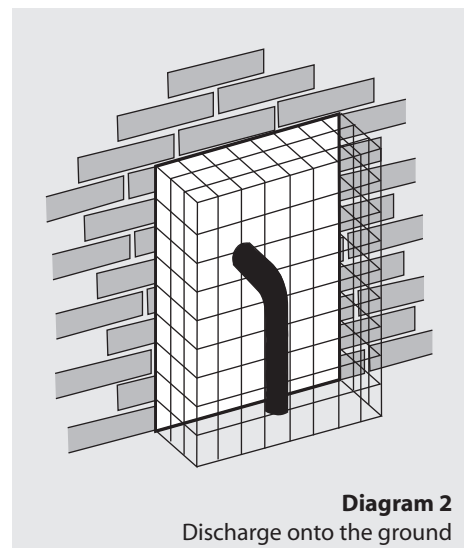
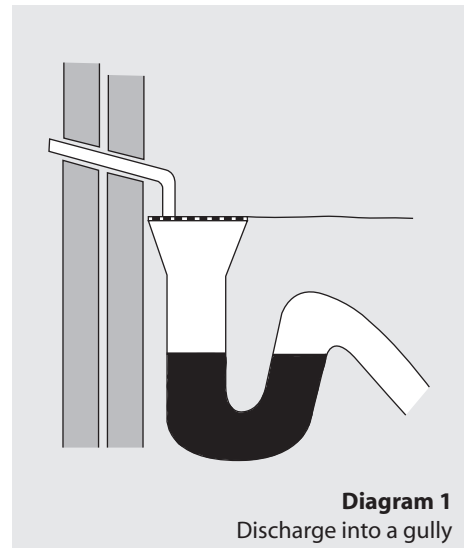
- onto a flat or pitched roof capable of withstanding high temperature water and at least 3m away from plastic guttering.
- or
- into a metal hopper and down pipe which terminates at low level (as described above.)

Discharge into a soil or waste pipe (whether plastic or metal) is not acceptable.

The proposals for the discharge pipe/termination point should be discussed and agreed with the Building Control Officer prior to commencing any work.

Further details are given in approved Document G3 of the Building Regulations.

Sizing of Discharge Pipe From Safety/ Temperature Relief Valve Tundish			
Valve outlet size	Min size of discharge pipe from tundish	Maximum resistance allowed shown as straight pipe length	Resistance created by each elbow or bend
G½	22mm	< 9m	0.8m
	28mm	< 18m	1.0m
	35mm	< 27m	1.4m



The appliance is designed to be installed in an airing/cylinder cupboard and the relevant minimum dimensions are provided in Table 1.2 Technical Data.

Because of the ease of installation we recommend that the cupboard construction is completed and painted before installation of the appliance. The cupboard door can be fitted after installation.

If the unit needs to be stored prior to installation it should be stored upright in a dry environment and on a level base/floor.

Installation and maintenance access is needed to the front and top of the appliance. See Table 1.2 in the Technical Data section of the manual for further details.

The minimum dimensions contained in Table 1.2 allow for the passage/connection of pipes to the appliance from any direction as long as the appliance is installed on the installation base provided. If the installation base is not used extra space may be needed to allow connection to the pipework and the whole of the base area should be continuously supported on a material which will not easily deteriorate if exposed to moisture.

The floor of the cupboard needs to be level and even and capable of supporting the weight of the appliance when full. Details of the weight when full is provided in Table 1.2 in the Technical Data section of the manual.

The appliance is designed to operate as quietly as practicable. However, some noise (from pumps etc) is inevitable in any heating system. This will be most noticeable in cupboards formed on bulkheads, or at the mid span of a suspended floor. In these cases the situation can be improved by placing the appliance on a suitable sound deadening material (i.e. carpet underlay or similar).

The appliance is very well insulated and no ventilation is normally required to the cupboard.

A suitable location will be needed for the unvented store expansion vessels. This will often be on top of the appliance itself or at high level in the cupboard housing the BoilerMate A-Class HP-DEM-A appliance. The dimensions and clearances are shown in the Technical Data section of the manual. A location is also required for the primary system expansion vessel as well as a suitable route for the connecting pipe from the BoilerMate A-Class HP-DEM-A appliance to the expansion vessel. A suitable route and discharge location will also be required for the discharge pipe from the P & T valve and ERV for all models.

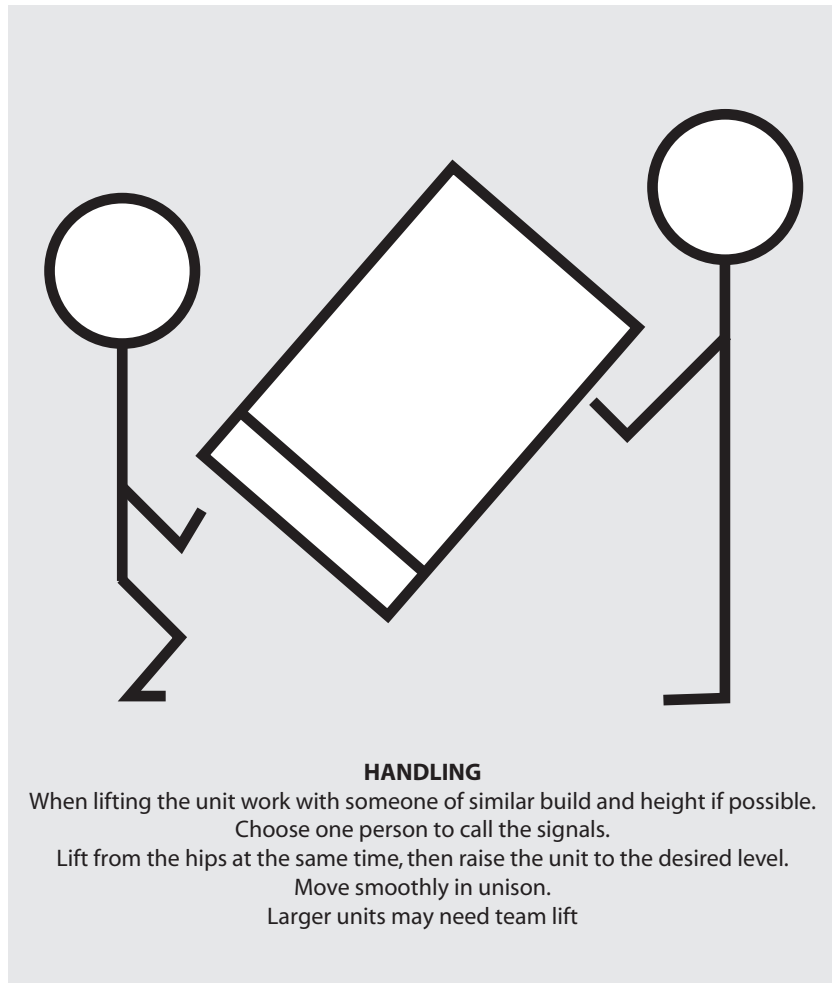
An electrical supply must be available which is correctly earthed, polarized and in accordance with the latest edition of the IEE requirements for electrical Installations BS 7671.

The electrical mains supply needs to be 230V AC/50Hz/Single Phase.

Connection must be made using a double-pole linked isolator with a contact separation of 3mm in both poles which is located within 1m of the appliance. The supply must only serve the appliance.

The supply to all models shall be rated at 32 amp.

INSTALLATION



Preparation/placing The Appliance In Position

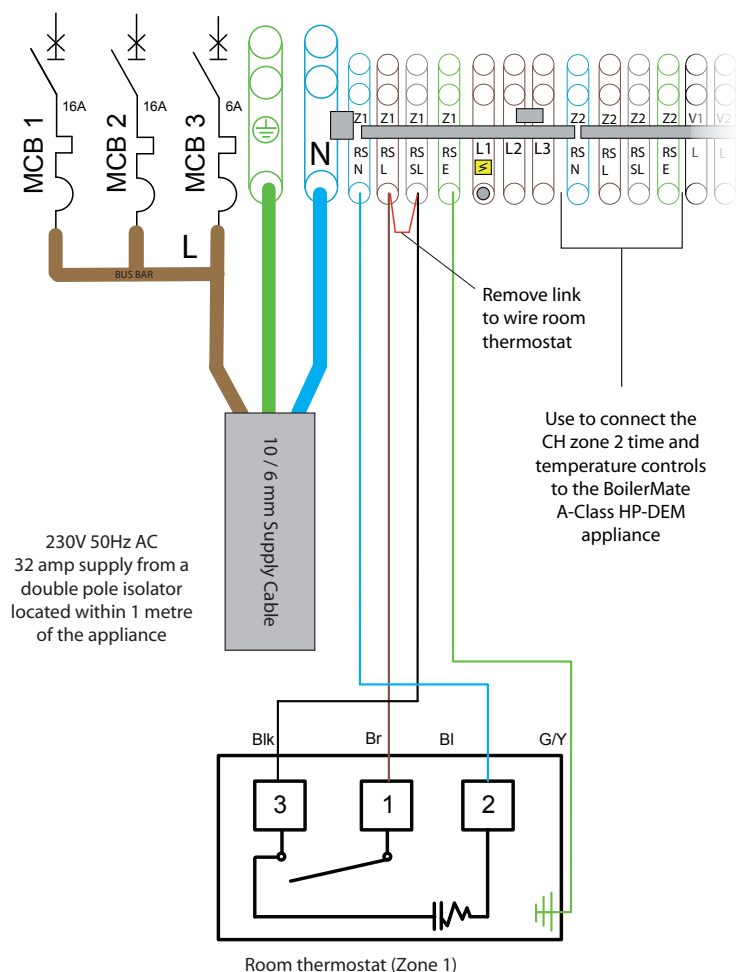
Details of the recommended positions for termination of the first fix pipework are provided in figures 1.5 and 1.6. The pipework can be located or its position checked using the template provided with each appliance. If these have been followed, installation is very simple and much quicker than any other system. The appliance is supplied shrink wrapped on a timber installation base. Carrying handles are also provided in the back of the casing.

If the optional primary sealed system kit is ordered this will be supplied in a separate box. **It is the installers responsibility to check that the size of expansion vessel provided is adequate for the primary/heating system being installed.**

The appliance should be handled carefully to avoid damage and the recommended method is shown opposite. Further details are provided on page 4 and Appendix of these instructions. Before installation the site requirements should be checked and confirmed as acceptable. The plastic cover and protective wrapping should be removed from the appliance and the installation base (provided) placed in position.

The appliance can be then be lifted into position in the cupboard on top of the base and the front panel removed by unscrewing the 2 screws and lifting the door up and out ready for connection of the pipework and electrical supplies. If they are not being fitted on top of the appliance a suitable support shall be installed for the unvented store expansion vessels.

The primary sealed system filling/expansion kit should be fitted on the supports provided and piped to the connection point provided on the BoilerMate A-Class HP-DEM-A appliance complete with a manual air vent at the high point.



Electrical Connection - Appliance

All the power and control functions of the BoilerMate A-Class HP-DEM-A are pre-wired to a terminal strip located at high level inside the appliance. The wiring to the appliance shall be carried out by a competent person in accordance with the Building Regulations (Approved Document P) and the IEE Requirements for Electrical Installations BS 7671. Details of the necessary wiring are shown opposite and on the electrical schematic drawing (see pages 26 and 27).

All the terminals are suitably labelled on the appliance.

Note: Do not attempt the electrical work unless you are competent to carry it out to the above standards.

Before commencing check that the power source is in accordance with the Site Requirements and ensure that it is isolated.

The heat pump wiring instructions (Appendix A) should be read in conjunction with this manual.

Run the external wiring through the service slot provided in the base of the appliance.

Make the connections as shown opposite on the terminal strip provided.

The room thermostat should be wired as shown opposite. The link in Z1-RS-L to Z1-RS-SL must be removed when the room thermostat is fitted.

The time and temperature controls for CH zone 2 should be wired as necessary into the Z2 terminals provided.

Before switching on the electrical supply check all the factory made terminal connections to ensure they have not become loose during transit.

Frost/Building Fabric Protection

When frost protection is required for the whole house set channel 2 of the clock to constant during the time required and adjust the room thermostat to a suitable setting.

IMPORTANT

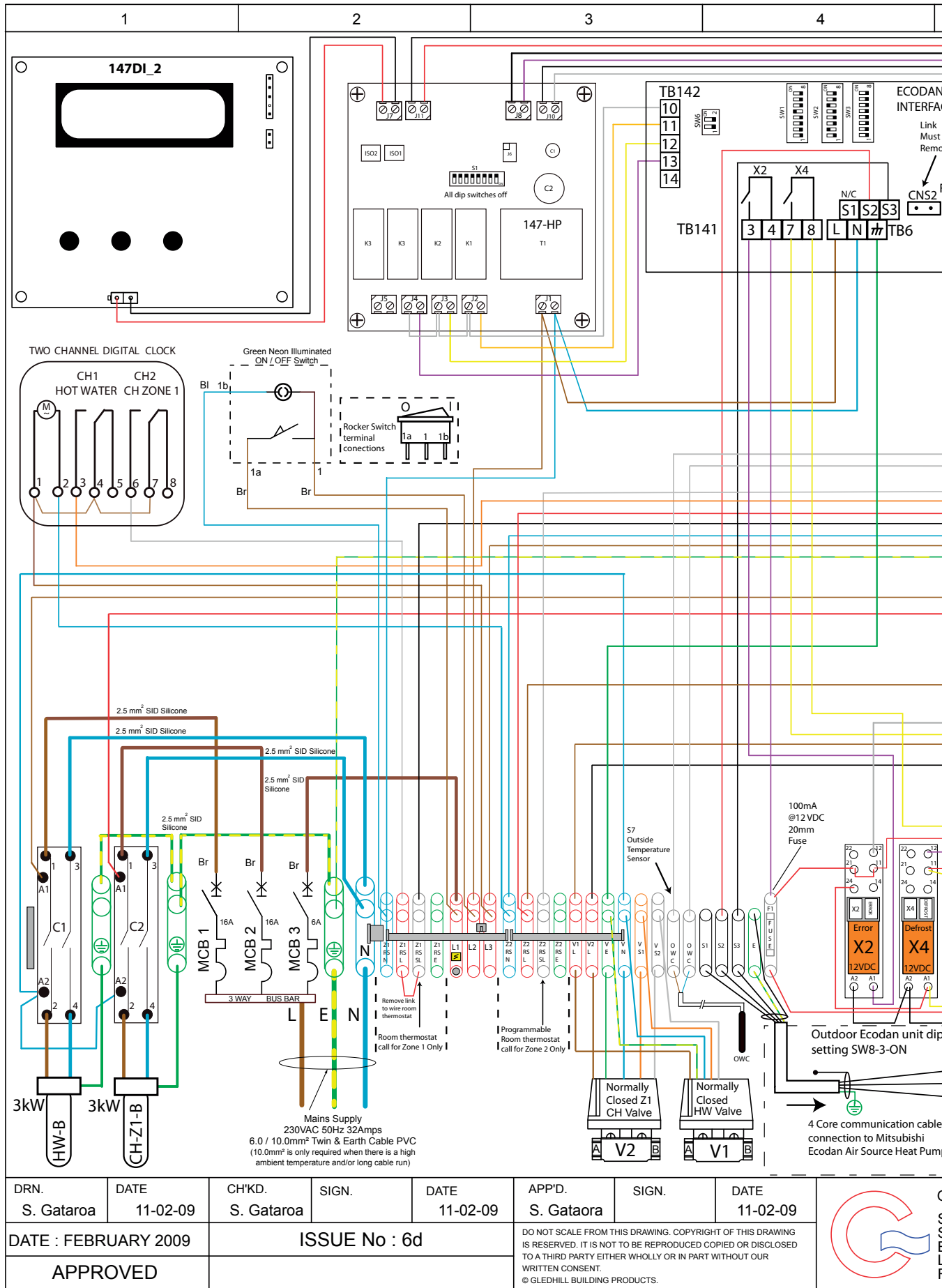
Electricians/Installers Please Note

The 2 x 16A MCB's (MCB1 and MCB2) for the central heating and hot water electric boost heaters are supplied set in the 'OFF' position by an adhesive warning label. MCB3 is supplied set in the 'ON' position. The heat pump/primary systems can be commissioned with the switches in these positions and MCB1 and MCB2 must not be switched on before the heat pump/primary systems have been fully tested/commissioned.

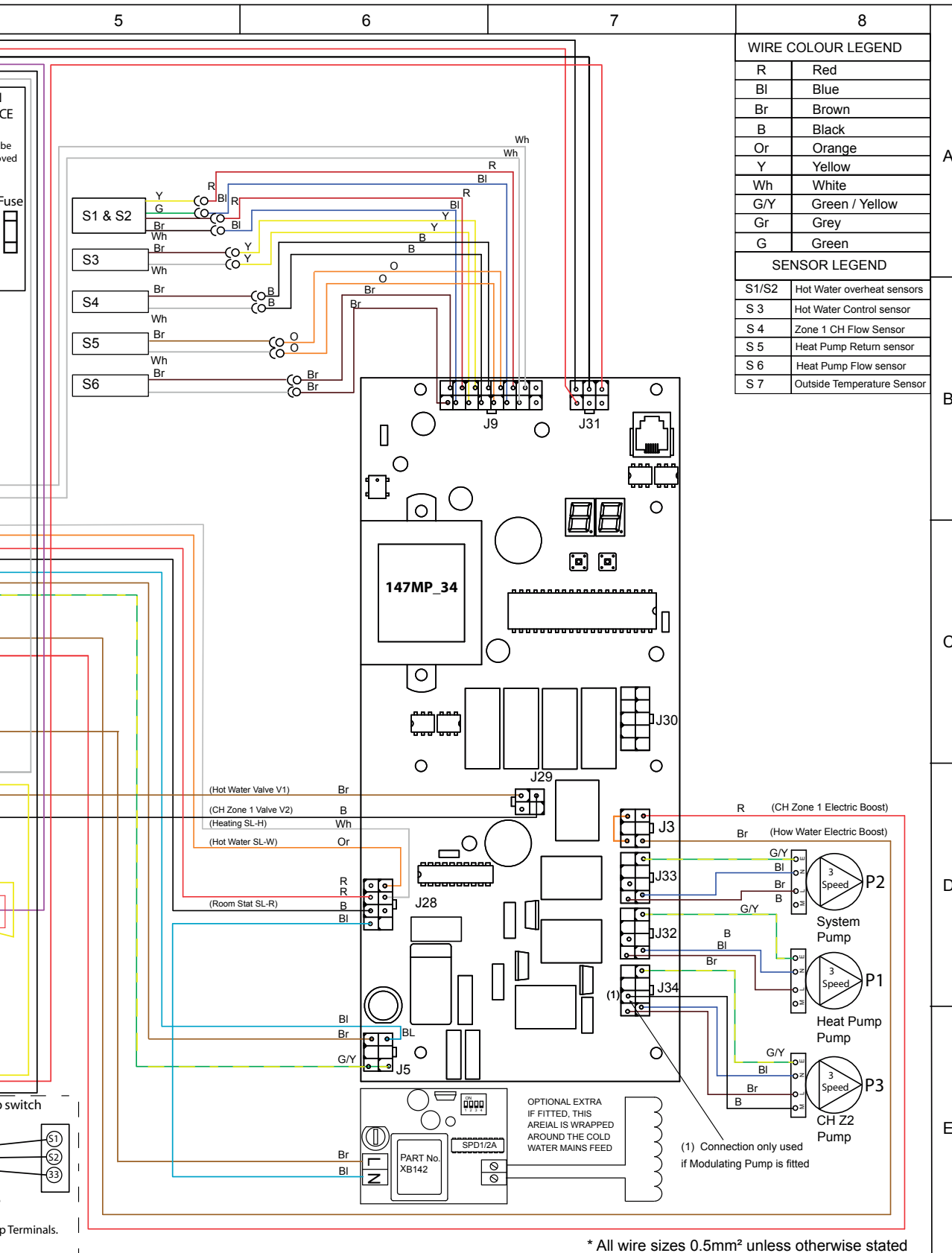
After these have been commissioned, move MCB1 and MCB2 to the 'ON' position which will break the warning label and then commission the electric boost facility. Ensure that all air has been vented from the primary system before doing this.

INSTALLATION

WIRING DIAGRAM



INSTALLATION



* All wire sizes 0.5mm² unless otherwise stated

GLEDHILL BUILDING PRODUCTS LTD.
 SYCAMORE TRADING ESTATE
 SQUIRES GATE LANE
 BLACKPOOL
 LANCASHIRE
 FY4 3RL

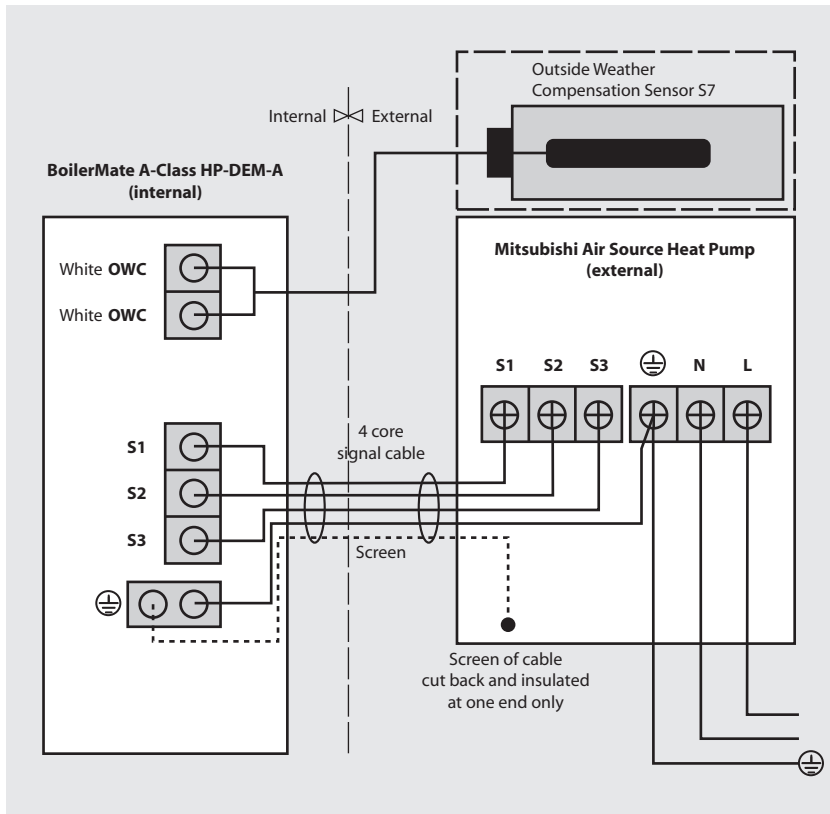
TITLE
**'A' Class BoilerMate
 Heatpump HP-DEM-A**

JOB NAME
 Electrical Schematic for :
 'A' Class BoilerMate Heatpump HP-DEM-A

DRG. SIZE | DRG. NAME
 A3 | 'A' Class Boilermate HP-DEM-A issue 6d.ai

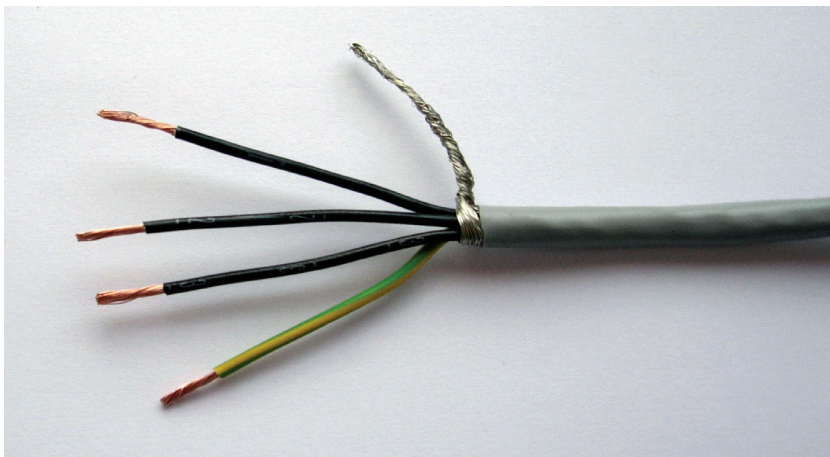
WIRING DIAGRAM

INSTALLATION



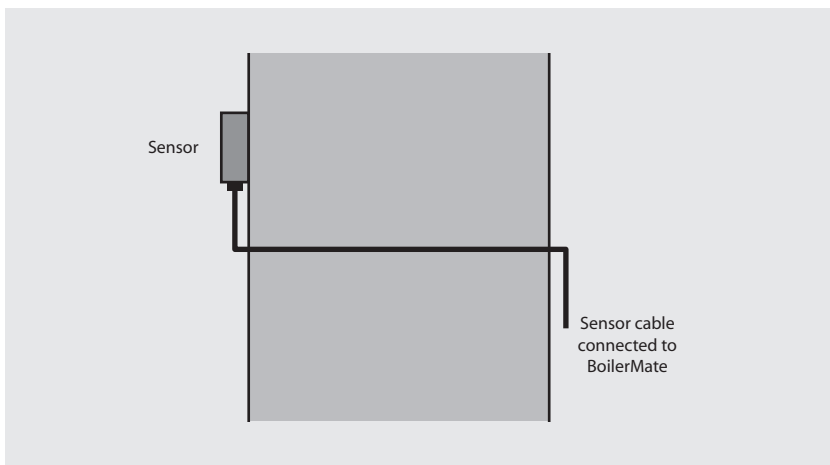
Electrical Interconnections Between BoilerMate A-Class HP-DEM-A and Mitsubishi Electric Ecodan air source heat pump.

The installer will need to provide a suitable four core cable. This cable is polarized and must be connected as shown in the adjacent diagram.



Cable specification:- CY1.54C, Nexans Rheyflex 500-CY-JZ 4G 1,5 (80m maximum cable length)

WIRING CONNECTIONS



External Temperature Compensation Sensor

The external temperature sensor is supplied with 10m of cable. This should be installed as shown in the diagram opposite and wired to the outside weather compensator terminals in the BoilerMate HP-DEM-A without any further joints.

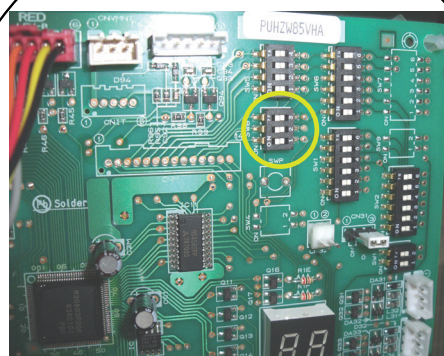
The sensor should be located in a position which is not unduly affected by wind/direct sunlight etc. On this basis a sheltered location on a north facing wall is recommended. South facing mounting locations should be avoided.

INSTALLATION

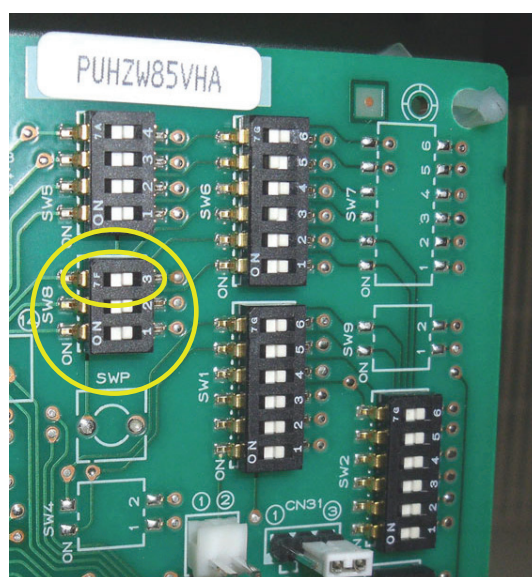
Important notice To Installer **YOU MUST** set the Ecodan outdoor unit DIP switch SW8-3 to ON!



DIP SWITCH
SW8-3-ON



The installer must ensure that before the Ecodan outdoor unit is switched on that the DIP switch SW8-3 is set to the 'ON' position, this let's the Ecodan unit know that the power for the interface will be provided by the in door Gledhill unit. See below for location of SW8.



WIRING CONNECTIONS

INSTALLATION

System Filling/Cleansing

Check and adjust as necessary the hot water system expansion vessel(s) air pressure to 1.5 bar.

Check that any drain valves are closed then open the incoming stop valve and fill the domestic mains cold and hot water systems in the normal way ensuring there is no air trapped in the system.

Check and adjust as necessary the primary heating system expansion vessel to the figure specified (normally 1.0 bar).

Note: The expansion vessel pressures should be checked before the systems are filled.

Fill the primary heating system with potable water through the filling loop provided to the pressure required (normally 1.0 bar).

During filling vent air as necessary from the high points of the system including the manual air vents provided on the appliance and on the feed to the expansion vessel.

Check the whole of the primary heating and domestic hot and cold distribution systems for leaks.

It is essential that all systems functions properly for optimum performance.

To achieve this, the primary system should be commissioned in accordance with good practice and generally in accordance with the requirements of BS 6798, BS 5449 and BS 7593.

When using either cleansing or corrosion inhibitor chemical, the manufacturers instructions **must** be followed.

Cleansing the Primary System

It is very important to ensure that the Primary system is cleaned using a suitable cleansing agent such as Fernox F3 to ensure that any flux residues/installation debris are removed.

The cleaning should be carried out fully in accordance with the manufacturers instructions. To allow thorough flushing, full bore drain valves should be provided.

Primary Water System Treatment

Although the BoilerMate A-Class HP-DEM-A has no special water treatment requirements, the radiators and other parts of the circuit will require the application of a scale and corrosion inhibitor. The heat pump and external connecting pipework will also require protection against freezing. **For this reason a combined anti freeze and inhibitor product such as Fernox Alphi 11 must be used.**

The volumes/concentration should be calculated in accordance with the manufacturers instructions allowing 10 litres for the volume for the primary pipework/coil in the BoilerMate A-Class HP appliance.

We consider that in typical radiator systems, the total water volume will not exceed 80 litres. On this basis, 20 litres of Alphi-11 will provide at least the 25% concentration recommended by the manufacturer as the minimum. However, because of the volumes experienced in underfloor system, the system volume for these types of systems will need to be calculated.

The Fernox Boiler Buddy supplied separately with the appliance package should be installed internally on the heat pump return as near as practical to the heat pump - see page 48 for further details.

Powerflushing/Cleaning Of The Heating System

If it is proposed to 'powerflush' the heating system always check and comply fully with the manufacturers instructions for the powerflushing equipment being used.

It is recommended that the heat pump and the BoilerMate A-Class HP appliance is bypassed during powerflushing of the primary/heating system.

If in any doubt please consult our Technical Helpline.

Cleansing the Hot/Cold Water System

Fully flush and, when necessary, chlorinate the hot and cold water system in accordance with the recommendations in the Model Water Byelaws and BS 6700.

Remove and clean the strainer element in the combination inlet valve, then replace it and re-fill the systems.

Once the systems have been refilled manually open the relief valves one by one and check that water is discharged and runs freely through the tundish and out at the discharge point. The pipework should accept full bore discharge without overflowing at the tundish, and the valve should seat satisfactorily.

On completion, check the pressure in the primary system is correct and disconnect the manual filling loop.

Appliance Commissioning

The built in controls should ensure compatibility if the heat pump and the BoilerMate A-Class HP-DEM-A appliance. They will automatically control the two appliances once both appliances are energised.

Turn on the BoilerMate A-Class HP-DEM-A and check that the sensors and all controls operate correctly as well as any motorised valves. Check that no water discharges from either the expansion valve or temperature and pressure-relief valve during the heating cycle.

Do not switch on MCB1 and MCB2 to activate the CH and DHWS electric boost systems until the primary systems have been commissioned.

Check the appliance, the heating system and hot water system for leaks when hot.

System Commissioning

Check that the correct outlet pressure is being maintained on the domestic water systems by the pressure reducing valve by checking the pressure at a hot tap or in the tapping provided on the combination inlet valve.

Check the correct flow is being achieved at each tap and the implications of opening more than one tap at the same time. If necessary fit flow regulators to each tap if these have not already been provided.

The heating systems and pumps should be set and balanced in the normal way to provide the temperature differential in line with the system design parameters chosen.

The primary system and pump to the heat pump should normally be set to speed 3.

If an automatic bypass valve is provided on the primary/heating circuit, check/adjust this as necessary to suit the particular installation requirements.

The room thermostat/clock or programmable room thermostat controls the heating and hot water systems and should be set to suit the householders requirements using the instructions provided with the controls.

This product is covered by the 'Benchmark' scheme and a separate commissioning/service log book is included with this product. This must be completed during commissioning and left with the product.

On completion:-

1. Do ensure that the electrical connections (e.g. mains supply, room thermostat) to the unit are correct and tight.
2. Do ensure that all the pipework connections in the appliance are tight and not leaking.
3. Do ensure that any pipework particularly plastic adjacent to the appliance is adequately supported and anchored.
4. Do ensure that the functioning and control of the system is explained to the occupant and explain the need and importance of periodic servicing.

These Instructions should be replaced along with the component manufacturers instructions in the pocket provided on the appliance and the front panel refitted.

NOTE:- With sealed heating systems air is released from the water during the first few weeks of operation. This must be vented and the system repressurised.

If the system is not likely to be used continuously after testing/commissioning it should be isolated from the water and electricity supply and either drained down or have the pressure removed from both the heating and water systems.

Important Do's and Don'ts

DO check the incoming mains water pressure and flow rate are adequate. (The preferred range of mains pressure is 2.5-3.5 bar).

DO check and ensure that the air pressure side of the hot water expansion vessel(s) is set at 1.5 bar.

DO check that all plumbing and electrical connections are in accordance with the labelling on the unvented storage appliance.

DO insulate any exposed pipework in the BoilerMate A-Class HP-DEM-A cupboard and insulate/waterproof the external pipework to the heat pump.

DO check the pump settings give the correct temperature difference across the flow and return in the primary/heating circuits.

DO ensure that the bypass valve is set correctly.

DON'T operate any immersion heaters until the appliance/systems are fully filled, vented and commissioned.

DON'T place any clothing or other combustible materials against or on top of this appliance.

DO ensure that the discharge pipework from the relief valves is/are installed to a fall and are of the correct size so that water does not overflow when a relief valve operates.

DO ensure the discharge point is safe and in accordance with the G3 Building Regulations.

DO check and ensure the air pressure side of the heating expansion vessel is set at 1.0 bar (or as specified).

DO check that the primary system pressure does not exceed 2 bar when the whole of the primary/heating system are up to temperature.

DO ensure that all systems are thoroughly flushed and cleaned and that a Fernox Boiler Buddy is fitted internally on the return as near as possible to the heat pump.

DO ensure that the inhibitor used is a combined product incorporating antifreeze and that sufficient has been added to provide at least the minimum concentration level recommended by the manufacturer.

SERVICING

Servicing/Maintenance

The Registered Installer is responsible for the safe installation and operation of the system. He must also make his customer aware that periodic checks of the equipment are required by the Building Regulations and essential for safety.

Maintenance and inspection periods will vary for many reasons. Gledhill Building Products Ltd recommend a maximum of 12 months between inspections. Experience of local water conditions may indicate that more frequent inspection is desirable, eg. when water is particularly hard and scale-forming or where the water supply contains a high proportion of solids, eg. sand. For Maintenance see the table below:

1	With the water supply turned off, remove the screen from the strainer in the combination inlet valve and clean off any detritus (dirt).
2	With the water supply turned off and the hot taps open, check the expansion vessel charge pressure and top up as necessary (1.5bar).
3	With the water supply turned on, open the temperature relief valve and then expansion valve to check for unrestricted discharge into tundish. Check valves for freedom of movement and confirm that the water stops and both valves reseal correctly. Check at a full bore discharge from either valve that there is no back up or discharges over the tundish.
4	Check that the correct outlet pressure is being maintained by the pressure reducing valve by recording the pressure at a terminal fitting or the tapping provided on the combination inlet valve.
5	Clean flow regulators (or restrictor/aerators) on each terminal fitting tap/shower as applicable. Check for correct flow rate at terminal fittings.
6	Visually inspect, checking for the presence of supplementary bonding and that it is being maintained.
7	Check correct rating and type of fuse is fitted on the electrical supply.
8	Check for the correct operation and temperature setting of the thermostats.
9	Check the operation of the motorised valves.
10	Check the operation of 'Switch'.
11	If necessary descale the heat exchangers immersion/heaters in hard water areas.

The Registered Installer is responsible for the safe installation and operation of the system. He must also make his customer aware that periodic checks of the equipment are required by the Building Regulations and essential for safety.

Maintenance and inspection periods will vary for many reasons. Gledhill Building Products Ltd recommend a maximum of 12 months between inspections. Experience of local water conditions may indicate that more frequent inspection is desirable, eg. when water is particularly hard and scale-forming or where the water supply contains a high proportion of solids, eg. sand. For Maintenance see the table above:

The above service/maintenance recommendations relate to the BoilerMate A-Class HP-DEM-A appliance only. Any service of the heat pump/heating system should include checks on the water pressure in the primary/heating systems and the air pressure in the primary expansion vessel with the system pressure removed.

Service of the heat pump is covered elsewhere in this manual. It is recommended that the Fernox Boiler Buddy is checked and cleaned at the same time as the BoilerMate A-Class HP-DEM-A appliance is serviced. The concentration of the inhibitor should also be checked and if necessary topped up with Alphi-11 to at least the minimum 25% level recommended by the manufacturer.

Changing Components

If it is necessary at any time to drain the storage vessel either for system modifications or to replace a component the appliance **must** be drained in the following way.

Before draining open all hot taps in the system then hold open the pressure and temperature relief valve until water stops discharging into the tundish.

Open the drain cock and **immediately hold open the P & T relief valve again. This must be held open until the cylinder is completely drained.**

When the unit is re-filled ensure the drain valve does not leak.

The KIWA Approvals for the BoilerMate A-Class HP-DEM-A appliance are conditional on the specific manufacturer/type of components fitted and any replacements must be purchased direct from Gledhill to ensure compatibility/continued safe operation.

Free of charge replacements for any faulty components are available from Gledhill during the in-warranty period (normally 12 months).

However, if any component is damaged during installation a new replacement must be ordered and paid for.

However, all components are readily accessible and can be changed quickly and easily by the installer using common plumbing practice.

If it is necessary to replace any of the pumps fitted to the appliance the pump head (motor pack) only should be removed as recommended by Grundfos. It is important when a pump has been replaced to ensure that any air is adequately vented.

	Description	Supplier & Model	Stock Code
1	22mm Inlet Control Group	Honeywell	XG170
2	P & T Valve TP152	Honeywell	XG169
3	Tundish	Altecnic	XG173
4	Hot Water/Heating Zone Valve 22mm V4043 with removable head	Honeywell	XG083
5	Hot Water Expansion Vessel - 25 litre	Varem	XG165
	Hot Water Expansion Vessel - 18 litre		XG009
6	Pump UPS 15-50 (22mm connections)	Grundfos	XB004
7	Pump Valve 22mm	Vemco	XB121
8	3kW Immersion Heater (HW & CH Temperature Boost)		XG086
9	Primary Expansion Vessel - 12 Litre	Altecnic	XG164
	Primary Expansion Vessel - 18 Litre		XG009
10	Primary Expansion Relief Valve and Pressure Gauge	Comap	XG154
11	Relay 12v dc Coil	Wago	XB481
12	Contactors (Heater elements)	Telemecanique	XB014
13	Sensor S1/S2	Tasseron	XB183
14	Sensor S4/S5/S6	Tasseron	GT198
15	Central Heating Temperature Boost Immersion Element		XG086
16	Main Control Board	Argus Vision	XB442
17	External Temperature Compensation Sensor	ATC Semitec	XB131
18	2 Channel Clock	Grasslin	XB218
19	28mm Comp Gate Valve		FT137
20	22mm Gate Valve		XB334
21	MCB Single Pole 16A	Jtec	XB450
22	MCB 6A	Jtec	XB449
23	Terminal Rail Assembly - DEM-A model	Wago	XB219
24	Laminated Front Membrane Panel	RH Technologies	XB473
25	147HP PCB		XB475
26	147DI PCB		XB477
27	Non Return Valve (Central Heating Zone 2)		GT048
28	Non Return Valve Adapter		GT049

SERVICING

Scale

In accordance with the Benchmark Guidance Notes in hard water areas, above 200ppm (mg/l) it is recommended that an in-line scale reduction device is fitted. Reducing the temperature of the stored water will reduce the rate at which scale forms but must not be reduced to less than 60°C. If the recovery rate is badly affected, this is an indication that scaling may have occurred. In this event, follow the procedures as recommended by a reputable Water Treatment Company.

General

All work must be carried out by a suitably qualified/competent person.

The display window on the front of the appliance has the facility to indicate fault conditions as a reference code and as a written description ie: Fault 10/sensor fault. This should be interrogated before any work is undertaken.

The main control board also has an LED panel which can also be used to show various set points/fault codes but it is normally recommended that on this appliance, the front panel is used when fault finding.

No/Reduced flow of hot water at the taps

Check that the mains water supply is turned ON. Check the line strainer in the combination inlet valve is not blocked. Check that the combination valve has been fitted so that water is flowing in the correct direction.

If the water at the tap is cold

Ensure that the heat pump has been switched ON and is working correctly. Check that there are no air locks in the primary system. ISOLATE THE UNIT AT THE MAINS ELECTRIC SUPPLIES AND THEN CHECK THE FOLLOWING:-

- i) The control thermostat
- ii) The overheat thermostat, which can be reset by unscrewing the cover and pushing the red button.
Note: If the overheat thermostat has been activated, we recommend that the control/overheat stat is replaced.
- iii) The motorised valve
- iv) Check that the heat is being produced by the heat pump and the pump is running. If the heat pump is running check/replace the 100MA (F1) fuse provided on the BoilerMate A-Class HP-DEM-A terminal strip to protect the main control board from a fault on the heat pump.

If for any reason heat is not being supplied to the appliance heating and/or hot water can be obtained by operating the 'Switch' controls on the front of the appliance.

Any Energy Cut-out Must Never Be By-passed Under Any Circumstances.

If the unit is still getting hot, ensure that the immersion heater is isolated from the mains before re-setting the energy cut-out. If the immersion heater(s) need replacing this should be done with the unit supplied from Gledhill Building Products Ltd. Same day despatch to approved installers can be arranged by telephoning 01253 474412.

Discharge From Relief Valves

If cold water is discharging from the expansion relief valve drop the system pressure and check the air pressure in the expansion vessel is 1.5 bar.

If the fault continues and the problem cannot be stopped by operating the easing control a few times then either the Pressure Reducing Valve or the Relief Valve may be at fault. If the cold water pressure is too high, this would suggest that the Pressure Reducing Valve is at fault and the Gledhill approved replacement should be fitted. If the pressure is correct then the Relief Valve/cartridge will require replacing with a Gledhill approved component.

If there is an overheat fault and very hot water is being discharged, turn off the heat source, but not the water supply. When the system is cool, check the control and overheat thermostats and energy cut-outs in the immersion heater and replace the faulty component with a unit supplied by Gledhill and check that it works correctly before returning the system to full operation.

ECODAN AIR SOURCE HEAT PUMP



Air to Water Heat Pump PUHZ-W·HA PUHZ-HW·HA

INSTALLATION MANUAL

FOR INSTALLER

For safe and correct use, read this manual as well as the indoor unit installation manual thoroughly before installing the unit.

English

INSTALLATION MANUAL

ECODAN AIR SOURCE HEAT PUMP

Contents

1. Safety precautions	2	5. Water piping work	5
2. Installation location	3	6. Electrical work	5
3. Installation procedures	4	7. Test run	7
4. Drainage piping work	5	8. Special function	7

1. Safety precautions

▶ Before installing the unit, make sure you read all the "Safety precautions".

Warning:
Precautions that must be observed to prevent injuries or death.

Caution:
Precautions that must be observed to prevent damages to the unit.

Warning:

- The unit must not be installed by the user. Ask an installer or an authorized technician to install the unit. If the unit is installed improperly, water leakage, electric shock, or fire may be caused.
- The unit must be installed according to the instructions in order to minimize the risk of damages by earthquakes, typhoons, or strong winds. An improperly installed unit may fall down and cause damages 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 damages or injuries.
- If the air to water heat pump is installed in an enclosed area, measures must be taken to prevent the refrigerant concentration in the room in the event of refrigerant leakage. Consult an installer regarding the appropriate measures. Should the refrigerant leak and cause the concentration oxygen in the room may lack.
- 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.
- Only the specified cables can be used for wiring. Connections must be made securely without tension on the terminals. If cables are connected or installed improperly, it may result in overheating or fire.
- Terminal block cover panel of the outdoor unit must be firmly fixed. If the cover panel is mounted improperly, dust and moisture may enter the unit, and it may cause electric shock or fire.

After installation, perform the test run to ensure normal operation. Then explain to your customer the "Safety Precautions," use, and maintenance of the unit based on the information in the Operation Manual. Both the Installation Manual and the Operation Manual must be given to the user. These manuals must always be kept by the actual users.

⚡: Indicates a part which must be grounded.

Warning:
Carefully read the labels attached to the unit.

- When installing or moving the air to water heat pump, make sure to use the specified refrigerant (R410A) to charge the refrigerant lines. Do not either mix it with any other refrigerant or allow air to remain within the pipes. Air enclosed in the pipes can cause pressure peaks resulting in a rupture and other hazards.
- Make sure to use accessories authorized by Mitsubishi Electric and ask an installer or an authorized technician to install them. If accessories are improperly installed, it may cause water leakage, electric shock, or fire.
- Do not remodel the unit. Consult an installer for repairs. If alterations or repairs are not performed correctly, it may cause water leakage, electric shock, or fire.
- The user should never attempt to repair the unit or transfer it to another location. If the unit is installed improperly, it may cause water leakage, electric shock, or fire. If the air to water heat pump needs to be repaired or moved, ask an installer or an authorized technician.
- After installation has been completed, make sure that refrigerant does not leak. If refrigerant leaks into the room and comes into contact with the flame of a heater or portable cooking range, poisonous gases will be released.
- Use clean enough water which meets water quality standards. The deterioration of water quality may result in the system breakdown or the water leakage.
- Never use anything other than water as a medium. It may cause a fire or an explosion.
- Do not use heated or cooled water that is produced by the air to water heat pump directly for drinking or cooking. There is a risk to damage your health. There is also a risk that installing the water heat exchanger may corrode if the necessary water quality for the air to water heat pump system cannot be maintained. If you wish to use the heated or cooled water from the heat pump for these purposes, take measure such as to isolate the second heat exchanger within the water piping system.

1.1. Before installation

Caution:

- Do not use the unit in an unusual environment. If the air to water heat pump is installed exposed to steam, volatile oil (including machine oil), or sulfuric gas, or exposed to briny air, or covered with snow, the performance can be significantly reduced and the internal parts can be damaged.
- Do not install the unit where combustible gases may leak, be produced, flow, or accumulate. If combustible gas accumulates around the unit, it may cause fire or explosion.
- The outdoor unit produces condensate during the heating operation. Make sure to provide drainage around the outdoor unit if such condensate is likely to cause damage.

- When installing the unit in a hospital or in a building where communication equipment is installed, you may need to take measures to reduce noise and electronic interference. Inverters, home appliances, high-frequency medical equipment, and radio communications equipment can cause the air to water heat pump to malfunction or to breakdown. At the same time, the noise and electronic interference from the air to water heat pump unit may disturb the proper operation of medical equipment, and communications equipment.

1.2. Before installation (relocation)

Caution:

- Be fully careful when moving the units. The unit must be carried by at least 2 people, as it weighs 20 kg or more. Do not hold the packaging bands. Wear protective gloves to unpack and to move or install it, in order to avoid your hands being injured by 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 injuries.

- The base of the outdoor unit must be periodically checked to ensure it is not loose, cracked or damaged. If such defects are left untreated, the unit may fall down and cause damage or injuries.
- Do not wash the air to water heat pump unit. You may receive an electric shock.

ECODAN AIR SOURCE HEAT PUMP

1. Safety precautions

1.3. Before electric work

⚠ Caution:

- Be sure to install a circuit breaker. If it is not installed, there may be a risk of an electric shock.
- For the power lines, use standard cables of sufficient capacity. Otherwise, it may cause a short circuit, overheating, or fire.
- When installing the power lines, do not apply tension to the cables. The cables may be cut or overheated resulting in a fire.

- Make sure to ground the unit. Do not connect the ground wire to gas or water pipes, lightning rods, or telephone grounding lines. If the unit is not properly grounded, there may be a risk to get an electric shock.
- Make sure to use circuit breakers (ground fault interrupter, isolating switch (+B fuse), and molded case circuit breaker) with the specified capacity. If the circuit breaker capacity is larger than the specified capacity, breakdown or fire may result.

1.4. Before starting the test run

⚠ Caution:

- Turn on the main power switch more than 12 hours before starting operation. Starting operation immediately after turning on the power switch can severely damage the internal parts. Keep the main power switch turned on during the operating period.
- Before starting operation, check that all panels, guards and other protective parts are correctly installed. Make sure not to get injured by touching rotating, hot, or high voltage parts.

- Do not touch any switch with wet hands. There may be a risk of an electric shock.
- Do not touch the refrigerant pipes with bare hands while unit is running. The refrigerant pipes can be hot or cold depending on the condition of the flowing refrigerant. There may be a risk to get burn or frostbite.
- After stopping operation, make sure to wait at least five minutes before turning off the main power. Otherwise, it may cause water leakage or breakdown.

1.5. Using R410A refrigerant air to water heat pump

⚠ Caution:

- Use only R410A refrigerant. If another refrigerant is used, the chlorine will let the oil deteriorate.
- Use the following tools specifically designed for R410A refrigerant use. Contact your nearest installer for further details.

- Be sure to use the proper tools. If dust, debris, or moisture enters the refrigerant pipes, the refrigeration oil may deteriorate.
- Do not use a charging cylinder. If a charging cylinder is used, the composition of the refrigerant may change and the efficiency will be worsened.

Tools (for R410A)	
Gauge manifold	Charge hose
Gas leak detector	Vacuum pump adapter
Torque wrench	Electronic refrigerant charging scale

2. Installation location

(mm)

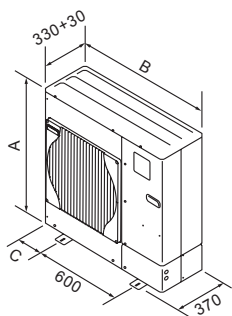


Fig. 2-1

Models	A(mm)	B(mm)	C(mm)
50	740	950	175
85	943	950	175
112	1350	1020	210
140	1350	1020	210

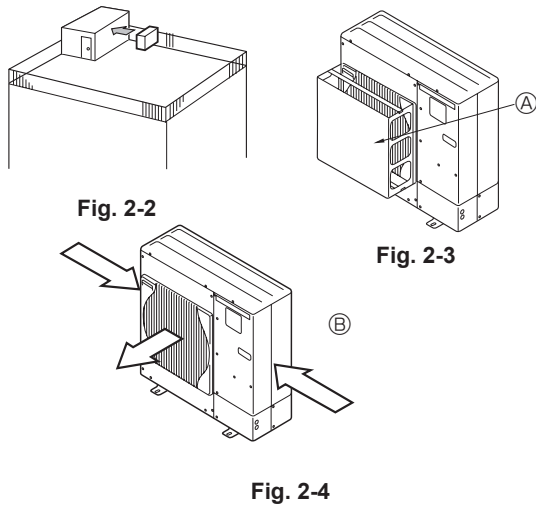
2.1. Choosing the outdoor unit installation location

- Avoid locations where the unit is exposed to direct sunlight or other sources of heat.
- Select a location where noise emitted by the unit does not disturb neighbors.
- Select a location where easy wiring and pipe access to the power source is available.
- Avoid locations where combustible gases may leak, be produced, flow, or accumulate.
- Note that condensate water may be produced by the unit during operation.
- Select a level location that can bear the weight and vibration of the unit.
- Avoid locations where the unit can be covered with snow. In areas where heavy snow fall is anticipated, special precautions must be taken to prevent the snow from blocking the air intake such as to install the unit at higher position or installing a hood on the air intake. This can reduce the airflow and the unit may not operate properly.
- Avoid locations where the unit is exposed to oil, steam, or sulfuric gas.
- Make sure to hold the handles to transport the unit. Do not hold the base of the unit, as there is a risk that hands or fingers may be pinched.

2.2. Outline dimensions (Outdoor unit) (Fig. 2-1)

ECODAN AIR SOURCE HEAT PUMP

2. Installation location



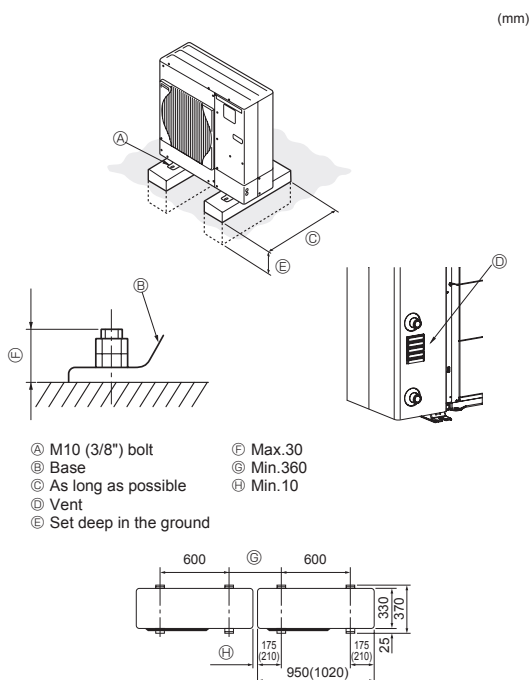
2.3. Windy location installation

When installing the outdoor unit on a rooftop or other location where the unit is exposed to strong wind, do not face the air outlet of the unit directly into the winds. Strong wind entering the air outlet may impede the normal airflow and it may result in a malfunction.

The following shows three examples of precautions against strong winds.

- ① Face the air outlet towards the nearest available wall keeping about 50 cm distance. (Fig. 2-2)
- ② Install an optional air guide if the unit is installed in a location where strong winds such as a typhoon, etc. may directly blow to the air outlet. (Fig. 2-3)
 - Ⓐ Air outlet guide
- ③ Position the unit so that the outlet air can blow at right angle to the seasonal wind direction, if possible. (Fig. 2-4)
 - Ⓑ Wind direction

3. Installation procedure



- Ⓐ M10 (3/8") bolt
- Ⓑ Base
- Ⓒ As long as possible
- Ⓓ Vent
- Ⓔ Set deep in the ground
- Ⓕ Max.30
- Ⓖ Min.360
- Ⓗ Min.10

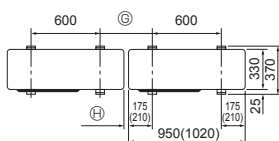


Fig. 3-1

2.4. NECESSARY SPACE TO INSTALL

2.4.1. When installing a single outdoor unit (Refer to the last page)

Minimum dimensions are as follows, except for Max., meaning Maximum dimensions, indicated.

The figures in parentheses are for 112/140 models.

Refer to the figures for each case.

- ① Obstacles at rear only (Fig. 2-5)
- ② Obstacles at rear and above only (Fig. 2-6)
- ③ Obstacles at rear and sides only (Fig. 2-7)
- ④ Obstacles at front only (Fig. 2-8)
 - * When using an optional air outlet guide, the clearance for 112/140 models is 500 mm or more.
- ⑤ Obstacles at front and rear only (Fig. 2-9)
 - * When using an optional air outlet guide, the clearance for 112/140 models is 500 mm or more.
- ⑥ Obstacles at rear, sides, and above only (Fig. 2-10)
 - * Do not install the optional air outlet guides for upward airflow.

2.4.2. When installing multiple outdoor units (Refer to the last page)

Leave 10 mm space or more between the units.

The figures in parentheses are for 112/140 models.

- ① Obstacles at rear only (Fig. 2-11)
- ② Obstacles at rear and above only (Fig. 2-12)
 - * No more than 3 units must be installed side by side. In addition, leave space as shown.
 - * Do not install the optional air outlet guides for upward airflow.
- ③ Obstacles at front only (Fig. 2-13)
 - * When using an optional air outlet guide, the clearance for 112/140 models is 1000 mm or more.
- ④ Obstacles at front and rear only (Fig. 2-14)
 - * When using an optional air outlet guide, the clearance for 112/140 models is 1000 mm or more.
- ⑤ Single parallel unit arrangement (Fig. 2-15)
 - * When using an optional air outlet guide installed for upward airflow, the clearance is 500 (1000) mm or more.
- ⑥ Multiple parallel unit arrangement (Fig. 2-16)
 - * When using an optional air outlet guide installed for upward airflow, the clearance is 1000 (1500) mm or more.
- ⑦ Stacked unit arrangement (Fig. 2-17)
 - * The units can be stacked up to 2 units high.
 - * No more than 2 stacked units must be installed side by side. In addition, leave space as shown.

• Be sure to install the unit in a solid, level surface to prevent rattling noises during operation. (Fig. 3-1)

<Foundation specifications>

Foundation bolt	M10 (3/8")
Thickness of concrete	120 mm
Length of bolt	70 mm
Weight-bearing capacity	320 kg

• Make sure that the length of the foundation bolt is within 30 mm from the surface of the base.

• Secure the base of the unit firmly with 4 M10 foundation bolts in solid locations.

Installing the outdoor unit

• Do not block the vent. If the vent is blocked, operation will be hindered and the unit may breakdown.

• If the additional fixation of the unit is necessary, use the installation holes on the back of the unit to attach wires, etc. with self-tapping screws ($\phi 5 \times 15$ mm or less).

⚠ Warning:

• 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.

• The unit must be installed according to the instructions in order to minimize the risk of damage by earthquakes, typhoons, or strong winds. An improperly installed unit may fall down and cause damage or injuries.

* Figures in parentheses are for 112/140 unit types.

ECODAN AIR SOURCE HEAT PUMP

4. Drainage piping work

Outdoor unit pipe connection

When drain piping is necessary, use the drain socket or the drain pan (option).

Optional parts name	Model name
Drain socket	PAC-SG61DS-E
Drain pan for 50/85	PAC-SG64DP-E

*There is no optional drain pan for 112/140.

5. Water piping work

5.1. Water piping connection (Fig.5-1)

- Connect the water pipes to the outlet and inlet pipes (ISO 228/1-G1B).
- Inlet and outlet pipes position is shown on the Fig.5-1.
- 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 0-0.3MPa.
- Use the inlet water of higher than 5°C and lower than 55°C.

Note : The water velocity in pipes should be kept within certain limits of material to avoid erosion, corrosion and excessive noise generation. Be aware, and take care of, that local velocities in small pipes, bends and similar obstructions can exceed the values above.
e.g.) Copper : 1.5m/s

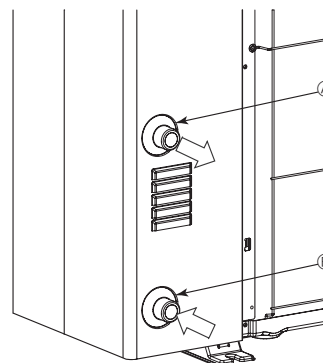


Fig. 5-1

5.2. Water quality condition

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

[Fig. 5-1]

- Ⓐ Water outlet
- Ⓑ Water inlet

Note : Make sure to perform the frozen prevention measure for water pipe system. (Water piping insulation, back-up pump system, using of a certain % ethylene glycol instead of normal water) Insulate the water piping properly. The performance can be poor if the insulation is insufficient.

⚠ Warning:

As the outlet water temperature can reach 60°C at maximum, do not touch the water piping directly with a bare hand.

6. Electrical work

6.1. Outdoor unit (Fig. 6-1, Fig. 6-2)

- ① Remove the service panel.
- ② Wire the cables referring to the Fig. 6-1 and the Fig. 6-2.

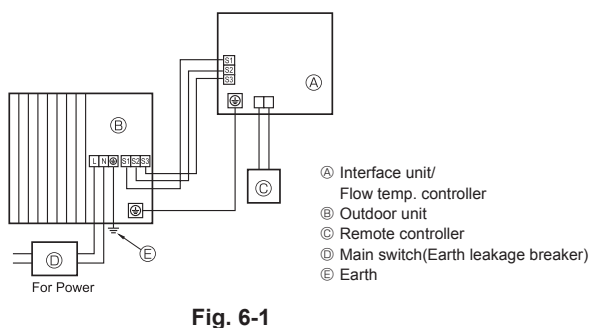


Fig. 6-1

- Ⓐ Earth terminal
- Ⓑ Terminal block
- Ⓒ Clamp
- Ⓓ Service panel
- Ⓔ Wire the cables so that they do not contact the center of the service panel.

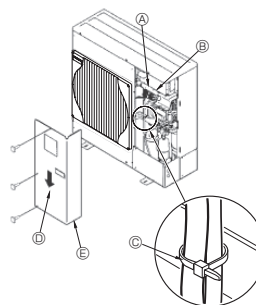
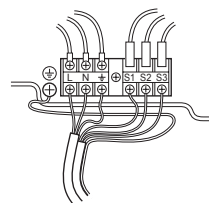
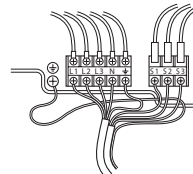


Fig. 6-2

■ 50-140V(Single phase)



■ 112-140Y(3 phase)



ECODAN AIR SOURCE HEAT PUMP

6. Electrical work

6.2. Field electrical wiring

Outdoor unit model	50 V	85 V	140 V	112 Y,140 Y
Outdoor unit power supply	~N (single), 50 Hz, 230 V	~N (single), 50 Hz, 230 V	~N (single), 50 Hz, 230 V	3N~ (3phase), 50 Hz, 400 V
Outdoor unit Circuit Breaker capacity	*1 16 A	25 A	40 A	16 A
Wiring Wire No. x size (mm ²)				
Outdoor unit power supply, earth	3 × Min. 1.5	3 × Min. 4	3 × Min. 6	5 × Min. 1.5
Interface unit/Flow temp. controller-Outdoor unit	*2 3 × 1.5 (polar)	3 × 1.5 (polar)	3 × 1.5 (polar)	3 × 1.5 (polar)
Interface unit/Flow temp. controller-Outdoor unit earth	*2 1 × Min. 1.5	1 × Min. 1.5	1 × Min. 1.5	1 × Min. 1.5
Remote controller-Interface unit/Flow temp. controller	2 × 0.3 (Non-polar)	2 × 0.3 (Non-polar)	2 × 0.3 (Non-polar)	2 × 0.3 (Non-polar)
Circuit rating				
Outdoor unit L-N (single)				
Outdoor unit L1-N, L2-N, L3-N (3phase)	*3 AC 230 V	AC 230 V	AC 230 V	AC 230 V
Interface unit/Flow temp. controller-Outdoor unit S1-S2	*3 AC 230 V	AC 230 V	AC 230 V	AC 230 V
Interface unit/Flow temp. controller-Outdoor unit S2-S3	*3 DC 24 V	DC 24 V	DC 24 V	DC 24 V
Remote controller-Interface unit/Flow temp. controller	*3 DC 12 V	DC 12 V	DC 12 V	DC 12 V

*1. A breaker with at least 3.0 mm contact separation in each poles shall be provided. Use earth leakage breaker (NV).

*2. Max. 80 m

*3. The figures are NOT always against the ground.

S3 terminal has DC 24 V against S2 terminal. However between S3 and S1, these terminals are NOT electrically insulated by the transformer or other device.

Notes: 1. Wiring size must comply with the applicable local and national codes.

2. Power supply cables and the cables between Interface unit/Flow temp. controller and outdoor unit shall not be lighter than polychloroprene sheathed flexible cables. (Design 60245 IEC 57)

3. Be sure to connect the cables between Interface unit/Flow temp. controller and outdoor unit directly to the units (no intermediate connections are allowed).

Intermediate connections may result in communication errors. If water enters at the intermediate connection point, it may cause insufficient insulation to ground or a poor electrical contact.

(If an intermediate connection is necessary, be sure to take measures to prevent water from entering the cables.)

4. Install an earth longer than other cables.

Warning:

In case of A-control wiring, there is high voltage potential on the S3 terminal caused by electrical circuit design that has no electrical insulation between power line and communication signal line. Therefore, please turn off the main power supply when servicing. And do not touch the S1, S2, S3 terminals when the power is energized.

ECODAN AIR SOURCE HEAT PUMP

7. Test run

Before test run

- ▶ After installation works are completed, check if there is no refrigerant leakage, no looseness in the power supply or control wiring, no wrong polarity, and no disconnection of one phase in the supply.
- ▶ Use a 500-volt megohmmeter to check that the resistance between the power supply terminals and ground is at least 1.0MΩ.

⚠ Warning:

Do not use the air to water heat pump if the insulation resistance is less than 1.0MΩ.

Insulation resistance

When installed the power source to the unit has been cut for an extended period, the insulation resistance may drop below 1 MΩ due to the accumulation of refrigerant within the compressor. This is not a malfunction. Perform the following procedures.

1. Remove the wires from the compressor and measure the insulation resistance of the compressor.
2. If the insulation resistance is below 1 MΩ, the compressor may be faulty or simply the accumulation of refrigerant in the compressor makes the resistance drop.
3. After connecting the wires to the compressor, the compressor starts to warm up once power is supplied. After supplying power for the times indicated below, remove the wires from the compressor and measure the insulation resistance again.

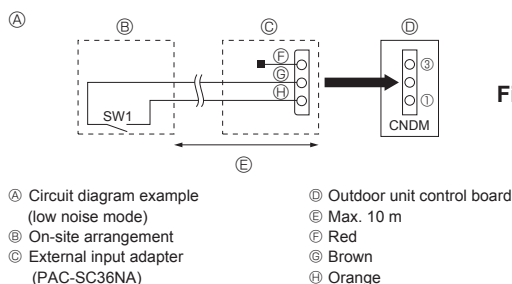
- The insulation resistance drops due to the accumulation of refrigerant in the compressor. The resistance will rise above 1 MΩ after the compressor is warmed up for 4 hours.
(The necessary time to warm up the compressor varies according to atmospheric conditions and refrigerant accumulation.)
- If the refrigerant accumulates within the compressor, the compressor must be warmed up at least 12 hours before starting the operation to prevent breakdown.
- 4. If the insulation resistance rises above 1 MΩ, the compressor is not faulty.

⚠ Caution:

- The compressor does not operate if the power supply phase connection is incorrect.
- Turn on the power at least 12 hours before starting operation.
- Starting operation immediately after turning on the main power switch can result in severe damage to internal parts. Keep the power switch turned on during the operating period.

Note : Occasionally, vapor that is made by the defrost operation may seem as if smoke come up from the outdoor unit.

8. Special Functions



8.1. Low noise mode (on-site modification) (Fig. 8-1)

The low noise mode will be activated when a commercially available timer or the contact input of an ON/OFF switch is added to the CNDM connector (option) on the control board of the outdoor unit.

- The ability varies according to the outdoor temperature and conditions, etc.
- ① Complete the circuit as shown when using the external input adapter (PAC-SC36NA). (Option)
 - ② SW1 ON: Low noise mode
SW1 OFF: Normal operation

This product is designed and intended for use in the residential, commercial and light-industrial environment.

The product at hand is based on the following EU regulations:

- Low Voltage Directive 2006/95/ EC
- Electromagnetic Compatibility Directive 2004/108/EC

MITSUBISHI ELECTRIC CORPORATION

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HARMAN HOUSE, 1 GEORGE STREET, UXBRIDGE, MIDDLESEX UB8 1QQ, U.K.

ECODAN AIR SOURCE HEAT PUMP

UNIT : mm

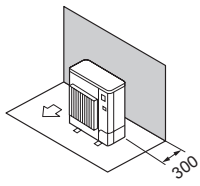


Fig. 2-5

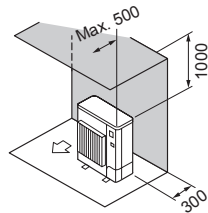


Fig. 2-6

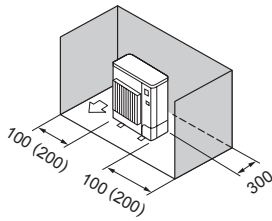


Fig. 2-7

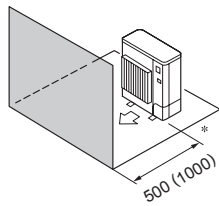


Fig. 2-8

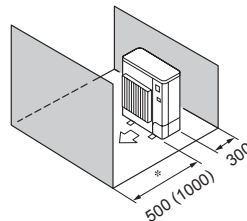


Fig. 2-9

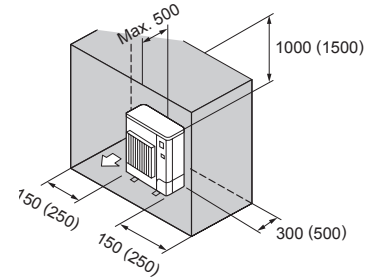


Fig. 2-10

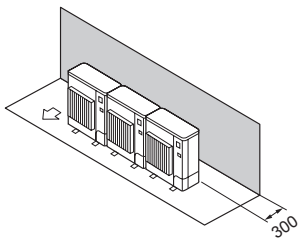


Fig. 2-11

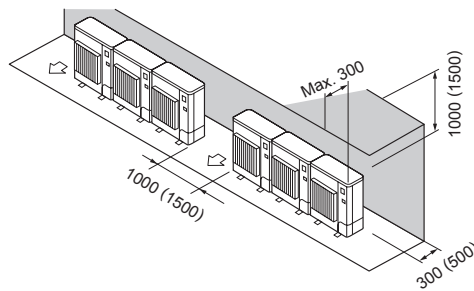


Fig. 2-12

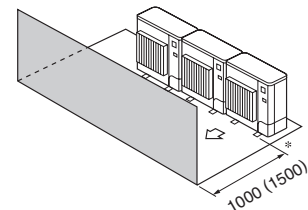


Fig. 2-13

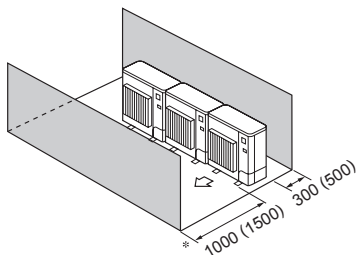


Fig. 2-14

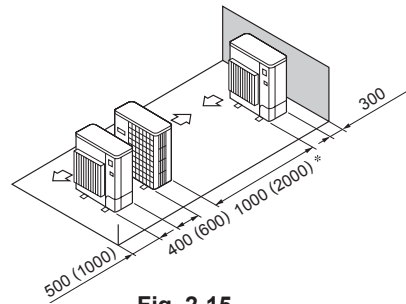


Fig. 2-15

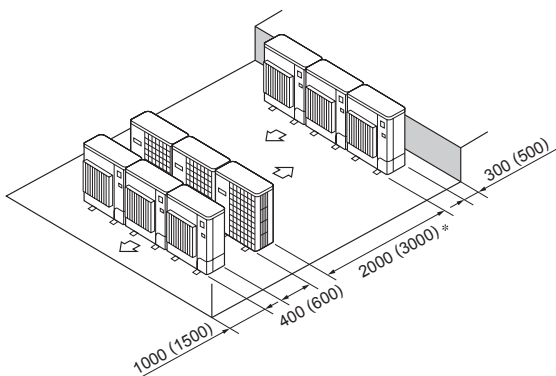


Fig. 2-16

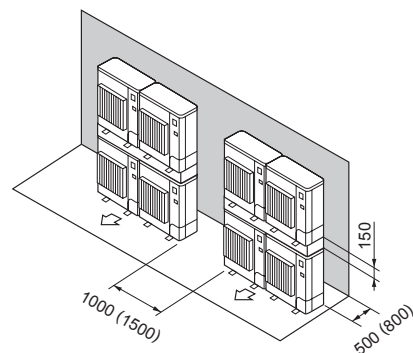


Fig. 2-17

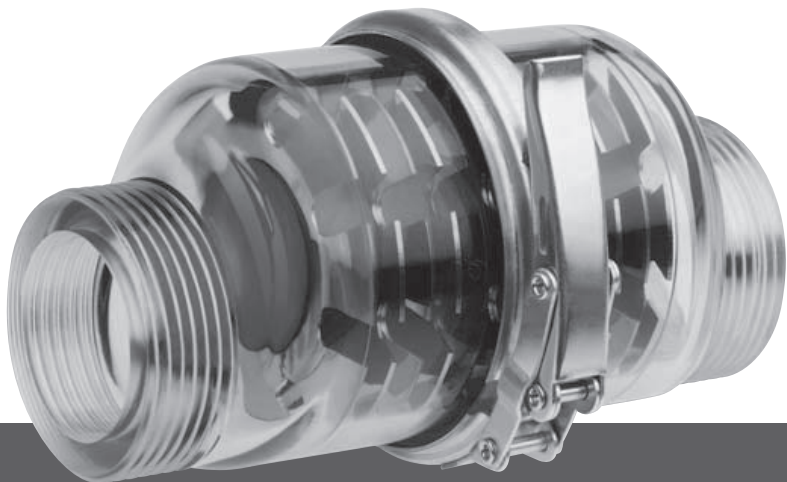
FERNOX BOILER BUDDY

FERNOX
MAKES WATER WORK

Boiler buddy

Designed to complement Fernox's extensive range of chemical water treatment products, the Boiler Buddy is a premium quality in-line, high efficiency magnetic filter with patented flux plates developed for use in Formula 1 motor racing. Unlike other conventional or magnetic filters, Boiler Buddy not only traps magnetite to sub-micron levels, it does so without restricting the water flow, even when full.

Boiler Buddy also offers a unique opportunity for condition monitoring of the system. Its transparent housing enables the build-up of debris to be observed; acting as an early warning sign of inherent problems which might result in pumps or valves seizing and ultimate system failure.



Application

The Boiler Buddy can be connected directly to **22 mm** copper pipework using conventional pump connectors (it is also compatible with **15 mm** with the appropriate adapter. It is not recommended for 28 mm systems, as it will restrict the water flow) Boiler Buddy can be installed vertically or horizontally. The unit is designed to slot into the space provided after removing a circulator pump when fitting a condensing boiler into

an existing system (ideally it should be fitted on the return close to the boiler itself.) The off-set inlet and outlet ports enable Boiler Buddy to be fitted flush against a wall in existing pipework. System cleaning can be undertaken when a Boiler Buddy is installed by simply isolating and removing the unit at the connection points and powerflushing across the connections.

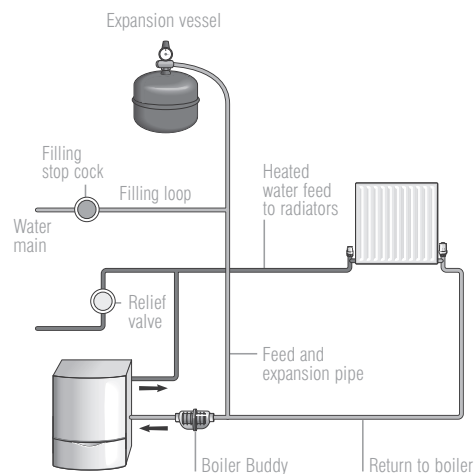
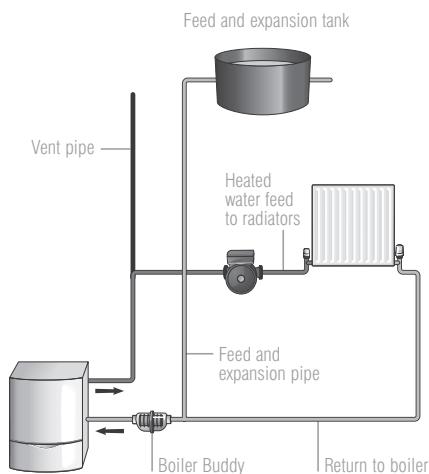
PRODUCT DATA

FERNOX BOILER BUDDY

How to install a Boiler Buddy

Boiler Buddy has a transparent body casing so that the build-up of contamination on the core can be observed in service. It has been designed to be fitted where it can be inspected and removed for cleaning and should be installed in the central heating return line as close to the boiler as possible.

There are a variety of installations but in general the open-vented system and the sealed system are typical.



Points to consider

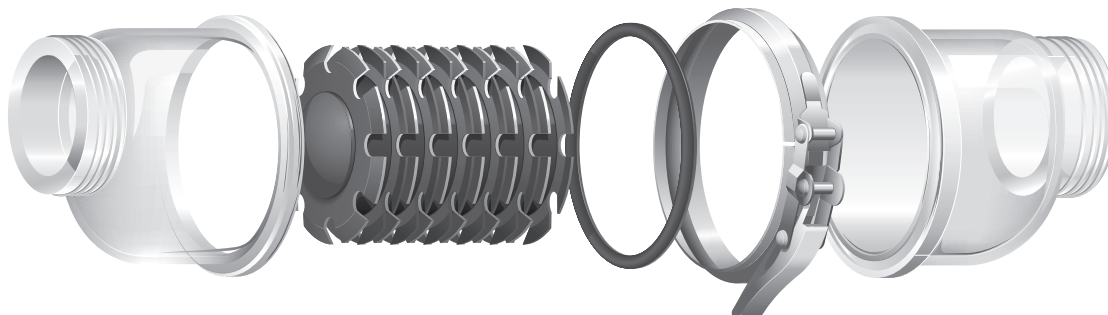
- When selecting a position to install a Boiler Buddy beware of electrical connections in the vicinity, as these will be hazardous if they come into contact with water.
- Install the Boiler Buddy with both an upstream and downstream servicing valve.
- Boiler Buddy is designed for use with standard 1 1/2" BSP x 22 mm pump servicing valves (on a 15 mm system we recommend fitting 22 to 15 mm reducing sets instead of three 22 mm olive in the pump servicing valves).
- Boiler Buddy has a face-to-face dimension of 130 mm.
- If standard pump servicing valves are used, a total space of 250 mm is required for installation.
- During installation ensure that all copper or plastic swarf is removed from joints and does not enter the water pipework. If soldered joints are being used to construct the pipework, ensure solder or flux is wiped away to avoid corroding plastic parts. Do **NOT** undertake any soldering while the Boiler Buddy is in the pipework. Boiler Buddy **MUST** be removed before soldering any joints.
- Once installed, secure the tamper-proof tag to avoid accidental opening. The tag must be replaced after cleaning the core.
- Complete the Boiler Buddy installation sticker and apply to the boiler.
- Run the system and check for leaks.

After installation

- The Boiler Buddy has no moving parts and needs no adjustment once in service.
- The body casing is transparent so that build-up of contamination can be observed.
- It is normal for the magnet nearest the inlet of the Boiler Buddy to become full first. Once this is full the next magnet will clog up followed by the next and so on. The Boiler Buddy has six magnets, we recommend cleaning the core when three magnets become full.
- It is recommended the Boiler Buddy is inspected and cleaned annually.
- Boiler Buddy is designed to last the life of the central heating system. More frequent cleaning of the core is an indication that the system has not been treated correctly with Fernox Protectors, Restorers and cleansers.

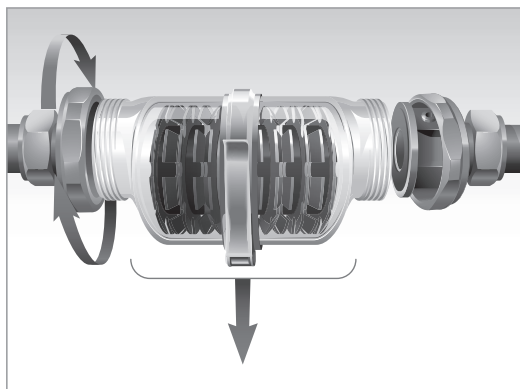
FERNOX BOILER BUDDY

How to **service** and **clean** a Boiler Buddy



Before removing the Boiler Buddy, place a container underneath the pipework to retain any water that may drip.

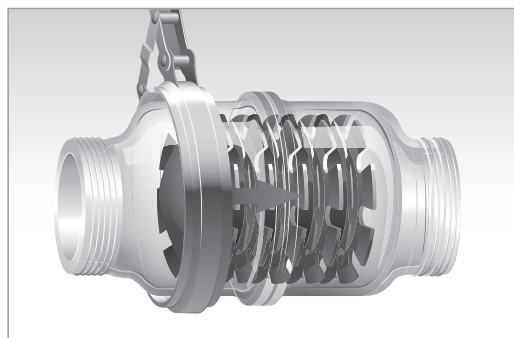
- 1** Isolate the Boiler Buddy from the system, by simply closing the quarter turn valves on the pump service connector
- 2** Once the Boiler Buddy has been isolated it can be removed. Undo the two 1½" BSP union nuts. Once these have been fully unscrewed the Boiler Buddy can be pulled out between the two flat faces. The two fibre washers may stick to the flat surface and tear on removal of the Boiler Buddy, this is normal



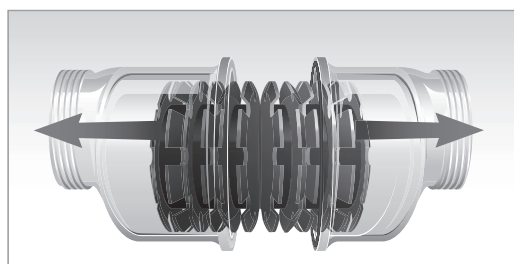
WARNING: Under no circumstances attempt to remove the Boiler Buddy from the system by removing the body clamp.

Once the Boiler Buddy has been safely removed from the system it can be disassembled. Fernox recommends that waterproof gloves are worn when cleaning the Boiler Buddy.

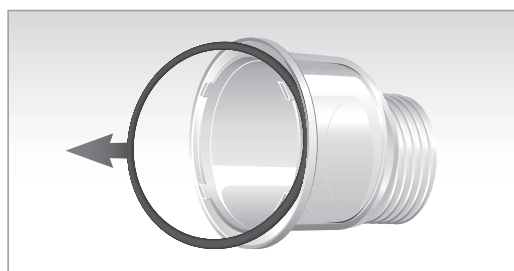
- 3** Cut off the tamper-proof tag
- 4** Open the latch on the body clamp and slide off the complete clamp over one end of the body



- 5** Pull the two halves apart



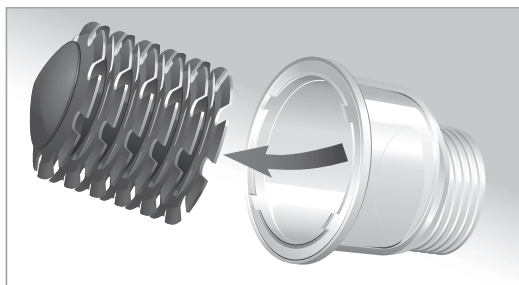
- 6** Remove the 'o' ring



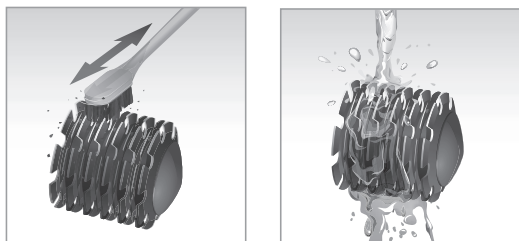
PRODUCT DATA

FERNOX BOILER BUDDY

7 Remove the complete core



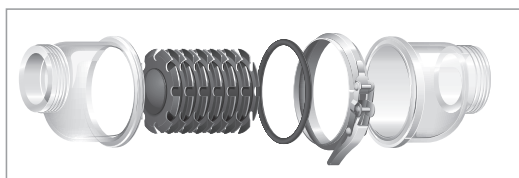
8 To clean the core either use a stiff brush or hold under running water perpendicular to the core (ensure that any magnetite is disposed of safely)



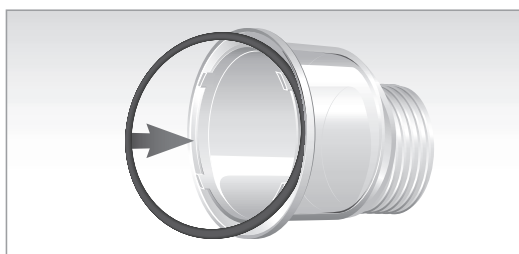
9 Wipe clean the inside surface of each half of the body casing

Once the core has been cleaned the Boiler Buddy can be reassembled.

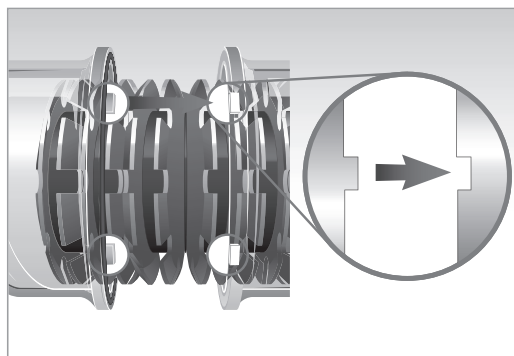
10 Place the clean core into the cleaned body casing



11 Place the new 'o' ring into position in the groove



12 Place the other body half over the 'o' ring; there are locator pins to help the correct alignment of the two parts



13 Once the body is assembled, place the body clamp over the flange and push the lever on the latch to the secured position

14 Pass the replacement tamper-proof tag through the slot in the latch ensuring that it also passes through the bridge on the latch. This will guard against accidental opening of the clamp

15 Using two new fibre washers place the Boiler Buddy back into the pipework between the two (pump) servicing valves

16 Tighten the union nuts until finger tight, after which use a spanner to tighten 1.8th of a turn or until secure. CAUTION: The body casing is a plastic part and will fail if excessive force is used

17 The servicing valves can be opened and flow of water will be observed through the Boiler Buddy

18 Run the heating system and check for leaks

Spare parts

The Boiler Buddy is designed to last the life of the heating system. The following spare parts are available from Fernox:

- ✓ 'O' ring
- ✓ Spare clamp
- ✓ Tamper-proof tag
- ✓ Spare core





Product data

PROTECTOR ALPHI-11

- Protects against corrosion and limescale
- Maintains efficiency so extending system life
- Prevents bacterial contamination
- Compatible with all metals and materials commonly used in heating systems
- Non-toxic, environmentally friendly
- Combined antifreeze and protector
- Protects heating, chilled water and solar systems

Product Uses

Fernox Protector Alphi-11 is a combined antifreeze and inhibitor, which gives long term protection of domestic central heating systems against internal corrosion and limescale formation. It prevents corrosion of all metals found in these systems, i.e. ferrous metals, copper and copper alloys and aluminium. It is especially recommended for use in solar systems. Fernox Protector Alphi-11 is compatible with all metals and materials commonly used in central heating systems.

For continued protection we recommend Protector levels are checked regularly (annually). The concentration of the product can be easily measured on site using a Fernox 'One Drop' Protector test kit.

Physical Properties

Fernox Protector Alphi-11 contains mono-propylene glycol.

Colour:	Colourless
Odour:	Mild
Form:	Clear liquid
pH (conc)	5.7 – 6.1
pH (soln 25%):	7.0 – 7.5
SG:	1.04 at 20°C

Application and Dosage

The minimum recommended "in-use" concentration of the product is 25% in order to ensure adequate corrosion protection. This concentration will protect down to -11°C. A concentration of 40% will protect down to -22°C. Alphi-11 Protector can be introduced via the feed and expansion tank or other suitable point of application, e.g. radiator, using a Fernox Injector. Introduce into the system after having drained a quantity of water at least equal to the amount of Alphi-11 to be added. Engage the circulating pump and have the system online for a few hours in order to achieve an even distribution.

Concentration	25%	30%	35%	40%
Protection	-11°C	-15°C	-18°C	-22°C

In single feed indirect cylinders, e.g. "Primatic" or similar, potable water chemicals must be used.

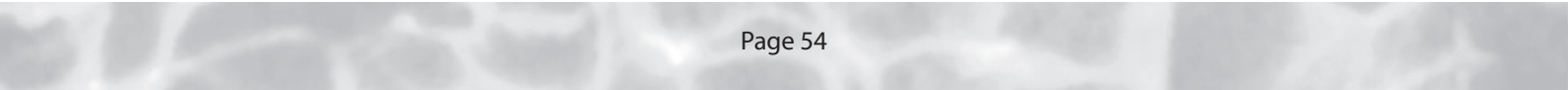
We recommend untreated systems are thoroughly cleansed and flushed, in accordance with BS7593 and Benchmark, using Fernox Cleaner F3 before treating with Fernox Alphi-11 Protector as existing debris can damage the installation.



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