MICROMAT EC

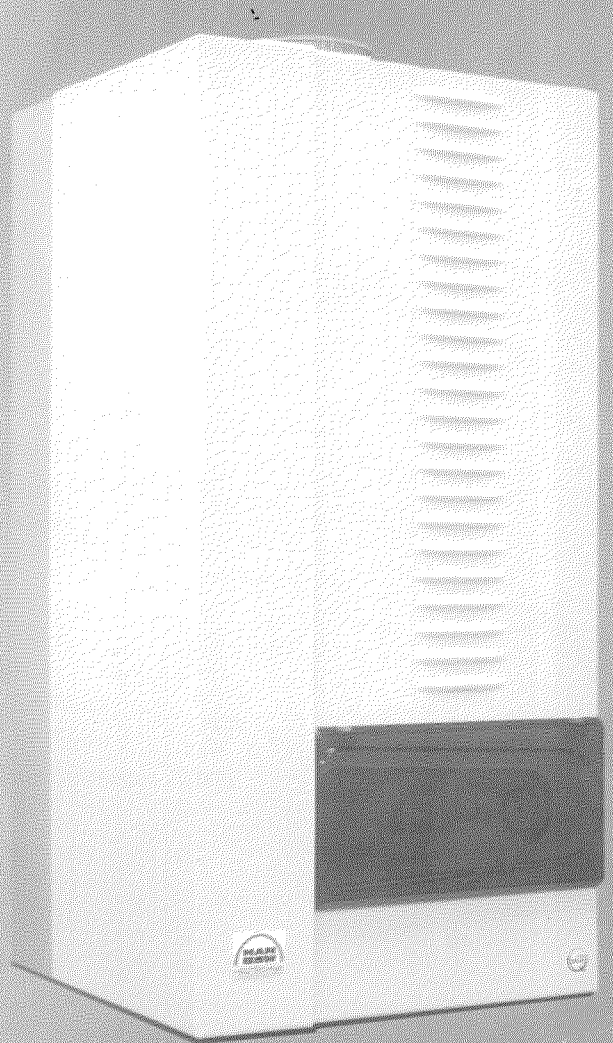
Wall mounted Ultra High Efficency Gas Boilers

45kW • 62 kW • 76 kW

Instructions for Usage, Installation & Commissioning

RVR Ltd.
Energy Technology

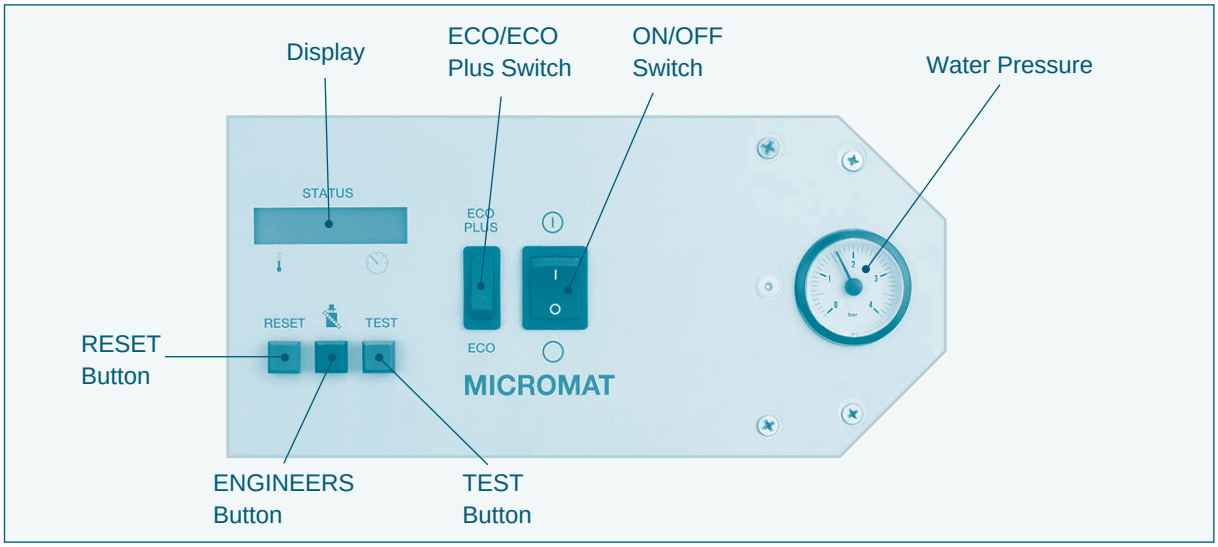
MAN B&W
HEIZTECHNIK



index

1.0 user instructions for *the micromat boiler appliance*

Boiler Switch Panel



Before operating the boiler:

Check that the boiler has been installed in strict accordance with the instructions contained in this manual. Non compliance with the instructions may result in injury and/or damage to property. The warranty on the boiler is void if the boiler is not installed in accordance with these instructions.

Check the following points with the installer:
A suitable corrosion inhibitor has been added to the water in the system. (see page 31)
The water used to fill the system is within the purity limits specified. (page 31)
Any soldering fluxes used are compatible with the boiler (see page 31)

Important!

The Micromat EC boiler requires an annual service. The boiler display will display [Service] when a service is due although the boiler will continue to operate normally. An RVR approved service technician should carry out the annual service.

Switching ON the MICROMAT EC

1) Ensure the pressure gauge indicates a pressure within the system of not less than 0.5 bar and not more than 3 bar.

2) Ensure the gas supply is turned on.

3) Switch on the on/off switch on the appliance control panel.

After switching on the boiler the MICROMAT EC operates automatically.

Switching OFF the MICROMAT EC

1) Switch off the on/off switch on the appliance control panel.

2) Turn off the gas supply

Turning off the boiler will leave the system at risk of freezing during the winter months and will disable the automatic pump exercising routine. If the only reason for shutdown is that normal heating is not required, then it is recommended to leave the boiler on and turn off or turn down any external controls.

1.0 user instructions for *the micromat boiler appliance*

Functions of the Control Panel Buttons and Dials

Reset Button

This button has two functions

1. Resetting of fault conditions: - When the display text is flashing on and off, a boiler fault is indicated. The type of fault is displayed on the screen. Please refer to the fault finding section on page 52 for a description of these faults. The boiler control is reset by pressing the Reset button once.
2. Inspection of boiler operating parameters:- When the display is not flashing (ie when the boiler is in normal operation), the Reset button may be used to inspect the boiler operating parameters.

Press once - Display shows “T1 Fl1 --°C” - This is the flow water temperature from heat exchanger 1.
Press twice - Display shows “T3 Fl2 --°C“ - This is the flow water temperature from heat exchanger 2.
Press three times - Display shows “T3 Ret --C” - This is the return water temperature to the boiler.
Press four times - Display shows “T5 Sto --°C” - This is the Domestic hot water storage temperature. A temperature is shown only if the hot water temperature sensor (RVR Stock no: SBA021) is connected.
Press five times - Display shows “Fan Sp 1 ---- RPM” - This is the burner blower speed for heat exchanger 1.
Press six times - Display shows “Fan Sp 2 ---- RPM” - This is the burner blower speed for heat exchanger 2.
Press seven times - Display shows “Pump 1 --%” - This is the speed of the circulation pump as a percentage of it’s maximum speed.
Press an eighth time and the display returns to normal displaying the supply water temperature.

Engineers Button

The user will not normally need to use this button. It is used by the service technician to enable measurement of flue emissions even without heat requirement being present.

NOTE: This function will not be available if the MICROMAT EC and the heating system have reached their maximum temperatures.

If the Engineers button is pressed once then the MICROMAT EC operates with half power. The display shows [Flue Emissi]. If the Engineers button is not pressed again within 10 minutes the MICROMAT EC will switch back to automatic operation after this period. Pressing the button again when [Flue-Emissi] is displayed brings [10min Low] onto the display. In this condition the power output of the boiler can be adjusted using the green potentiometer between 11kW and 57kW (EC62H) and 14kW and 72kW (E76H)

Turning it to the right : Less Power Turning it to the left: More Power

Pressing the Engineers button again while [10 min. low] is shown in the display switches the MICROMAT EC back to automatic operation. After 10 minutes partial output the MICROMAT EC will return to automatic operation

TEST Button

The Test button is used to simulate the function of the hot water High Limit Stat.

Whilst theTEST-button is pressed the display shows [Limit F/R]. During this display the function of the MICROMAT EC is blocked. When the button is released the boiler will return to normal operation.

If the button is pressed for more than 3 minutes [Wat 1 Lockout] will blink on the display. The function of the MICROMAT EC is then locked.

The MICROMAT EC can also be locked by simultaneously pressing the TEST and ENGINEERS button.

When the RESET button is pressed again the MICROMAT EC returns to automatic operation.

ECO and ECO PLUS Operation

In ECO PLUS mode the pumps in the MICROMAT EC maintain a temperature differential of 20K (10K with underfloor heating) if the system design allows this. This ensures the most effective use of energy.

In ECO mode the temperature differential is only regulated if the return temperature exceeds 50°C. With lower temperatures the pumps work at full speed. This also ensures the maximum heat dissipation. The ECO mode setting is recommended if individual rooms do not get warm enough and hydraulic balancing is not possible.

Green Potentiometer

The green potentiometer is used to adjust the Domestic hot water storage temperature, if the boiler has been configured for this. See page 48 for more information.

Red and Blue potentiometers

These are used to alter the weather compensation settings. See page 45 for more information.

2.0 general *notes*

These instructions are intended to assist the installer, commissioning engineer, maintenance engineer and user with the installation, maintenance and usage of MICROMAT EC,45, 62 and 76 models gas fired condensing boilers.

Please read this manual fully before commencing the installation of the appliance. The MICROMAT EC must only be installed by persons deemed to be competent. This manual must be handed to the user following completion of the installation.

3.0 product *description*

The MICROMAT EC range of wall mounted gas fired condensing boilers are state of the art appliances which include a comprehensive range of features. The appliance must only be used on sealed and pressurised systems. System design must take into account the boiler operating Δt of 20°C.

wall mounted with compact dimensions

At 900H x 458W x 435D the MICROMAT EC boiler provides maximum heat from minimum dimensions without compromising serviceability.

fully modulating heat output

The output of the boiler is fully variable, sliding between (approx.) 20% to 100%, which automatically and instantly adjusts to match the needs of the system. The percentage of power at any given time can be dictated by either outside air temperature, flow temperature, return temperature, stored domestic hot water temperature, or room temperature, or a combination of the aforementioned.

fully condensing stainless steel heat exchanger

The MICROMAT EC boiler is designed with extended heat exchange surface area and is fabricated from corrosion resistant long-life stainless steel. The unique Spiranox heat exchanger will return operating efficiencies from 88% gross (96% nett) at 60°C return temperature, up to 96% gross (104% nett), at 30°C return temperature.

extremely low harmful emissions

The boiler utilises 100% pre-mix gas/air fed at positive pressure to the metal fibre sheathed radiant burners. The combustion system incorporates internal flue gas re-circulation and this combined with the precise nature of pre-mix fuel/air control, gives ultra low emissions to satisfy the most stringent emission regulations in the world currently. That is: <20mg/kWh NOx (14 ppm DAF) and <14mg/kWh CO (13 ppm DAF). The fully modulating nature of the appliance also reduces emissions by avoiding repeated start/stops and the associated increase in emissions, which occurs with burner on/off cycling.

accurate variable burner output control

The pre-mix burner fans have low voltage direct current drive motors with pulse relay counting. This system allows precise control over fan speed/combustion air volumes. Coupled with a gas valve system set to provide a one to one ratio of precisely measured volumes of fuel to air, this allows extremely accurate and instant variable burner output control to be achieved.

3.0 product *description*

energy saving

In addition to the extremely efficient burner and heat exchanger system employed in the MICROMAT EC each appliance includes a modulating speed boiler primary pump. This feature allows the boiler to self-maintain a 20°C Δt across the heat exchanger, optimising the heat exchanger efficiency and reducing also the electrical consumption of the pump motors. The result is a seasonal increase in boiler efficiency of a further 7-10% and a reduction in pump electricity consumption of up to 70%.

natural gas or LPG

Appliances can be supplied for use with natural gas (G20) or LPG (G31).

comprehensive microprocessor control

The boiler control panel includes a user friendly microprocessor control centre which manages the entire function of the appliance and encompasses: -

1. Management of the essential safety functions of burner ignition and flame monitoring.
2. Water high temperature and flue gas high temperature safety cut out.
3. Modulation of the boiler output and pump speeds in conjunction with operating temperature control.
4. LCD display screen with two lines of text to continuously display operational or fault status.
5. In built weather compensator to provide direct-on boiler VT flow temperature (if required).
6. Remote stored hot water temperature control.
7. In built 2 stage boiler frost protection program.
8. In built pump exercising program to avoid standstill seizure.
9. Cold start boost facility.
10. PC compatibility with data logging which allows communication with the boiler via a lap-top computer to review / modify operational parameters and access operational history as an aid to fault finding and preventative maintenance.
11. Range rate adjustment which allows the power to be set to accurately match the maximum needs of the system, with the facility to set a different firing rate for heating. Output to hot water self adjusts to the heat transfer capability of the calorifier.
12. Facility to connect optional matched control components which allow the boiler to control a heating circuit pump, HWS primary pump or diverter valve and an underfloor circuit mixing valve and pump, plus the ability for the boiler to be controlled by a remote multi function modulating room unit. Multiple boilers may be connected to a modulating Kaskade manager which further enhances the operating efficiency of a larger load modular boiler system.

room sealed option

If required, the boiler may be installed to be completely room sealed, taking combustion air directly from outside the building, using a 125/70 concentric air duct/flue duct system. Inherent safety is afforded by the negative pressure within the boiler casing, which in the event of incorrect sealing results in safe inward air leakage only.

extended flue lengths

The excess fan pressure from the combustion system is 100 Pa, which allows the appliance to be exhausted using small diameter PPS plastic flue components, over long distances, allowing for complete flexibility in boiler siting.

designed for ease of maintenance

Although compact, the MICROMAT EC does not compromise serviceability. The appliance has been engineered to be easy to maintain with even the most major of service operations being able to be completed easily and quickly with the minimum of tools.

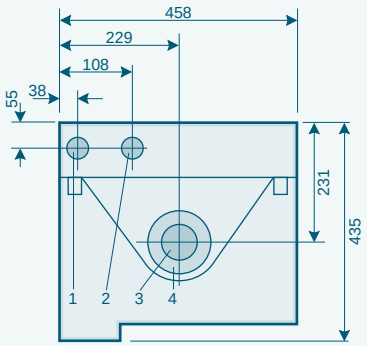
guarantee

The heat exchanger carries a five year guarantee against manufacturing or material defect provided that INIBAL corrosion inhibitor is used in the system and a service contract is in place with an RVR approved service agent. Please contact the RVR Customer Care Department for details.

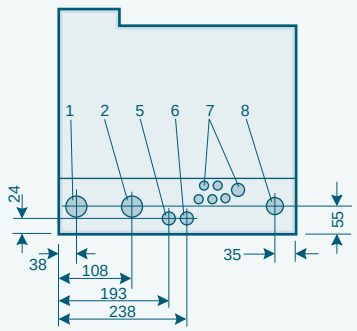
4.0 technical *data & dimensions*

MODEL	MICROMAT EC		45	62	76
Nominal Heat Input Nett (max)		kW	43	57	72
Nominal Heat Output 80/60°C		kW	41.3	55.8	70.6
Nominal Heat Output 50/30°C		kW	45.2	60.4	76.0
Input Rate Nat Gas (max)		m^3/h	4.5	6.01	7.6
Minimum/Maximum Gas Pressure		mbar	15/60	15/60	15/60
Flue Gas Volume (hot)		m^3/h	64	81	104
Pressure at Flue Outlet		pa	100	100	100
Maximum Working Pressure		bar	3.0	3.0	3.0
Minimum Working Pressure		bar	0.5	0.5	0.5
Maximum Flow Temperature		°C	85	85	85
Power Supply		Volts	230	230	230
Fuse rating		Amps	3.0	3.0	3.0
Average Power Consumption		Watts	115	115	164
Water Content		Litres	6	7	8
Weight (Dry)		kg	64	69	73

plan - models 45/62/76

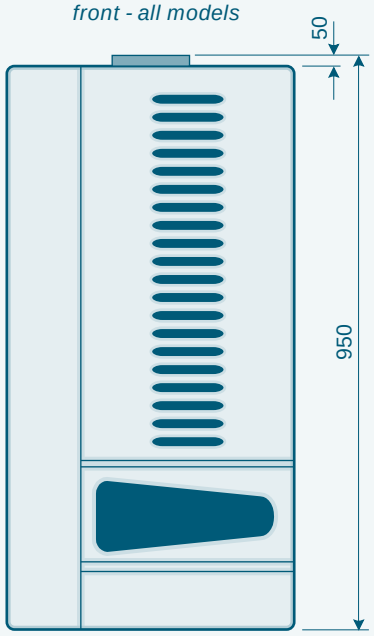


underside - models 45/62/76



CONNECTION MICROMAT EC	45	62	76
1. Return	1 1/4" BSP-M	1 1/4" BSP-M	1 1/4" BSP-M
2. Flow	1 1/4" BSP-M	1 1/4" BSP-M	1 1/4" BSP-M
3. Flue Gas (OD)	70mm	70mm	70mm
4. Air Duct (OD)	125mm	125mm	125mm
5. Condense Siphon Cleaning Point (capped)	3/4" BSP	3/4" BSP	3/4" BSP
6. Condensate	3/4" BSP-M	3/4" BSP-M	3/4" BSP-M
7. Cable Entries	Multiple	Grommets	
8. Gas	3/4" BSP	3/4" BSP	3/4" BSP

front - all models



5.0 delivery consignment *unpacking the boiler*

The boiler is delivered as a consignment of a carton containing the boiler and associated fittings, plus any other optional ancillary flue or control components in separate cartons.

The boiler carton contains

- Assembled Boiler
- Wall mounting bracket
- Fittings carton including 2Nr 1¼" x 1¼" x ½" BSP Tees, 2Nr 1¼" x ½" BSP reducing sockets, 1 Nr ¾" BSP Inlet x 1" BSP outlet safety valve set 3.0 bar, 1 Nr ¾" x ½" BSP reducing nipple (for safety valve inlet) and 1 Nr outside air temperature sensor.

To unpack the boiler, the carton should be laid on the floor with the top carton seam uppermost. Carefully remove tape from seam and open carton flaps, remove packing material, wall mounting bracket and fittings carton. For ease of boiler handling from the carton it is suggested that the carton be slit down each corner and the carton sides laid out flat. The boiler should only be lifted by contact with the rear (grey) chassis assembly.

To remove the casing from the boiler, slacken the screw in the underside of the casing, unlatch left and right hand catches on underside of case, pull casing slightly to the front and lift upwards to disengage casing hooks from rear chassis and then remove casing to the front.

6.0 boiler *location*

The MICROMAT EC Boiler is not suitable for installation external to a building. The position chosen for the boiler must be a structurally sound wall capable of supporting the weight of the boiler and any ancillaries. The position should allow for access to a condensate drain nearby or an alternative is to install a condensate sump receptacle and condensate disposal pump which should remove the condensate water to a remote drain. The wall mounting position of the boiler must allow the boiler to be true plumb vertical to ensure correct operation of the internal gravity flow condense system. The position for the boiler must satisfy the requirements of BS6798: I987 or BS6644: 1991.

7.0 installation *clearance*

For ease of installation, commissioning and maintenance the following minimum clearances should be observed.

Sides	50mm
Above	250mm
Below	150mm
Front	450mm

8.0 wall *mounting*

The MICROMAT EC boiler mounts to the wall via a wall mounting bracket which interlocks to a rail on the rear of the boiler. The wall mounting bracket should be firmly fixed to the wall using suitable fixings with a countersunk head. The wall mounting bracket positioning detail is shown in fig 1. The boiler must be carefully offered up to the wall so that the rail on the rear of the boiler is just above the wall mounting bracket and then the boiler should be lowered to engage the bracket and rail. Lifting is advised with 2 persons. **Do NOT lift the boiler by the internal parts of the appliance.**

important

When viewed from the side, the axis of the boiler must be vertical. The appliance must not be inclined out from the top, if necessary block or shim behind the bottom rear of the boiler to achieve a vertical installation.

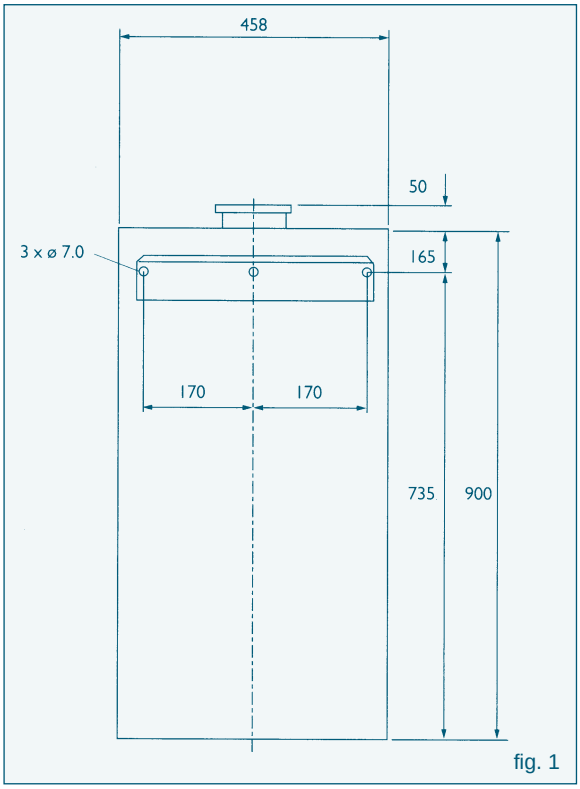


fig. 1

9.0 gas *connection*

The gas connection is located at the base of the appliance rear r/h side, see fig 2. The pipe size used to supply the appliance must not be smaller than the gas connection size on the appliance. The connection to the appliance must include a suitable method of disconnection and a gas control cock must be installed adjacent to the appliance for isolation purposes. The gas pipe used to supply the appliance must not allow a pressure drop of greater than 1mbar from the meter to the appliance. The nominal inlet working gas pressure measured at the appliance should be 20.0 mbar for Nat. Gas and 37 mbar for LPG.

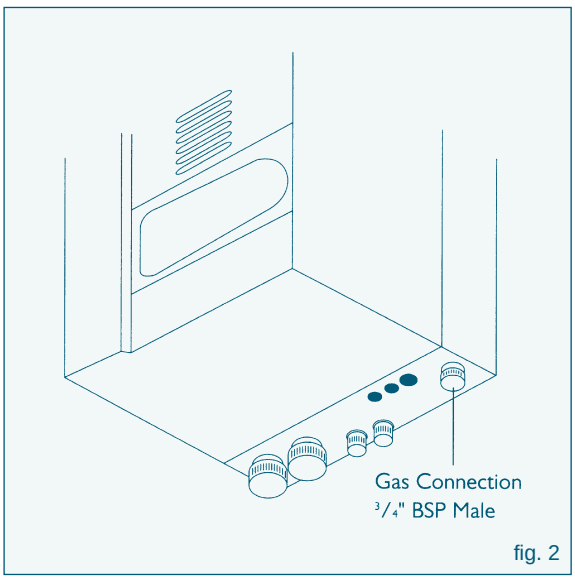


fig. 2

9.1 gas *conversion*

The MICROMAT EC is factory fitted for Natural Gas (G20). However the unit can easily be converted to LPG (G31) by using the kit supplied (part no. 251588) and following the instructions below.

- Remove cover from boiler
- Open the outlet flange joints at the gas combi valves.
- On the outlet side of the gas combi valve add the Ø 5.7mm LPG jets from the conversion kit.
- On the inlet side of the left hand gas combi valve only, replace the NG jet with the 3.5mm LPG Prejet.
- Re-tighten the flange joint. Do not forget the O-rings.
- Check for Leakage.
- On the MICROMAT EC 45 H/62 H/76 H, when converting to LPG, the front bore on both gas/air mixing chambers must be closed using the black ø10mm plugs supplied in the conversion kit.
- In addition, with the MICROMAT EC 76H both back bores in both gas/air mixing chamber must be closed using the Ø15mm plugs supplied in the conversion kit.

Enter the gas type to which the MICROMAT EC is converted on the label next to the type label

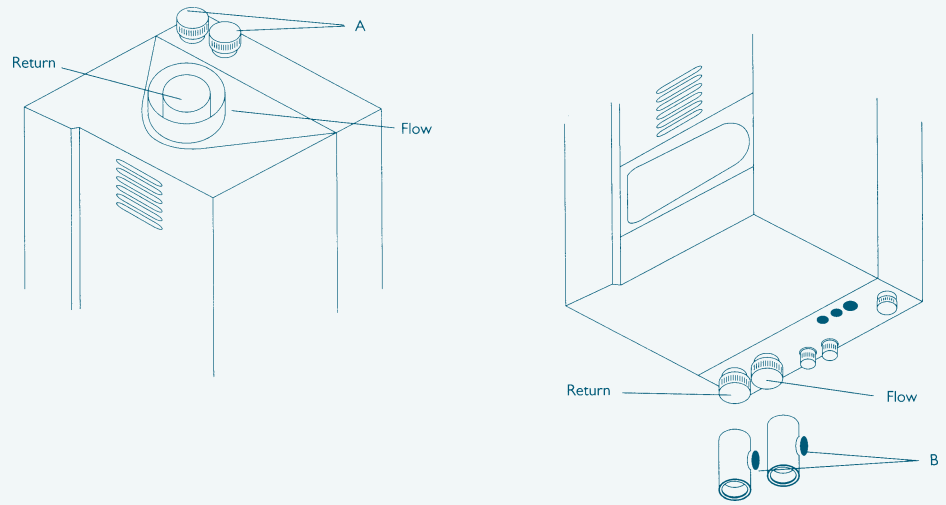
10.0 system flow *& return connections*

Note The MICROMAT EC boiler must only be installed on sealed and pressurised systems. The maximum working pressure of the boiler = 3 bar. A safety valve set to 3.0 bar is supplied with the boiler and must be installed onto the flow pipe adjacent to the boiler. It is recommended that the final working pressure (hot) of the system does not exceed 2.3 bar.

The boiler is equipped with 2 sets of 1¼" BSP Male flow & return connections which are located top rear L/h side & bottom rear L/h side. See figs 3&4.

The installer may choose to use both top connections or both bottom connections or one of each (e.g. flow-top, return-bottom). The appliance is supplied complete with 2Nr 1¼" x ½" BSP reducing sockets (see fig 3. item A) which may be used either at the top of the appliance (when flow and return connections are made to the lower boiler connections) to install air vents or be used at the bottom flow and return connections (when system connections are to the top of the appliance) to install drain cocks.

The appliance is supplied with 2Nr 1¼" x 1¼" x ½" BSP Tees (see fig 4. item B) which may be used to connect the supplied safety valve into the flow pipe adjacent to the appliance and either a system filling point/expansion vessel or a drain cock.



The flow and return pipework should include isolation valves and a method of disconnection local to the boiler

11.0 condensate *connection*

The condensate connection is located at the underside rear of the appliance see fig 5.

The condensate syphon cleaning point is factory fitted with a heavy grade black plastic cap which MUST NOT BE REMOVED (see fig 5) apart from routine maintenance cleaning operations and must be in place whenever the appliance is in operation. WARNING. Operating the appliance with the cap removed from the syphon cleaning point will cause products of combustion to be discharged from the cleaning point.

The condensate connection is a ¾" BSP Male threaded stub fabricated from plastic.

The installer must connect to this stub, a condensate pipe fabricated from plastic tube and fittings (¾", 22mm, overflow pipe is considered suitable). **Copper tube must not be used for the condensate pipe!** The condensate pipe must fall continuously from the appliance to a suitable nearby drain.

11.0 condensate *connection*

If any part of the condensate pipe is to be run external to the building or is at risk of freezing, then the pipe must be suitably insulated to protect from freezing.

If a suitable drain for accepting the condensate is not available nearby to, and below the boiler (e.g. boiler installed in a basement below ground level location), then a suitable condensate sump receptacle with a discharge pump should be installed below the boiler to remove the condensate to a remote drain.

When making the condensate pipe connection to the boiler, do not use adhesives, it is recommended to lightly apply a suitable jointing tape (PTFE or similar) and use only light pressure to connect fittings to the appliance to avoid damage to the condensate outlet assembly.

It is recommended that the condensate pipework should include a method of disconnection and cleaning points.

12.0 flue/combustion *air connection general*

The flue connection and combustion air inlet to the appliance are located on the top of the appliance see fig 6. These connections are arranged concentrically with the 70mm flue gas connection centrally within the 125mm air inlet connection.

There are two options for flueing the MICROMAT EC boiler.

i) Conventionally, using flue gas tube only and air for combustion from the room or compartment in which the appliance is installed. If using a conventional flue arrangement then the room or compartment must be ventilated in accordance with the requirements of BS 6644 or BS5440 as appropriate. For guidance on ventilation see section 16.

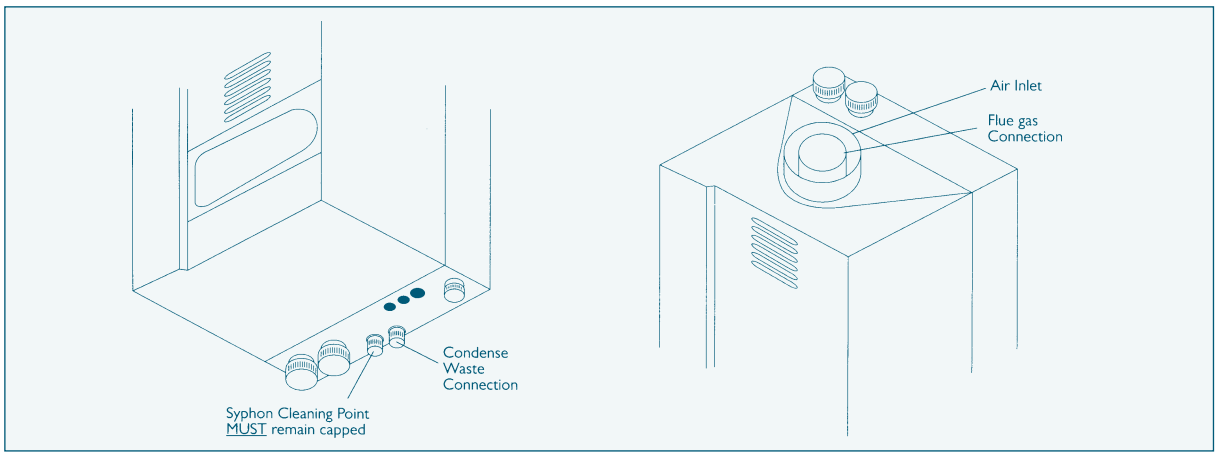
ii) Room sealed using concentric 70/125 components where air for combustion is taken from outside of the building. When using a room sealed flue, whereas air for combustion is provided from outside of the building directly to the appliance, ventilation to a compartment may still be required - See section 16 for general space cooling.

Multiple Boilers

For detail and advice on common flues serving multiple boilers, contact RVR Ltd.

Important Note

Where the MICROMAT EC is to be installed in an application where the combustion air is likely to be contaminated with oxidising agents, such as swimming pool areas, special industrial processes etc, then the appliance must be room sealed.

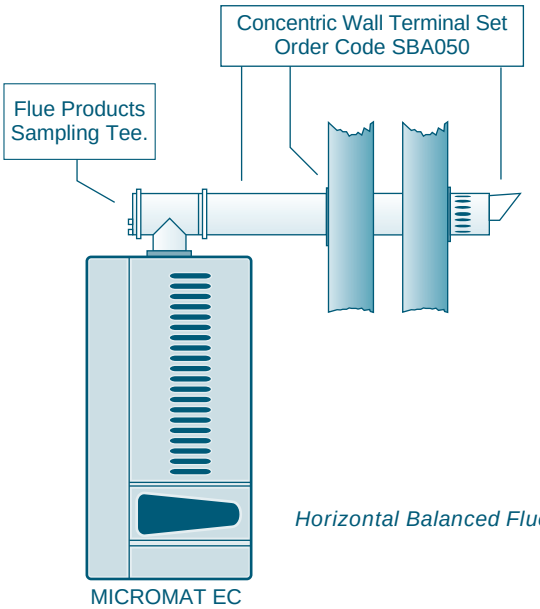


13.0 flue *systems*

The MICROMAT EC has an excess pressure combustion system that allows the appliance to be exhausted over extended distances using small OD flue components.

The flue gas temperature is extremely low (typically the same as the flow water temperature), which allows the use of easy to install PPS (polypropylene) flue pipe and fittings.

The appliance can take combustion air from the room in which it is installed (conventional application) or can be room sealed using a concentric flue arrangement of a 70mm PPS flue duct within a 125mm galvanised metal air duct, finished in off-white RAL 7035. A full range of flue pipe and air duct components including roof and wall terminals is available from RVR Limited.



Horizontal Balanced Flue with side exit

Flue System Option No. 1

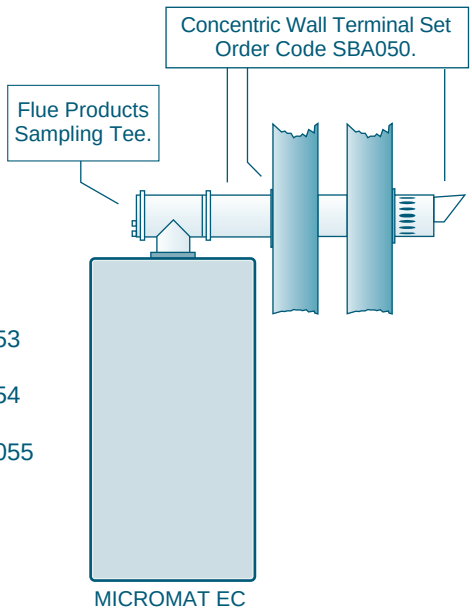
Horizontal Balanced Flue System

Using this sytem the air for combustion and the flue products are piped to/from outside the space.

The balanced flue may pass through the wall directly behind, or, on either side of the MICROMAT EC.

The following components and options are available from RVR Limited:~

•70/125 concentric wall terminal set complete with flue products sampling tee, 500mm straight concentric flue, wall sealing plates and outside terminal. These are finished in RAL 7035 (the 125mm galvanised pipe) and light grey (natural colour of 70mm PPS pipe). RVR Order Code - SBA050



Horizontal Balanced Flue with rear exit

The system may be extended using the following accessories:

•125mm Ø Extension pipe RAL7035, 250mm long. RVR Order Code - SBA053

•125mm Ø Extension pipe RAL7035, 500mm long. RVR Order Code - SBA054

•125mm Ø Extension pipe RAL7035, 1000mm long. RVR Order Code - SBA055

•125mm Ø 90° bend RAL7035. RVR Order Code - SBA056

•70mm Ø Extension Pipe PPS, 250 mm long. RVR Order Code - SBA057

•70mm Ø Extension Pipe PPS, 500mm long. RVR Order Code - SBA058

•70mm Ø Extension Pipe PPS, 1000mm long. RVR Order Code - SBA059

•70mm Ø 90° bend PPS. RVR Order Code - SBA060

•Birdscreen for 70mm Pipe. RVR Order Code - ACB002

Flue System Option No. 2

Vertical Balanced Flue System

Using this system the air for combustion and the flue products are piped vertically to/from outside the space.

The balanced flue may exit through both flat and pitched roofs. Suitable flashings are available for either case.

The following components and options are available from RVR Limited:

•70/125 concentric roof terminal set, complete with concentric pipes and terminal. The air pipe is finished in black PPS and the flue pipe in grey PPS. The length is 1150mm. RVR Order Code - SBA051

•70/125 concentric roof terminal set, complete with concentric pipes and terminal. The air pipe is finished in black PPS and the flue pipe in grey PPS. The length is 2000mm. RVR Order Code - SBA061

•Flue Products Sampling Tee (RAL 7035). RVR Order Code - SBA052 (Note: This item must be used with either of the above kits)

•Pitched Roof Flashing (20° - 45°). RVR Order Code - SBA062

or

• Flat Roof Flashing. RVR Order Code - SBA063

The system may be extended using the following accessories:

•125mm Ø Extension Pipe, Black PPS, 1020mm long. RVR Order Code - SBA064

•125mm Ø Extension Pipe, Black PPS, 2000mm long. RVR Order Code - SBA065

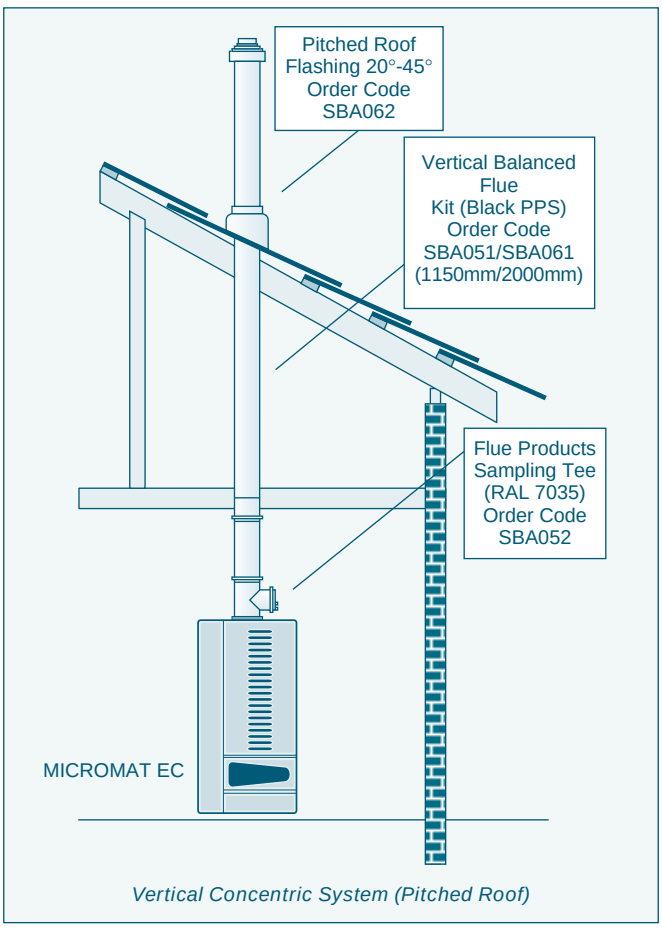
•70mm Ø Extension Pipe, Grey PPS, 1000mm long. RVR Order Code - SBA059

•70mm Ø Extension Pipe, Grey PPS, 2000mm long. RVR Order Code - SBA066

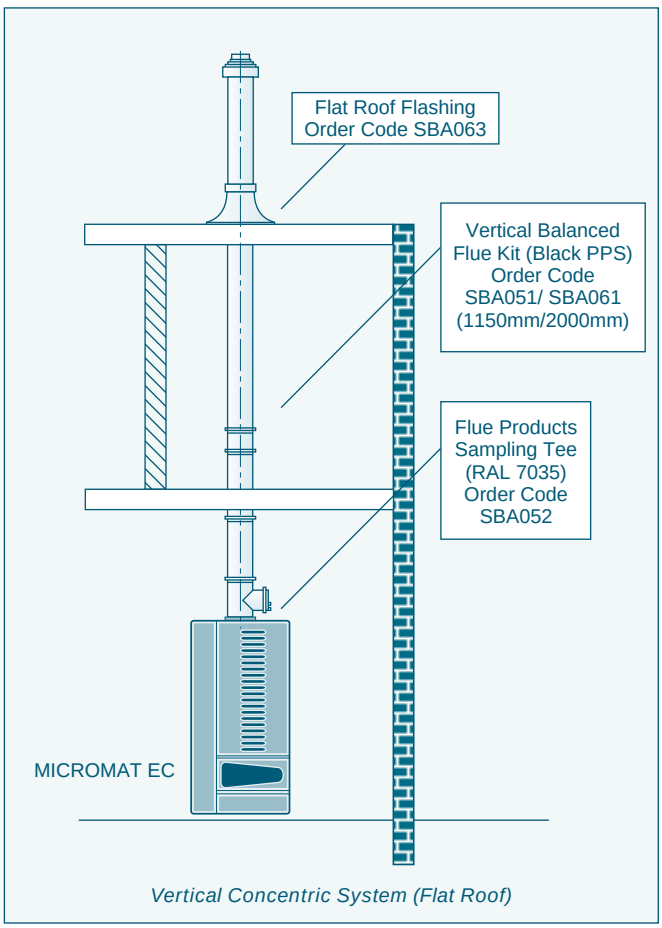
•45° Bend Black PPS, Male and Female Connections. RVR Order Code - SBA067

•45° Bend Black PPS, two Female Connections. RVR Order Code - SBA068

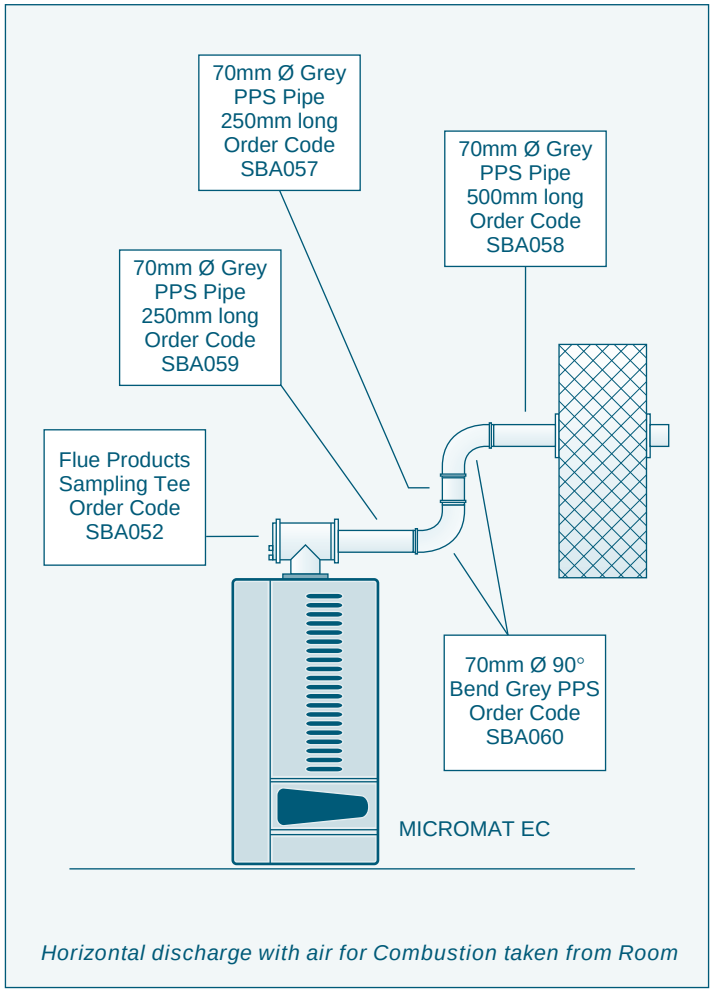
•70mm Ø 90° bend PPS. RVR Order Code - SBA060



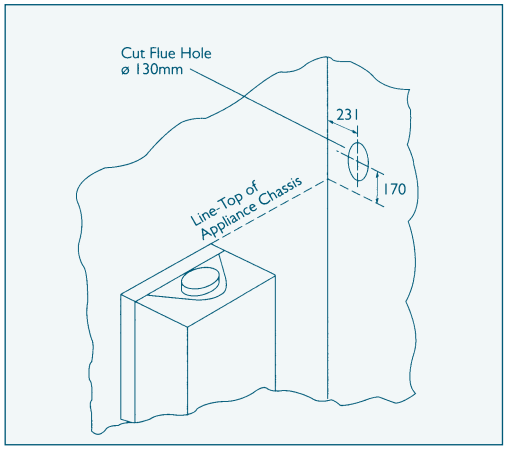
Vertical Concentric System (Pitched Roof)

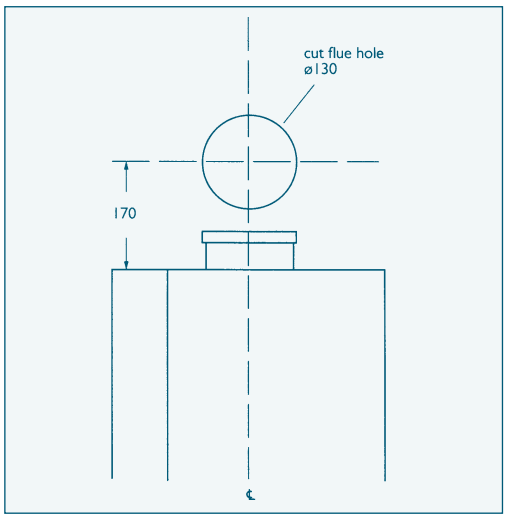


Vertical Concentric System (Flat Roof)



Horizontal discharge with air for Combustion taken from Room





Flue System Option No. 3

Horizontal Discharge with air for Combustion taken from Room.

Using this sytem the air for combustion is taken in from the room at the sampling Tee and the flue products are exhausted horizontally through a wall.

This sytem comprises :

- Flue Products Sampling Tee (RAL 7035). RVR Order Code - SBA052 (This must always be used)
- 70mm Ø Extension Pipe, Grey PPS, 1000mm long. RVR Order Code - SBA059

The system may be extended using the following accessories:

- 70mm Ø Extension Pipe PPS, 250 mm long. RVR Order Code - SBA057
- 70mm Ø Extension Pipe PPS, 500mm long. RVR Order Code - SBA058
- 70mm Ø Extension Pipe PPS, 2000mm long. RVR Order Code - SBA066
- 70mm Ø 90° bend PPS. RVR Order Code - SBA060.
- Birdscreen for 70mm Pipe. RVR Order Code - ACB002.

14.0 calculating *flue resistance*

The excess pressure available for overcoming the frictional resistance of a flue system is 100 Pa. The adjacent table of flue component resistances will assist the designer in calculating total flue system frictional loss.

If the total installed flue system resistance exceeds 100 Pa., then the result will be a reduction in boiler output. Reference to the 'Effect of Flue System Resistance On Boiler Output", graphs will assist. If the resistance of a proposed flue system has an unacceptable effect on boiler output, then a larger diameter flue tube should be selected.

Thermal up-draught is generated in a vertical flue system, reducing the resistance of the system. Reference to the "Thermal Up-draught Graph' will provide a figure in Pa., which may be deducted from the total calculated flue system resistance.

NB. Thermal up-draught does not apply to horizontal sections of a flue system.

COMPONENT RESISTANCE (Pa)	45	62	76
70/125 Concentric Wall Terminal	14.6	21.4	31.2
70/125 Concentric Roof Terminal Without Rain Cap	14.6	21.4	31.2
70/ 125 Concentric Roof Terminal With Rain Cap	21.9	32.2	46.8
1m length 70/125 Concentric Tube	10.7	16.6	23.4
93°C 70/125 Concentric Bend	10.7	16.6	23.4
45°C 70/125 Concentric Bend	5.4	8.3	11.7
1m length DN 70 PPS Tube Carrying Fluegas	9.7	14.6	21.4
1m length DN 70 PPS Tube Carrying Combustion Air	5.8	9.7	13.6
90° DN 70 PPS Bend Carrying Fluegas	9.7	14.6	21.4
90° DN 70 PPS Bend Carrying Combustion Air	5.8	9.7	13.6
45° DN 70 PPS Bend Carrying Fluegas	4.9	7.8	10.7
45° DN 70 PPS Bend Carrying Combustion Air	2.9	4.9	6.8
Room Sealed Chimney Cap DN 70	13.6	19.5	29.2
DN 70 x 100 PPS Increaser Piece-Fluegas or Air	1.9	1.9	1.9
90° DN 100 PPS Bend Carrying Fluegas	3.9	4.9	7.8
90° DN 100 PPS Bend Carrying Combustion Air	2.9	2.9	3.9
45° DN 100 PPS Bend Carrying Fluegas	1.9	2.5	3.9
45° DN 100 PPS Bend Carrying Combustion Air	1.6	1.9	1.9
Im length DN 100 PPS Tube Carrying Fluegas	2.0	2.5	4.0
Im length DN 100 PPS Tube Carrying Combustion Air	1.5	2.0	2.0
DN 70 Open Termination With Mesh	7.8	10.7	15.6
DN 100 Open Termination with Mesh	2.0	3.0	4.0
70/125 To 100/150 Concentric Increaser	3.9	5.8	9.7
90° DN 100 PPS Bend Carrying Fluegas	2.0	2.5	4.0
90° DN 100 PPS Bend Carrying Combustion Air	1.5	2.0	2.0
45° DN 100 PPS Bend Carrying Flue gas	1.0	1.3	2.0
45° DN 100 PPS Bend Carrying Combustion Air	0.8	1.0	1.0
1m length DN 100 PPS Tube Carrying Flue gas	2.0	2.5	4.0

14.0 calculating flue resistance

flue pressure loss

example I

A MICROMAT EC 62 boiler is installed with a concentric flue system which takes an all horizontal route to a wall terminal. Length of flue = 3m including one 90° bend.

Resistance =

3 x 1m length 70/125 concentric tube @ 16.6 Pa = 49.8

1 x 90° 70/125 concentric bend @ 16.6 Pa =16.6

I x 70/125 concentric wall terminal @ 21.4 Pa = 21.4

Total Resistance = 87.6Pa

conclusion: Total resistance is less than 100 Pa. therefore, no alternative design required and no effect on boiler output, or positioning required

example 2

A MICROMAT EC 45 boiler is installed with a concentric flue system which takes a part horizontal, part vertical route to a roof terminal with rain cap.

Length of horizontal section = 1m, vertical section = 6m, system includes 1 x 90° bend.

Resistance =

7 x 1m lengths 70/125 concentric tube @ 10.7 Pa = 74.9

1 x 90° 70/125 concentric bend @ 10.7 Pa= 10.7

1 x 70/125 roof terminal @ 21.9 Pa = 21.9

Total Resistance = 107.5 Pa

Take into account that 6m of vertical (assume uninsulated, as air for combustion direct from outside air surrounds the flue gas tube) flue creates 10 Pa of up-draught,

then final resistance = 107.5 - 10 = 97.5 Pa.

conclusion: Final operating resistance is less than 100 Pa, therefore, no alternative design required and no effect on boiler output.

example 3

A MICROMAT 1-75 boiler is installed (non room sealed) with a proposed flue using DN 70 PPS single skin flue components which takes a part horizontal, part vertical route to a vertical open termination with bird mesh.

Length of horizontal section = 4m, length of vertical (uninsulated) section = 11m with 4 x 90° bends, and 2 x 45° bends.

Resistance =

15 x 1m lengths DN 70 PPS tube @ 21.4 Pa = 321

4 x 90o DN 70 PPS bends @ 21.4 Pa = 85.6

2 x 45o DN 70 bends @ 10.7 Pa = 21.4

1 x DN 80 open termination @ 15.6 Pa = 15.6

Total Resistance: 443.6 Pa

Take into account that 11m of vertical uninsulated flue creates 18 Pa of up-draught, then final resistance would be 443.6-18 = 425.6 Pa. Reference to the graph of resistance effect on boiler output shows the output would be reduced to approximately 59kW. If this is unacceptable, then the flue resistance must be re-calculated using a larger size flue tube as shown below or consideration given to moving the boiler position.

Re-calculating proposed flue installation using DN 100.

15 x 1m lengths DN 100 PPS tube @ 3.0 Pa = 45

4 x 90o DN 100 bends @ 3.0 Pa = 12

2 x 45o DN 100 bends @ 1.5 Pa = 3.0

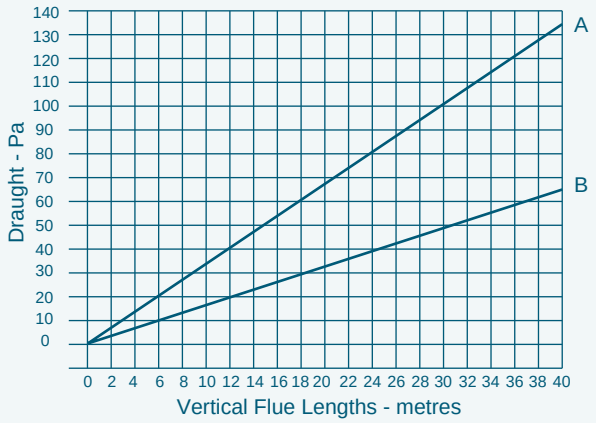
1 x DN 100 open termination @ 4.0 Pa = 4.0

Total Resistance: 64 Pa

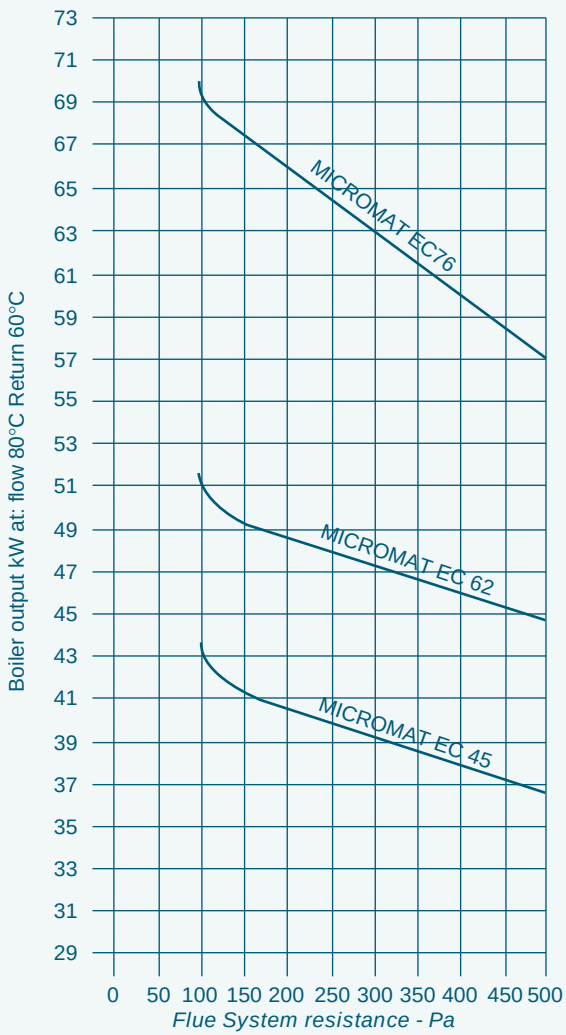
Take into account thermal up-draught created (as before) 18 Pa. Therefore operating resistance = 64 – 18 = 46 Pa, with no effect on boiler output.

thermal updraught when flue gas temp 80°C and outside temp -5°C

A = Insulated or within the building
B = Uninsulated and exterior to the building



effect of flue system resistance on boiler output



14.0 calculating *flue resistance*

Minimum dimensions of flue terminal positions see fig 19 below.

Dimension	Terminal Position	Balanced flue room sealed (mm)	Non room sealed (mm)
A	Directly below an opening, air brick, windows etc. Not Recommended.	300mm	300mm
B	Below gutters, soil pipes or drain pipes	75mm	75mm
C	Below eaves	200mm	200mm
D	Below balconies or car port roof. Not Recommended	200mm But installation not recommended	200mm But installation not recommended
E	From vertical drain pipe or soil pipe	75mm	75mm
F	From an internal or external corner	300mm	200mm
G	Above ground, intersecting roof or balcony level	300mm	300mm
H	From a surface facing the terminal	2000mm	2000mm
I	From a terminal facing the terminal	2000mm	2000mm
J	From an opening in the car port (e.g. door, window) into dwelling	1200mm But installation not recommended	1200mm But installation not recommended
K	Vertically from a terminal on the same wall	1500mm	1500mm
L	Horizontally from a terminal on the same wall	300mm	300mm
M	From the wall on which the terminal is mounted.	N/A	50mm
N	From a vertical structure on the roof	500mm	N/A
P	Above intersection with roof	500mm	150mm

15.0 flue *terminal positions*

The flue terminal of a MICROMAT EC boiler will plume heavily and care must be taken when selecting a terminal position to ensure that a “nuisance situation’ is not created

If a flue terminal is positioned within 2 m above ground level or any upper part of a building where people have general access (e.g. balcony etc) then the terminal should be fitted with an appropriate guard.

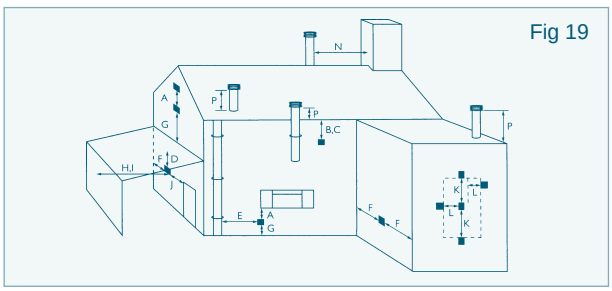


Fig 19

15.0 ventilation requirements
single appliances

The room or space in which the MICROMAT EC boiler is installed may require to be ventilated in accordance with BS5440: Part 2:1989 or BS 6644: 1991 as appropriate to the boiler input.

The following tables must be read to ascertain the amount of ventilation required.

Table 1	Room Installation - Non Room Sealed Flue. Natural Ventilation Direct to Outside Air	
Boiler Model	Ventilation Openings Free Area cm^2	
	High Level	Low Level
MICROMAT EC 45	196	Position Not Dictated
MICROMAT EC 62	278	555
MICROMAT EC 76	319	637

Table 2	Room Installation - Non Room Sealed Flue. Natural Ventilation From Adjacent Room
Boiler Model	Ventilation Openings Free Area cm^2
MICROMAT EC 45	196cm^2 with adjacent room similarly ventilated direct to outside air.
MICROMAT EC 62 & 76	Ventilation from adjacent room not permitted see Table 1 for ventilation area direct to outside air.

Table 3	Room Installation – Room Sealed Flue There are not specific requirements for a room to be ventilated where the appliance is room sealed. However, consideration should be given to providing ventilation for general cooling, (BS6644 specifies room temperature limits) and the following free ventilation areas are recommended to be installed.
Boiler Model	Recommended Natural Ventilation Free Area cm^2
MICROMAT EC 45	196 cm^2 (if ventilated from adjacent room, then adjacent room must be equally ventilated direct to outside air)
MICROMAT EC 62	253 cm^2 Direct to outside air.
MICROMAT EC 76	335 cm^2 Direct to outside air.

Table 4	Compartment Installation – Non room sealed flue Natural Ventilation Direct to outside air	
Boiler Model	Ventilation Openings Free Area cm^2	
	High Level	Low Level
MICROMAT EC 45	227	454
MICROMAT EC 62	278	555
MICROMAT EC 76	319	637

15.0 ventilation requirements
single appliances

Table 5	Compartment Installation – Non room sealed flue	
	Natural Ventilation from Adjacent room	
Boiler Model	Ventilation Openings Free Area cm^2	
	High Level	Low Level
MICROMAT EC 45	454	908
	With adjacent room ventilated at 196 cm^2 direct to outside air.	
MICROMAT EC 62 & 76	Ventilation from adjacent room not permitted see table 4 for ventilation area direct to outside air.	

Table 6	Compartment Installation – Room sealed flue Natural Ventilation direct to outside air.	
Boiler Model	Ventilation Openings Free Area cm^2	
	High Level	Low Level
MICROMAT EC 45	227	227
MICROMAT EC 62	285	285
MICROMAT EC 76	367	367

Table 7 Room.	Compartment Installation – Room Sealed Flue Natural Ventilation from Adjacent	
Boiler Model	Ventilation Openings Free Area cm^2	
	High Level	Low Level
MICROMAT EC 45	454	454
MICROMAT 62 & 76	Ventilation from adjacent room not permitted see table 6 for ventilation area direct to outside air.	
Multiple Appliances Installed in the Same Room or Space.		
Where multiple MICROMAT EC boilers are installed in the same room or space then The aggregate of the appliance inputs must be taken to determine (from the following Data) the amount of ventilation required..		
Appliance Gross Heat Inputs Should be taken as:-		
MICROMAT EC 45	= 50.34kW	
MICROMAT EC 62	= 60.20kW	
MICROMAT EC 76	= 81.41kW	

Table 8	Non Room Sealed Flue Installations Natural Ventilation Direct to Outside Air. Low Level (Inlet): 540 cm^2 plus 4.5 cm^2 per kW in excess of 60kW total rated input. High Level (Outlet): 270 cm^2 plus 2.25 cm^2 per kW in excess of 60kW total rated input.

Table 9	Room Sealed Flue Installations Natural Ventilation Direct to Outside Air (Ventilation recommended for cooling purposes) Low Level (Inlet) 4.5 cm^2 per kW of total rated input. High Level (Outlet) 4.5 cm^2 per kW of total rated input.

16.0 hydraulic system *design*

The MICROMAT EC boiler can be operated to serve a heating load in a number of ways:

1. Constant flow temperature, with the option to set either high temperature (85°C), medium temperature (75°C) or low temperature (55°C).

2. Direct-on-boiler weather compensated flow temperatures, with adjustable maximum flow temperature.

3. Underfloor heating coils via a VT mixing valve with a maximum flow temperature of 55°C plus a second circuit (eg. radiators) operating with direct-on-boiler weather compensated temperatures.

Flow to return drop (Δt). The microprocessor controls monitor return temperature and the facility to dictate a set Δt (by pump speed modulation) is a standard and most important feature and will maintain the Δt across the boiler at 20°C, as the lower the return temperature, the higher the operating efficiency. HT and MT systems should be designed for Δt 20°C and LT (underfloor coils via a mixing valve) systems Δt 10°C. Designing for a Δt 20°C gives the added cost saving advantage of smaller pipe sizes and pumps.

The MICROMAT EC includes ‘in built’ primary pumps with a residual head pressure as listed below.

- Appliances may be installed as single units or in multiples.

- Single units may or may not require additional system pumps which will be dictated by the system configuration and by the index resistance.

- Multiple units (and single units which require additional pumps), should always be installed with a low loss mixing header or similar arrangement - see table below.

- The MICROMAT EC boiler has in built domestic hot water (remote stored) temperature control ability, and if required, the in built pumps may be used to provide the primary flow to a nearby indirect cylinder or calorifier with the boiler controlling a diverter valve in the main flow or return pipework.

- BS 6644 Requires that the following devices shall be installed, and provision within the system design must allow for: Low water pressure cut off device, water pressure gauge and a temperature gauge.

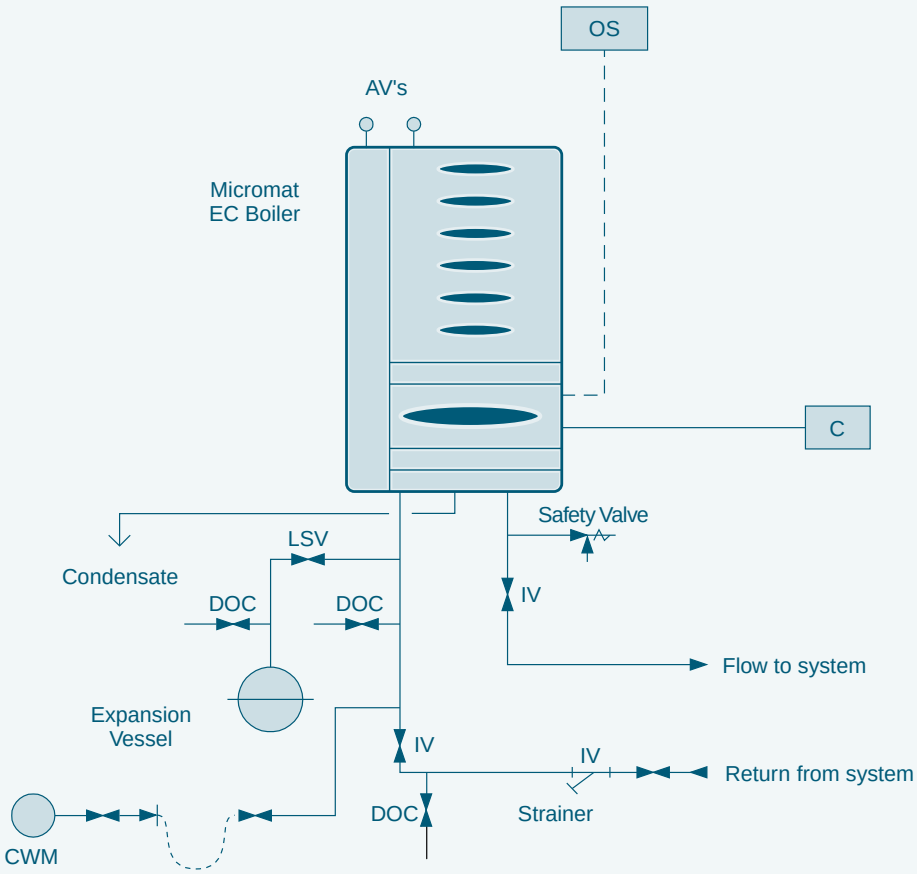
The following system schematics show a number of typical installation types to which the MICROMAT EC boiler may be connected.

The MICROMAT EC is not limited to just the systems shown, and may be used in conjunction with many commercially available control items.

For further advice or guidance on schematic designs or control options contact RVR Ltd.

system type 1

Typical Single MICROMAT EC boiler installation serving heating only where the boiler's own in-built circulating pumps are used to circulate the water around the system (used only where system index resistance <1 metre). Flow temperature may be fixed/constant or weather variable.

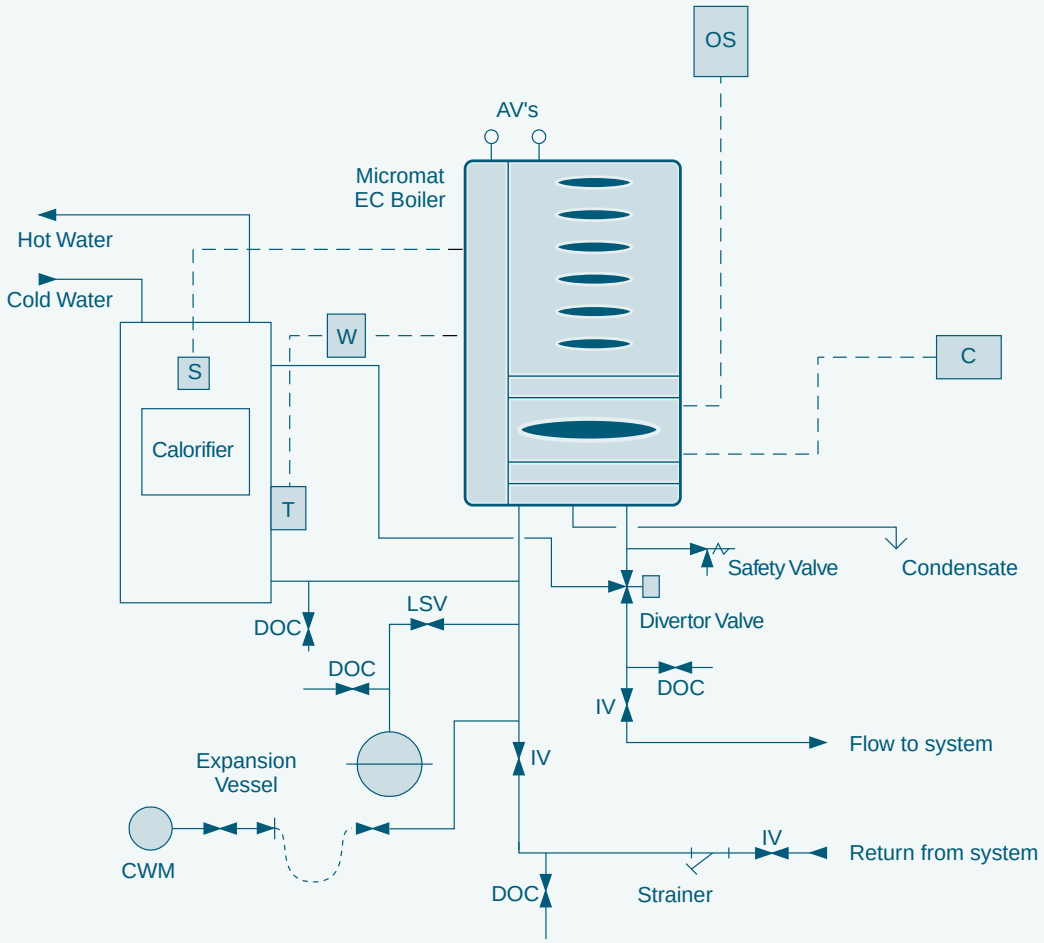


OS = Outside air temperature sensor, used where direct-on-boiler weather compensated flow temperatures are required.

C = Room temperature controls e.g. RE2132 modulating room unit from RVR Ltd., or, separate time clock & room thermostat.

system type 2

Typical Single MICROMAT EC boiler installation serving domestic hot water and heating where hot water has priority via a divertor valve. The in-built circulating pumps within the boiler are used to circulate the system (used only where system index resistance <1 metre). Flow temperature to hot water is constant and flow temperature to heating may be constant or weather variable.



OS = Outside air temperature sensor, used where direct-on-boiler weather compensated flow temperatures are required.

C = Room temperature controls e.g. RE2132 modulating room unit from RVR Ltd., or, separated time clock & room thermostat.

S = HWS sensor from RVR Ltd. Gives 24hr HWS operation.

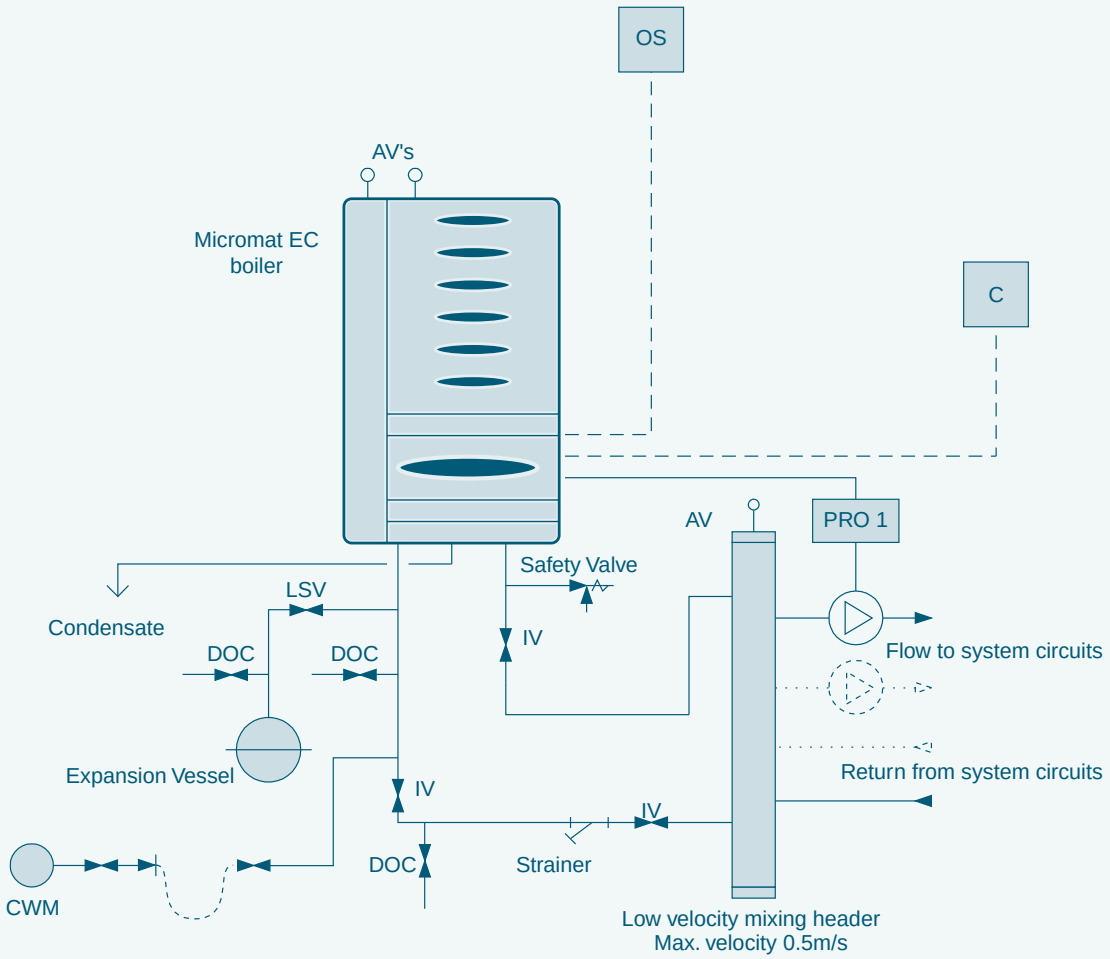
W/T = Alternative to "S" where "W" is a time switch in series with a cylinder thermostat "T". Allows for timed HWS.

Divertor valve will require SPDT relay if not spring return.

Divertor valve must be so installed as to spring return to heating.

system type 3

Typical Single MICROMAT EC boiler installation serving heating only and using a low velocity mixing header where system index resistance exceeds 1 metre. Flow temperature may be fixed/constant or weather variable.



OS = Outside air temperature sensor, used where direct-on-boiler weather compensated flow temperatures are required.

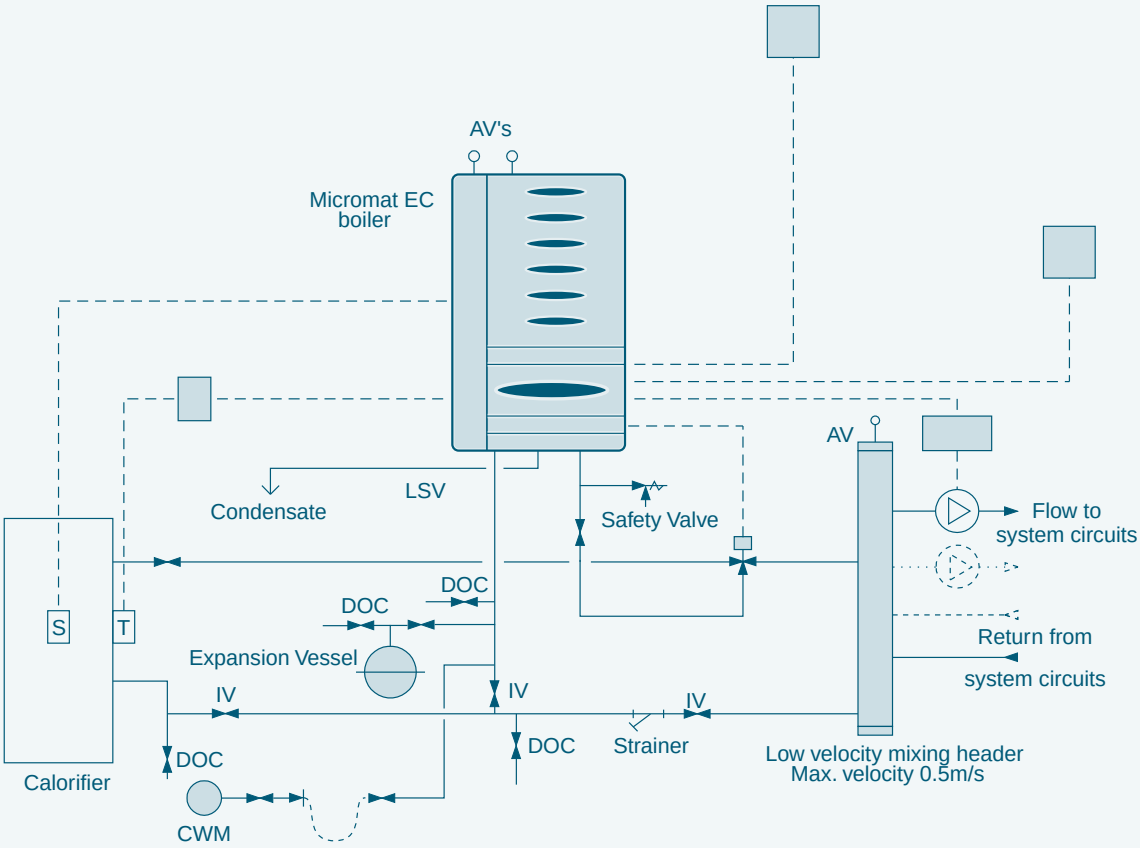
C = Room temperature controls e.g. RE2132 modulating room unit from RVR Ltd., or, separated time clock & room thermostat.

PR01 = Pump regulation module from RVR Ltd. Allows heating pump to be driven from boiler, providing for auto operation, frost protector running & summer standstill exercising.

Must be used where RE2132 modulating room unit is installed. Max pump motor load 2A.

system type 4

Typical Single MICROMAT EC boiler installation serving heating & domestic hot water. Hot water is priority and is served via a divertor valve and the boiler's in built circulating pump where index loss through HWS primaries is less than 1 metre. Heating circuit index loss exceeds 1 metre and is served via a low velocity mixing header and a separate pump. Heating flow temperature may be fixed/constant or weather variable.



OS = Outside air temperature sensor, used where direct-on-boiler weather compensated flow temperatures are required.

C = Room temperature controls e.g. RE2132 modulating room unit from RVR Ltd., or, separated time clock & room thermostat.

S = HWS sensor from RVR Ltd. Gives 24hr HWS operation.

W/T = Alternative to "S" where "W" is a time switch in series with a cylinder thermostat "T". Allows for timed HWS.

PR01=Pump regulation module from RVR Ltd. Allows heating pump to be driven from boiler, providing for auto operation, frost protector running & summer standstill exercising.

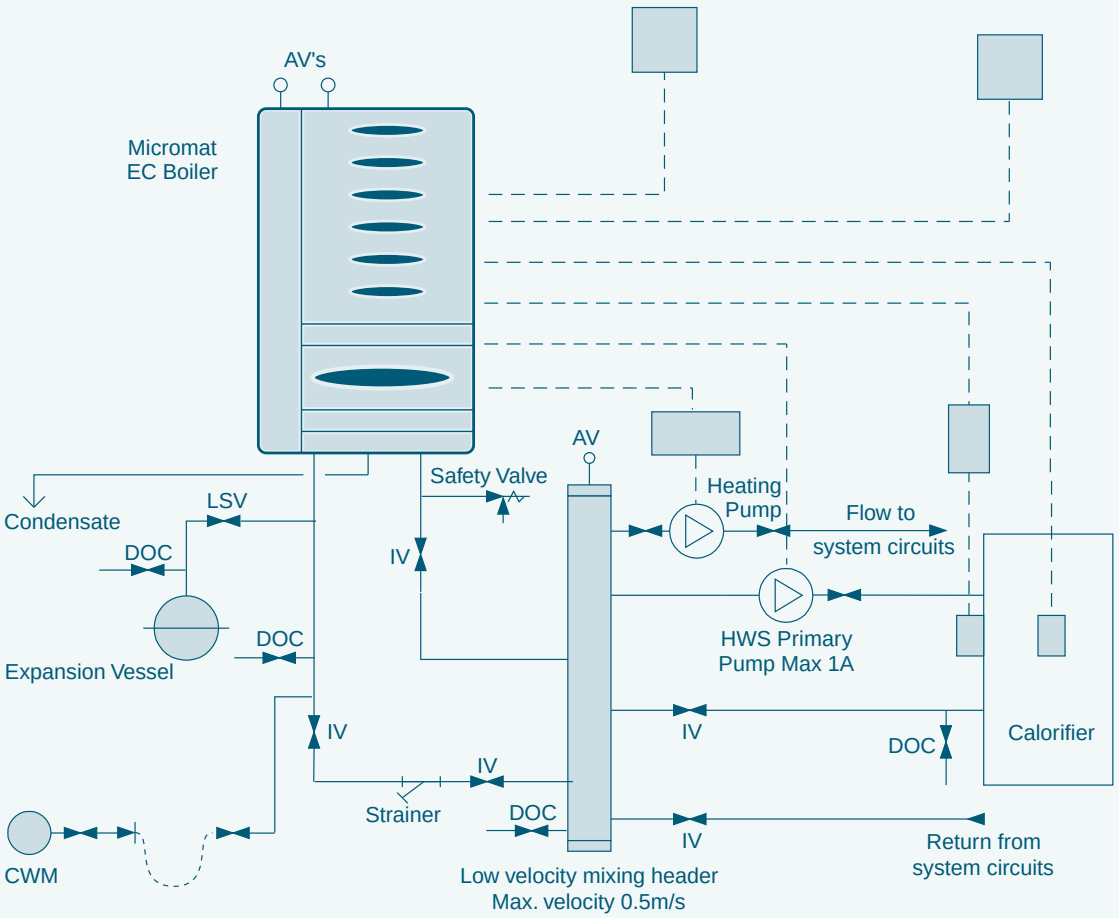
Must be used where RE2132 modulating room unit is installed. Max pump motor load 2A.

Divertor valve will require SPDT relay if not spring return.

Divertor valve must be so installed as to spring return to heating.

system type 5

Typical Single MICROMAT EC boiler installation serving heating & domestic hot water with hot water priority. Hotwater & heating circuits both have index resistance exceeding 1 metre & are served by independent pumps from a low velocity mixing header. Heating flow temperature may be fixed/constant or weather variable.



OS = Outside air temperature sensor, used where direct-on-boiler weather compensated flow temperatures are required.

C = Room temperature controls e.g. RE2132 modulating room unit from RVR Ltd., or, separated time clock & room thermostat.

S = HWS sensor from RVR Ltd. Gives 24hr HWS operation

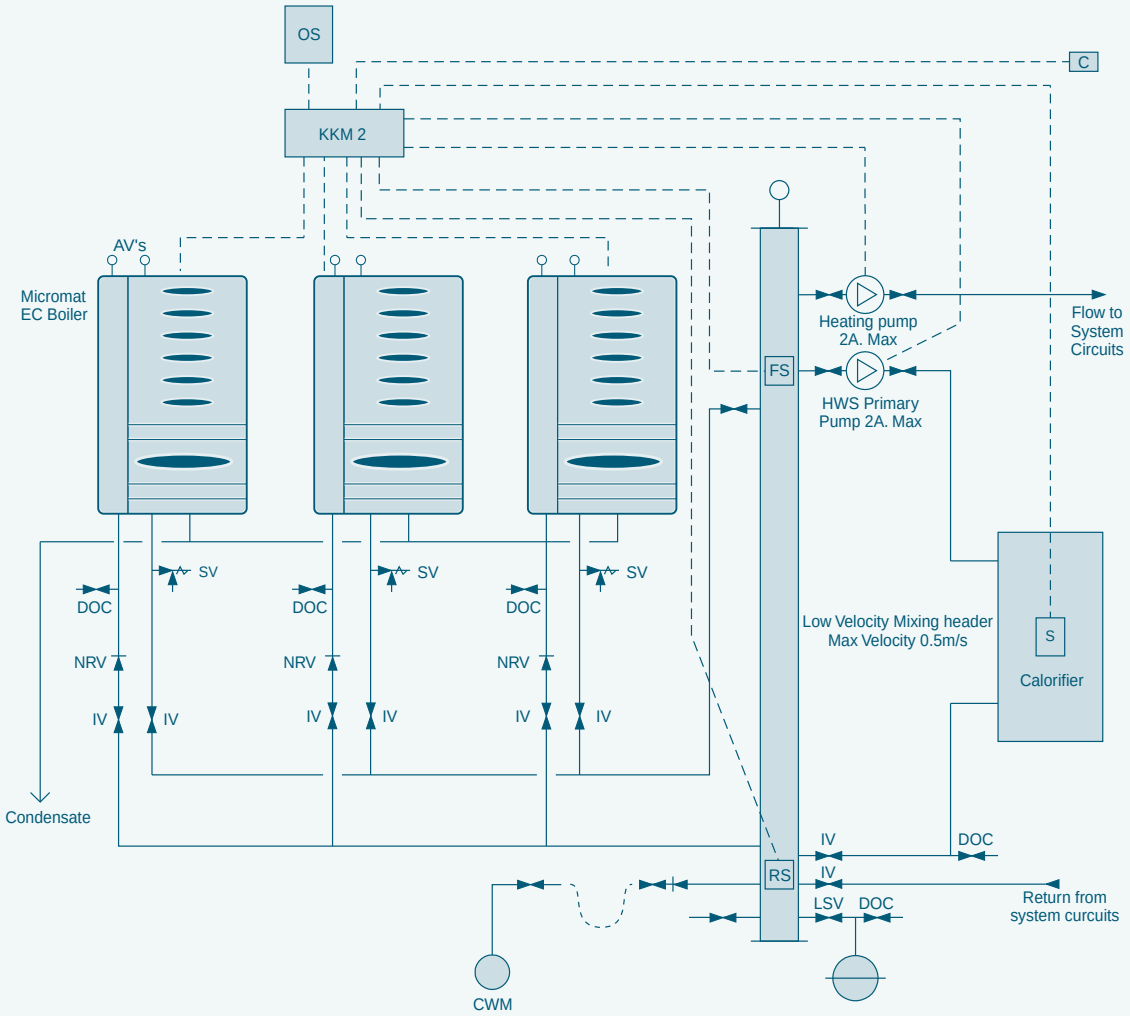
W/T = Alternative to "S" where "W" is a time switch in series with a cylinder thermostat "T". Allows for timed HWS.

PR01= Pump regulation module from RVR Ltd. Allows heating pump to be driven from boiler, providing for auto operation, frost protector running & summer standstill exercising.

Must be used where RE2132 modulating room unit is installed. Max pump motor load 2A.

system type 6

Typical Multiple MICROMAT EC installation. Boilers controlled by modulating Kaskade manager which also has the facility to control heating & domestic hot water production. Heating flow temperature may be fixed/constant or weather variable. Hot water has priority.



OS = Outside air temperature sensor, used where direct-on-boiler weather compensated flow temperatures are required.

C = Room temperature controls e.g. RE2132 modulating room unit from RVR Ltd., or, separated time clock & room thermostat.

FS = Flow temperature sensor

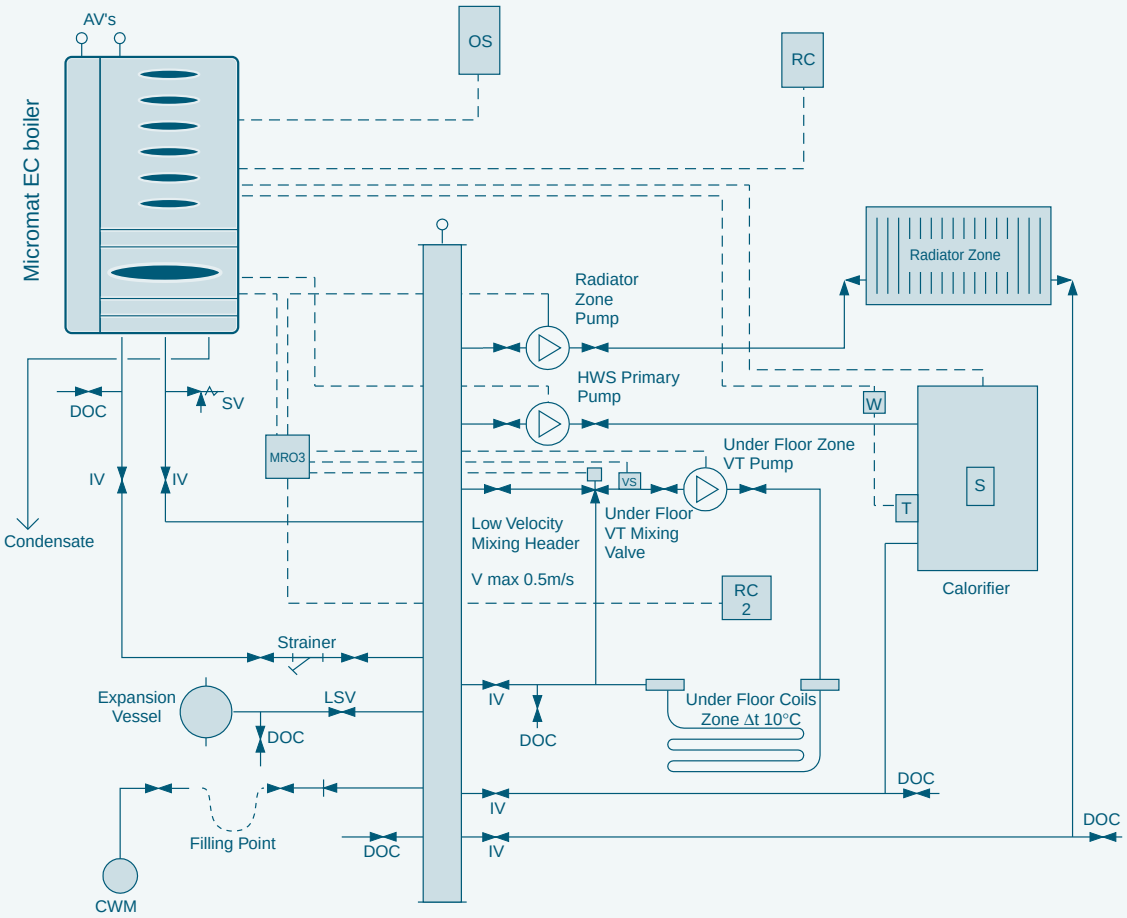
RS = Return temperature sensor

S = Hot water temperature sensor or thermostat.

KKM2 = Modulating Kaskade Manager. Up to 9Nr boilers may be controlled using 2Nr linked KKm2's.

system type 7

Typical Single MICROMAT EC boiler installation serving domestic hot water and radiator heating zone and an underfloor coil zone all via a low velocity mixing header. The HWS will always have priority. The 2Nr heating zones may operate independently via 2 Nr separate room units. The 2 Nr heating zones will always be weather compensated but may have differing compensation slopes.



OS = Outside air temperature sensor. Provides outside air temperature references for both heating zones

MR03 = Pumps and mixer regulation control box from RVR Ltd. provides pump control for both heating zones i.e. auto operation, frost protection and summer stand still protection running.

Provides drive for underfloor coil zone VT mixing valve with max flow temperature limitation set at 55°C. Includes ratio setter for compensation of under floor coils. Max pump motor loads 2A

RC1 = RE2132 modulating room unit from RVR Ltd. provides Time & Temperature control for radiator heating zone.

RC2 = As RC1 but for underfloor coil zone.

VS = Underfloor zone VT flow sensor (supplied with MR03)

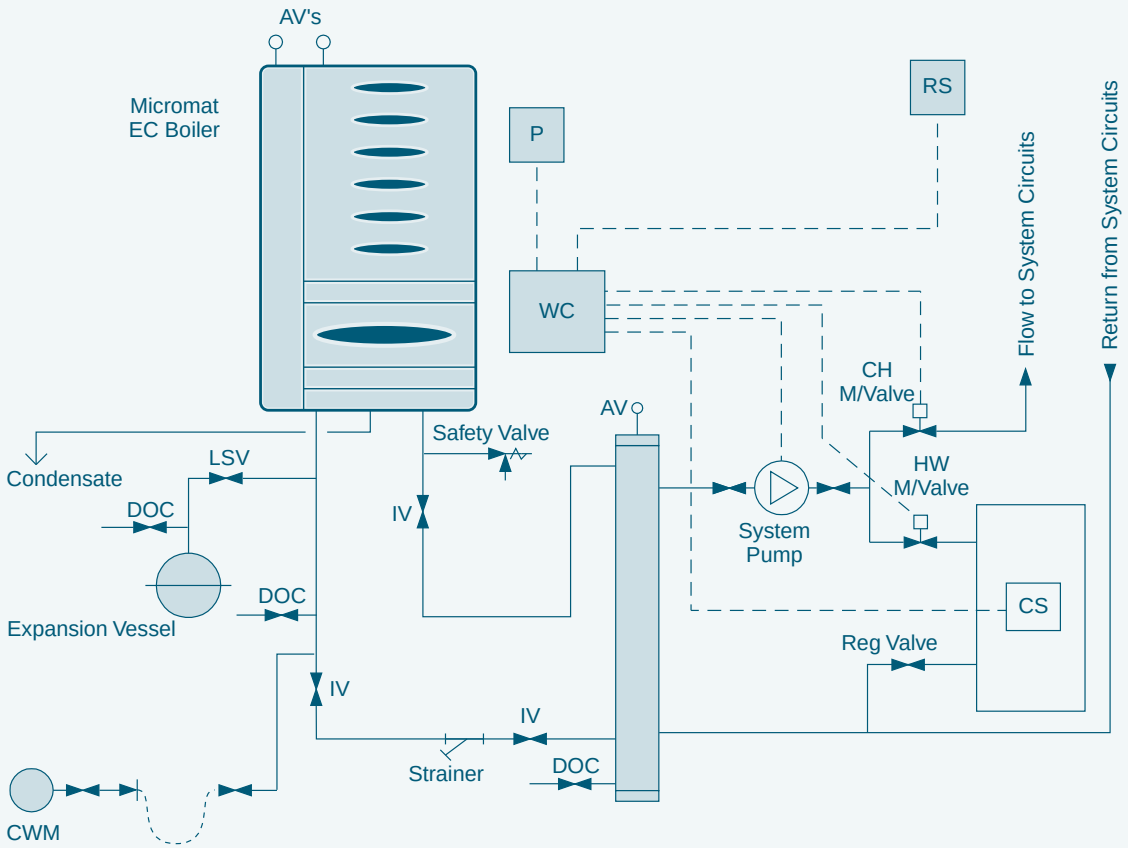
S = HWS sensor from RVR Ltd. Gives 24hr operation.

W/T = Alternative to "S" where "W" is a time switch in series with a cylinder thermostat "T". Allows for timed HWS.

system type 8

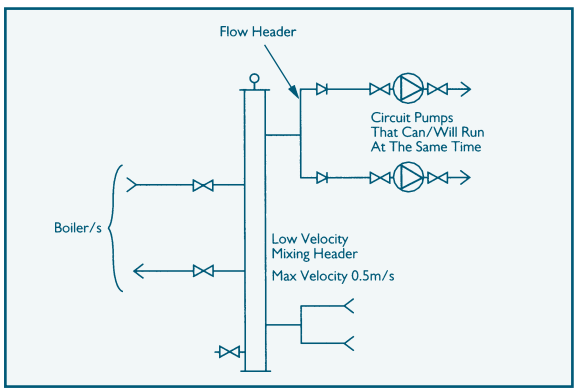
Typical Single MICROMAT EC boiler installation serving heating and domestic hotwater via a system pump and 2Nr 2Port motorised valves with conventional controls i.e. programmer, room stat & cylinder stat.

NOTE: system temperature will be fixed constant and direct-on-boiler weather compensation is not possible.



P = Programmer WC = Wiring Centre/Junction Box RS = Room Thermostat CS = Cylinder Thermostat

Typical Schematic Arrangement Where System has Multiple Pumps That Will Operate At The Same Time.



16.1 water treatment *system cleaning*

The entire system must be thoroughly cleansed and flushed to remove debris, flux residues etc before opening the boiler isolation valves & flooding the boiler. Particular care must be taken where the MICROMAT EC boiler is being retro-fitted into an old/existing system, as system silt or magenite can be very damaging to the new boiler.

The system must be filled with clean chemically neutral water. Water hardness must not exceed 3.6 mol/m^3 (=20°dH). Chloride Concentrations must not exceed 150mg/l.

Following cleansing and flushing, the system must be dosed with a good quality water treatment to prevent corrosion and the formation of scale. A suitable corrosion inhibitor 'INIBAL' is available from RVR Limited and should be used in all systems. The required concentration is 1-2% of system capacity.

Failure to observe these requirements will render the guarantee on the product void.

Cleansing, flushing and water treatment must be carried out in accordance with the requirements of BS 7593:1992.

16.2 care with the use of *soldering flux*

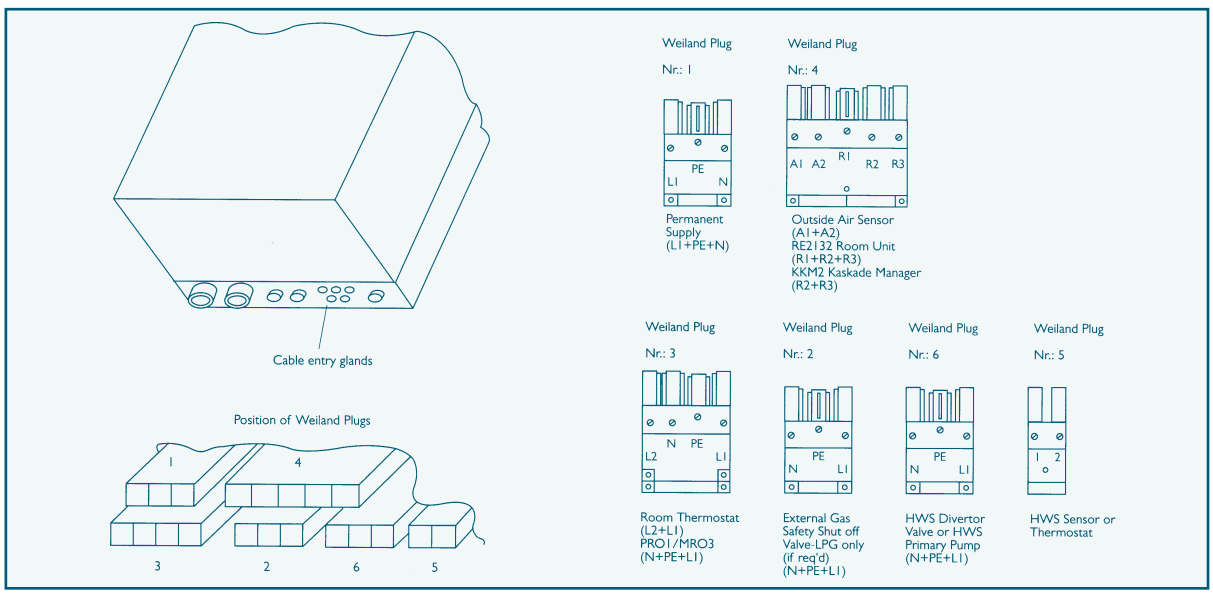
The MICROMAT EC boiler has heat exchangers fabricated from 316L stainless steel. It is most important that the compatibility of any flux is checked with the flux supplier before use, and that any flux manufacturers recommendations are strictly followed with regards to use in conjunction with stainless steel.

17.0 electrical *connection*

The electrical connections to the MICROMAT EC boiler are made via discreet plugs and sockets (Weiland Type) which are located within the boiler case and below the control panel.

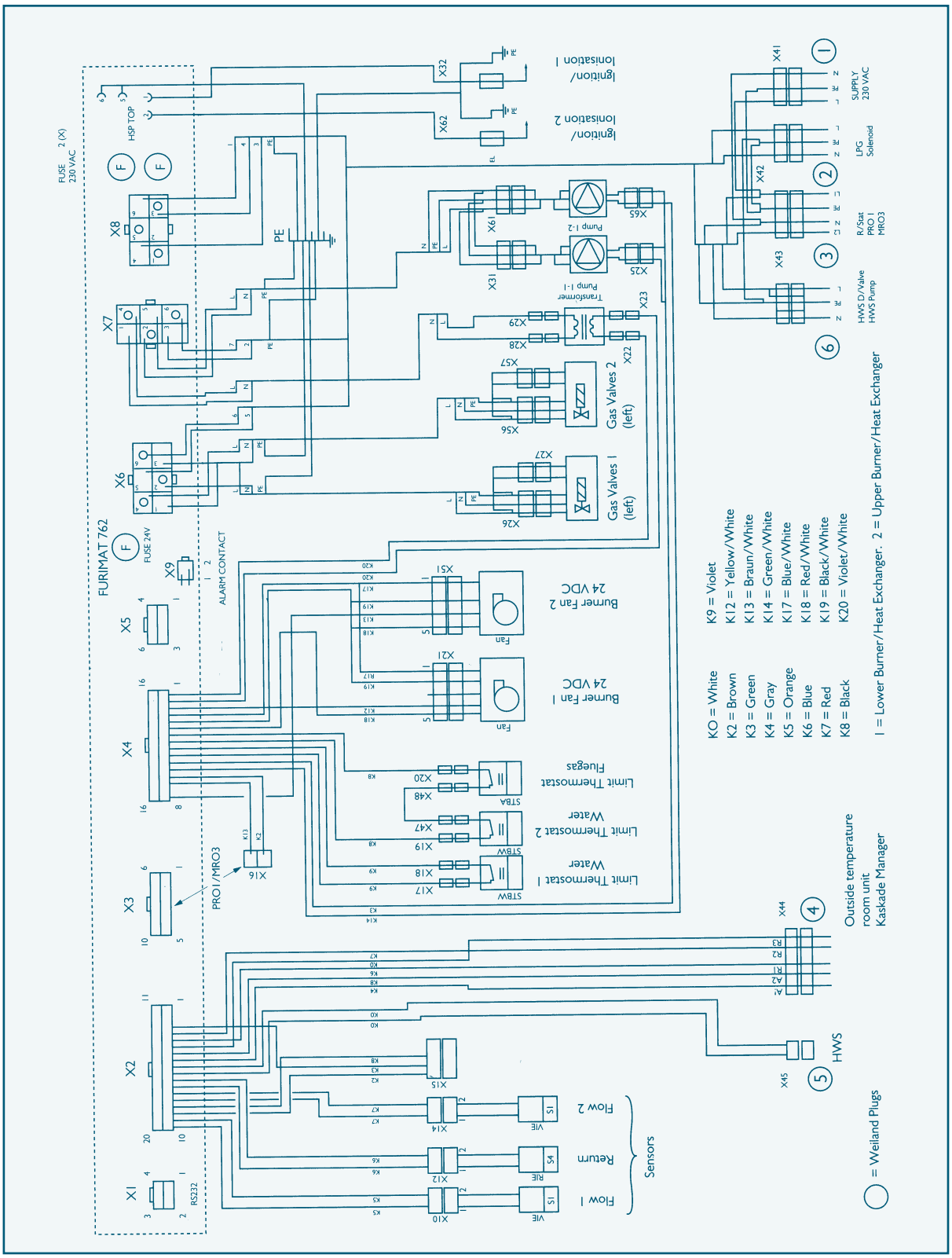
Connections must only be made using appropriate diameter multi strand flex cables and cable entry must only be via the rubber glanded cable entry points located at the bottom rear r/h side of the appliance. If the boiler is to be room sealed flued then care must be taken to ensure the cable entries are reasonably air tight.

For electrical connection plug/socket function and location see fig 20.



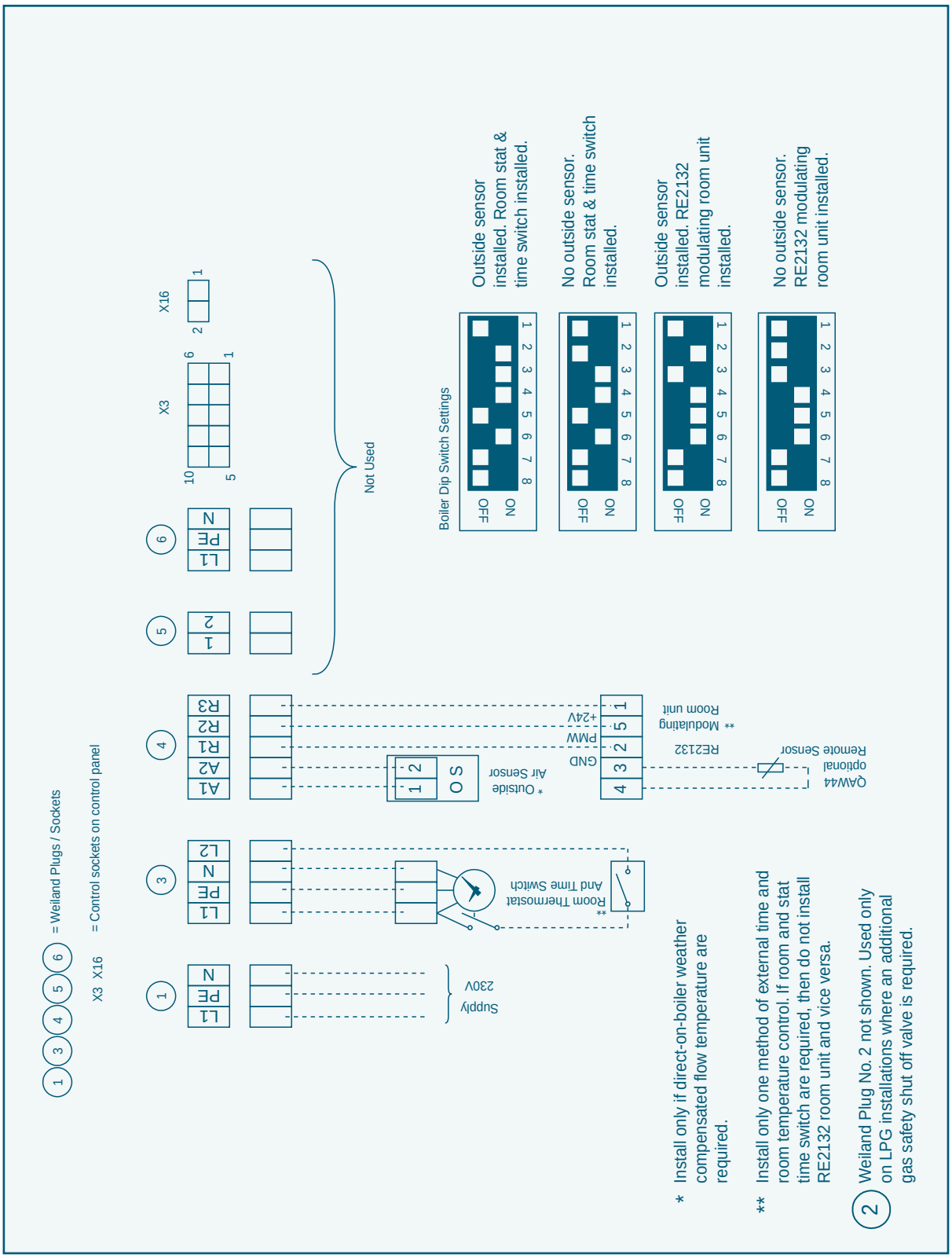
17.0 electrical *connections*

plan of internal electrical connections



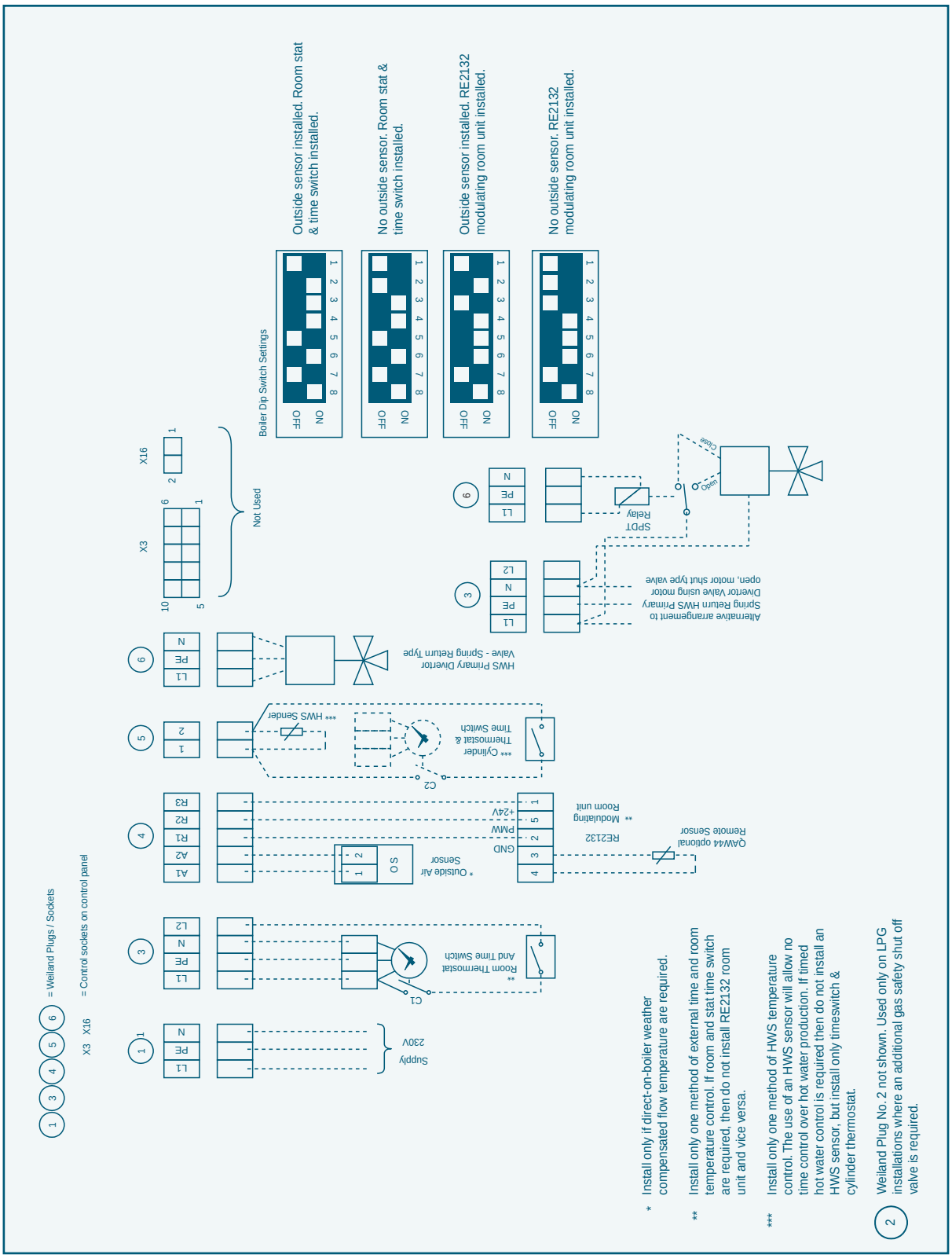
17.0 electrical *connections*

Typical electrical connection schematic to suit system type 1



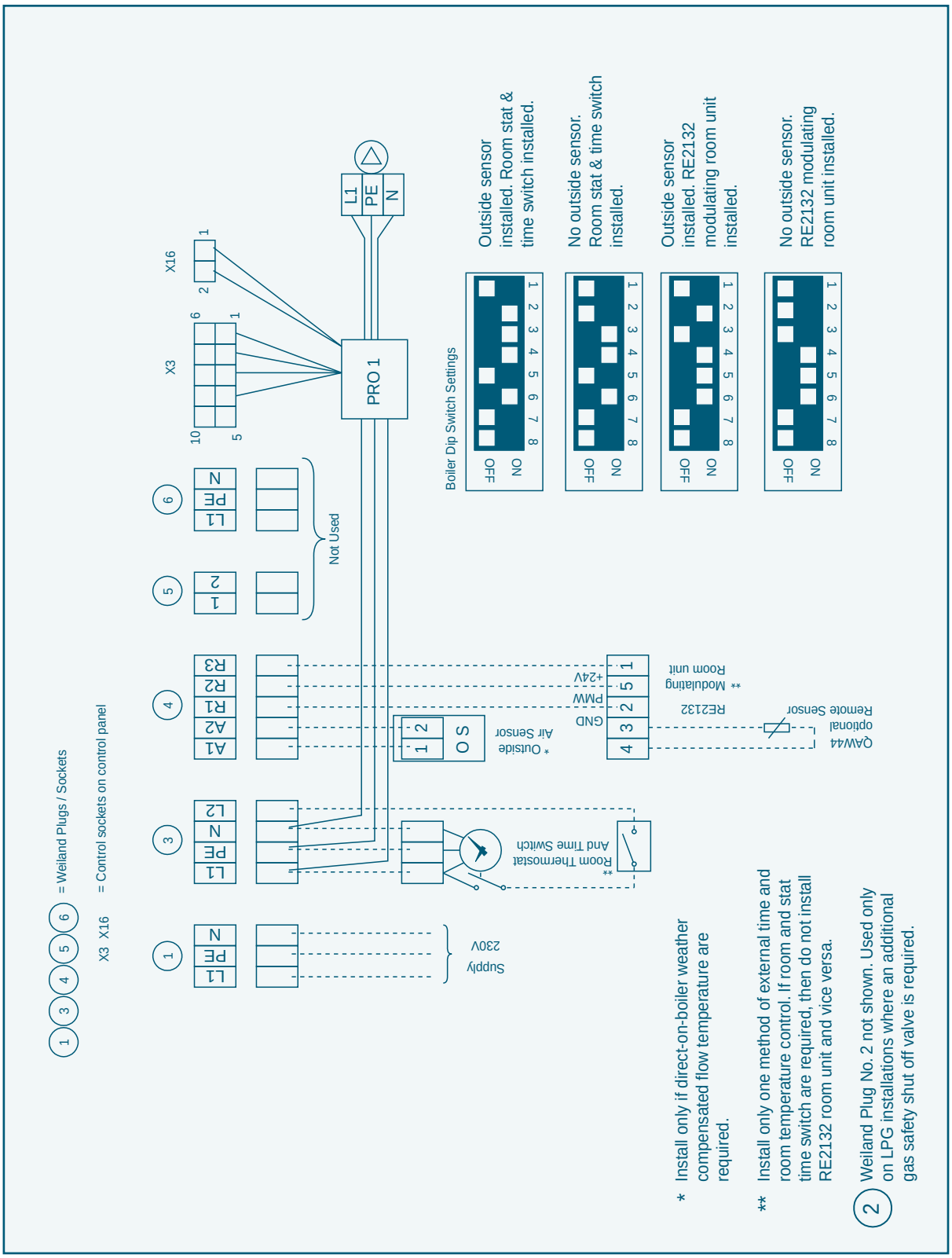
17.0 electrical *connections*

Typical electrical connection schematic to suit system type 2



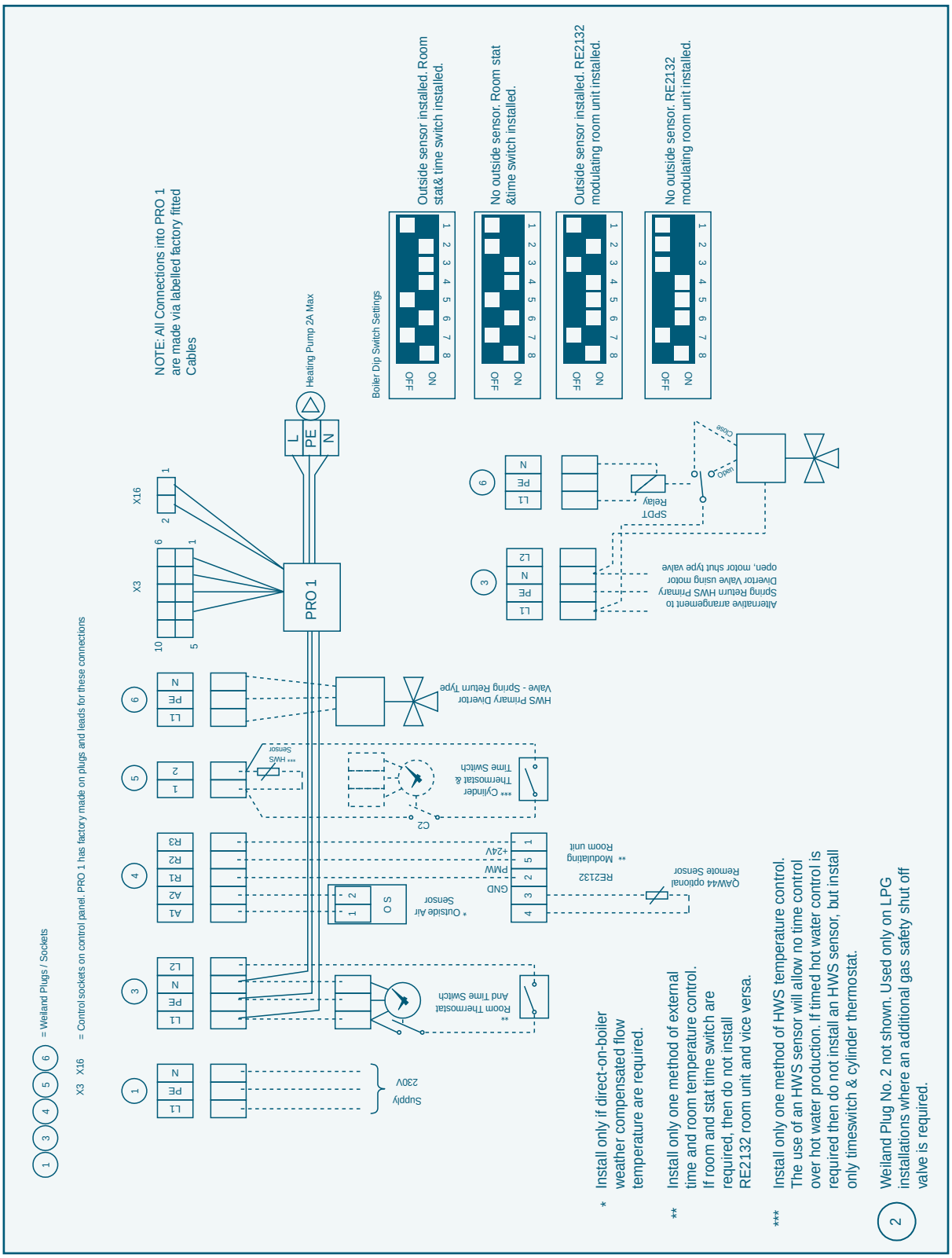
17.0 electrical *connections*

Typical electrical connection schematic to suit system type 3



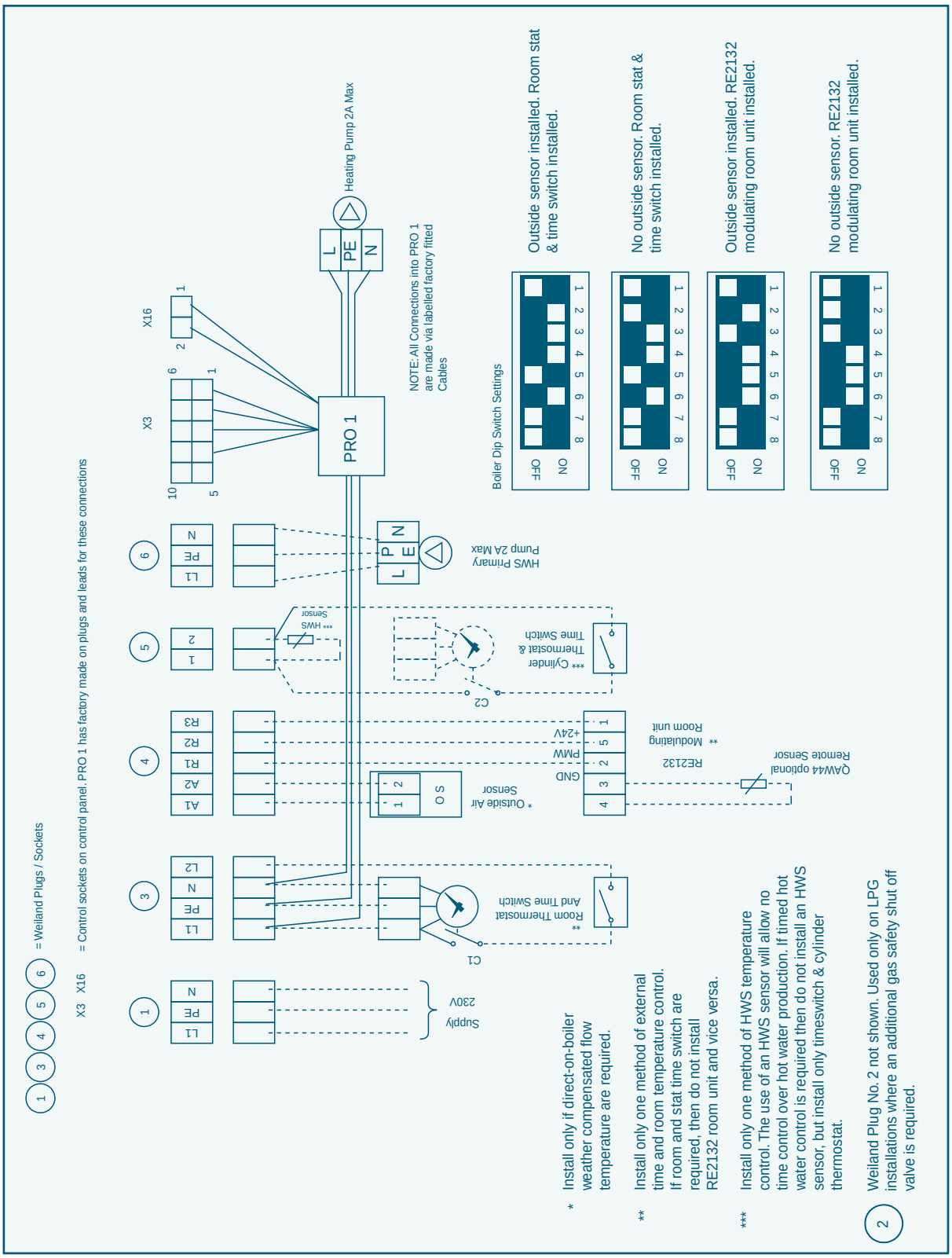
17.0 electrical *connections*

Typical electrical connection schematic to suit system type 4



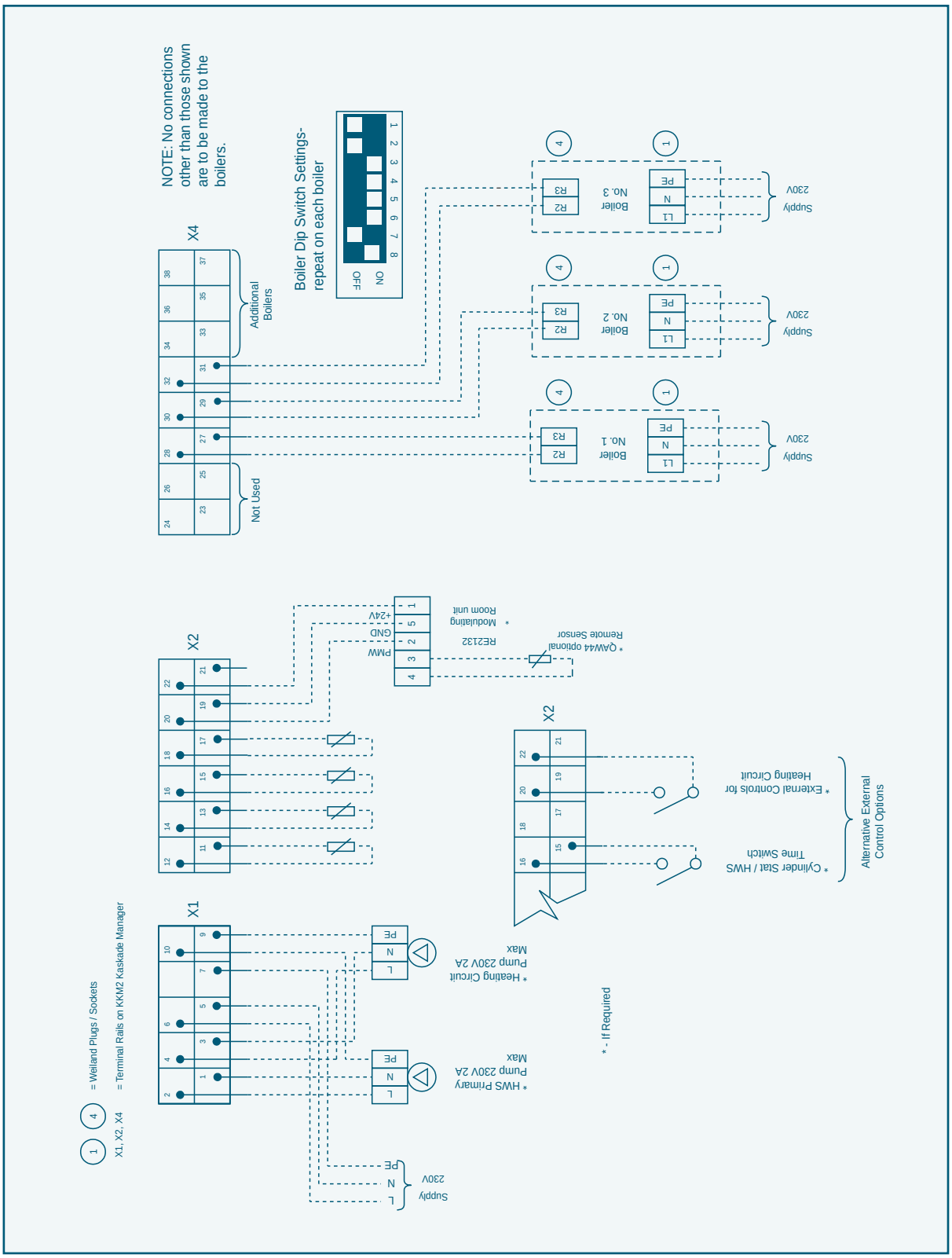
17.0 electrical *connections*

Typical electrical connection schematic to suit system type 5



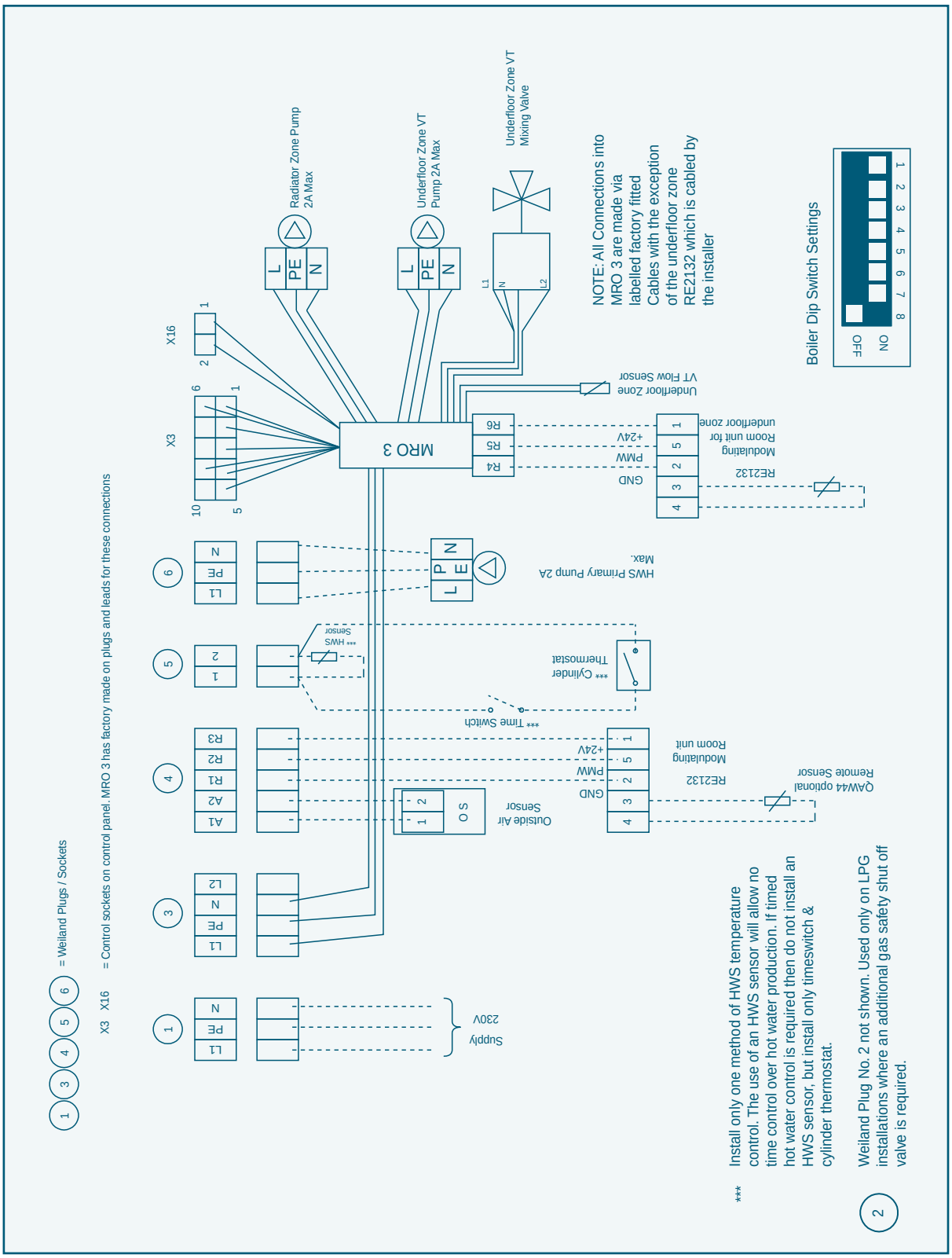
17.0 electrical *connections*

Typical electrical connection schematic to suit system type 6



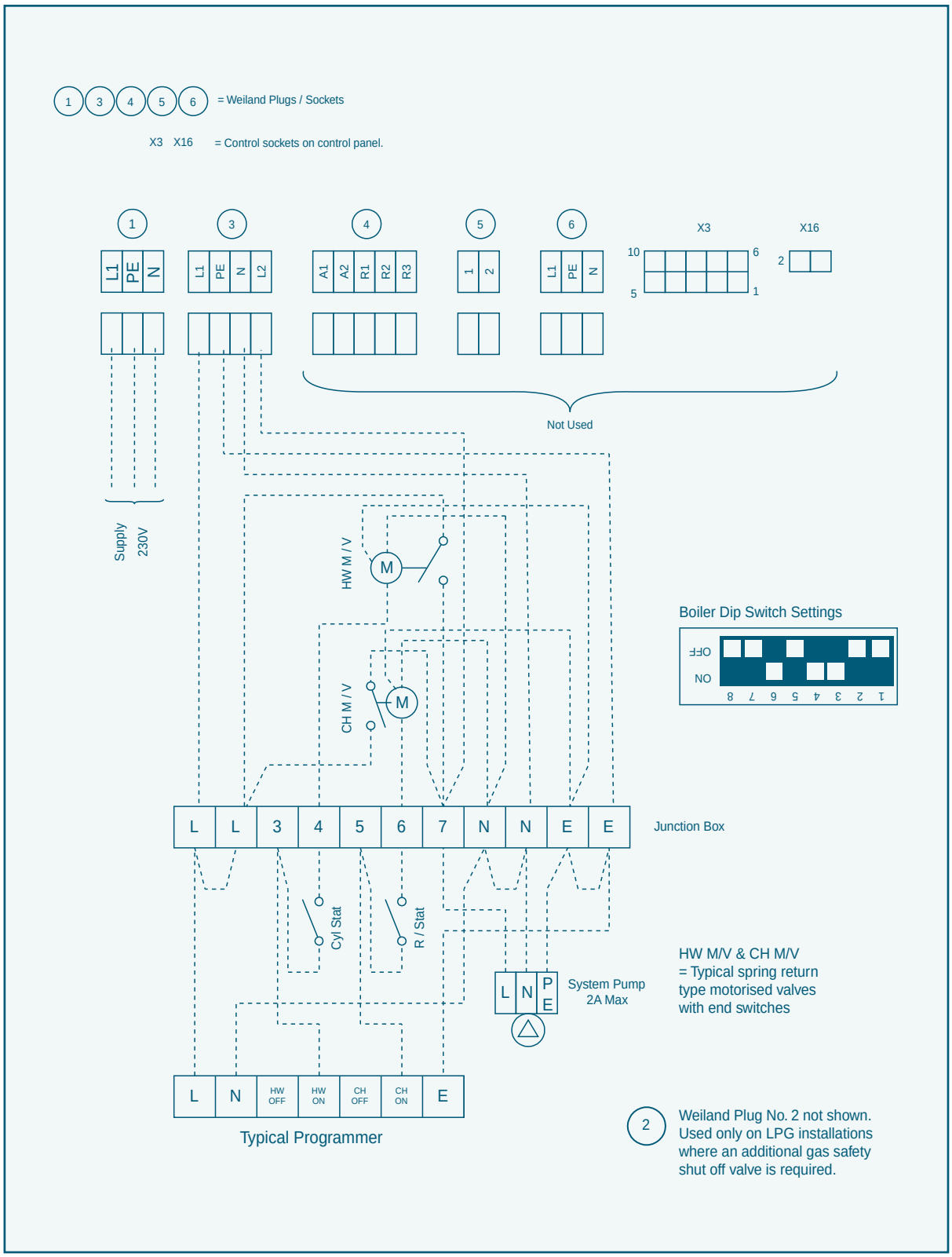
17.0 electrical *connections*

Typical electrical connection schematic to suit system type 7



17.0 electrical *connections*

Typical electrical connection schematic to suit system type 8



17.0 electrical *connections*

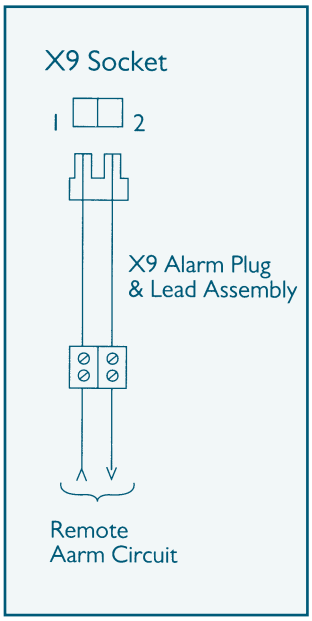
Remote Fault Indication

The MICROMAT EC boiler includes a built in fault alarm relay with volt free contacts for interface with, if required a remote alarm indicator.

The volt free contacts within the boiler control panel will close in the event that the boiler goes to a fault resulting in boiler lockout. The volt free contacts indicate “common alarm” upon closing. The actual fault description will be displayed upon the LCD screen of the boiler.

Connection to the volt free contacts is made via an alarm plug and lead assembly available from RVR Ltd.

The alarm plug and lead Connects to socket x9 located in the lower area of the boiler control panel.



18.0 commissioning *the micromat EC boiler*

The MICROMAT EC boiler should be expertly commissioned by a competent engineer who will need, in addition to standard hand tools, a U tube manometer and a combustion analyser.

Before attempting to set the MICROMAT EC boiler to work, the following check list must be worked through. See 20-1.

18.1 pre-commissioning *checks*

a) Ensure system has been thoroughly cleansed and flushed, any strainers have been cleaned and that the appropriate water treatment has been added to the system to prevent corrosion, scale formation etc.

b) Ensure the system and boiler has been properly and fully flooded and vented of air and the cold fill pressure at the boiler is at a minimum 0.5 Bar

c) Check that the pumps within the boiler are free to rotate by removing the vent screw in the end of both pump motors and checking that the impeller shafts rotate freely when turned with an appropriate sized screwdriver. Replace vent screws.

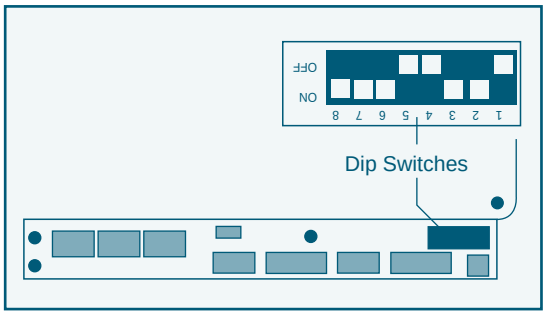
d) Ensure Gas supply has been purged and there is the availability of working inlet pressure of nominal 20 mbar (Nat gas) or 37 mbar (LPG).

e) Check that the flue installation has been properly made.

f) Check that a condensate pipe (in plastic - copper tube is not acceptable) has been connected to the boiler and that the syphon cleaning point cap is in place.

g) Where the appliance is taking air for combustion from the room in which it is installed - ensure an adequate provision for ventilation has been made.

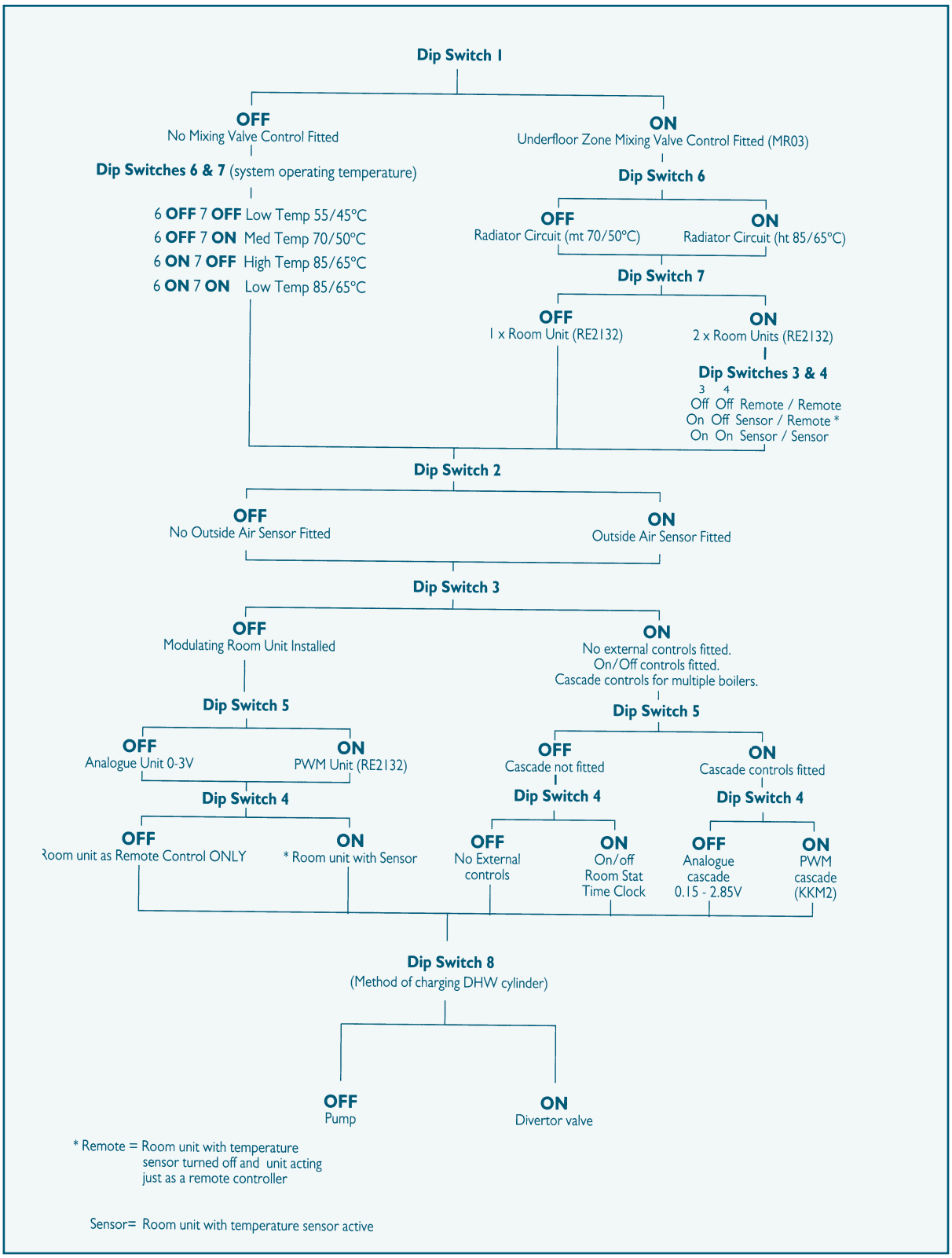
h) Ensure that there is an adequate heat load available.



i) Ensure that the electrical connections have been made correctly.

j) Ensure that the appliance has been correctly configured via the Dip switches located on the bottom right hand side of the control panel. See Dip switch setting table in 20.2.

18.2 dipswitch *settings*



18.3 first *firing*

NOTES

The MICROMAT EC boiler has 2Nr heat Exchange and Burner Assemblies. The Lower Assembly is referred to as No 1 and the upper as No 2. There are two gas valves - one for each burner: the left hand gas valve serves the lower assembly (No 1), and the right hand gas valve serves the upper assembly (No2).

a) Ensure gas & electricity supplies are turned on to the appliance.

b) Switch on the boiler at the on/off switch. (See figure 20) The appliance will purge both combustion chambers with air from the burner fans and then will pulse the pumps on/off (venting) to push away any air that may be remaining in the heat exchangers.

c) Turn the green potentiometer (HWS) fully clockwise (60°C).

d) Attach U tube manometer to inlet pressure test point on right hand gas valve (See figure 21) nominal pressure should be 20mb for NG or 37mb for LPG.

e) Press the Engineers" test button twice - the screen should/must display "10 min Low'. The boiler should now ignite and following stabilisation of the flame, will turn down to and hold at minimum output. In the event that ignition of one or both burners does not occur after 4 attempts the appliance will go to ignition failure lockout. Remove the cover cap screws from Qmin adjustment on gas valves (See figure 21(3)) turn adjustment screw half turn clockwise.

Press reset button, appliance will post purge and vent again.

Press Engineers test button twice to reset appliance to "10 min Low" and ignition sequence will start again. If ignition fails again after 4 attempts, then further increase Qmin on each gas valve by half turn until burners ignite.

f) Observe the colour of both burner flames - correct colour should be dull red. Adjust colour of burner flames using Qmin until flame colours are correct. Following this procedure will avoid poisoning your combustion analyser.

g) Remove flue gas analysis test point cap or plug (from top right of combustion chamber) of the lower heat exchanger and insert probe of combustion analyser Adjust as necessary Q min of left hand valve to obtain required C02% value. (See table 1) Make adjustments slowly and wait at least 2 minutes for reading to stabilise before re-adjusting. Remove analyser and refit cap/plug to test point. Repeat above procedure with upper heat exchanger and right hand gas valve.

Control Panel

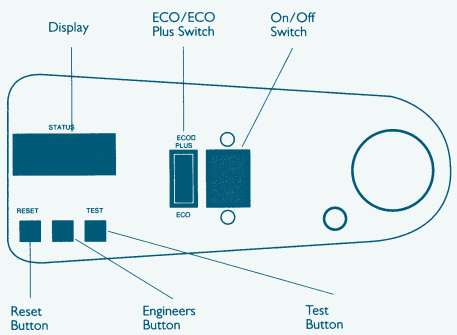


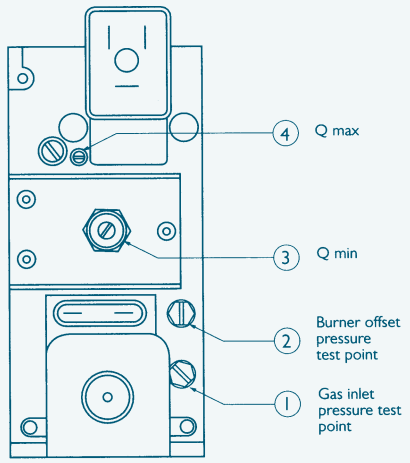
Fig. 20

FLUE GAS CO^2% SETTINGS

Gas Type	Nat Gas G20	LPG G31
CO_2% at min output	9-9.5	11-12
CO_2% at max output	8.7-9.2	10-11

Table 1

Gas Valve



Adjustments

Turning 3 clockwise increases min output & Co^2%

Turning 4 Anti clockwise increases max output & Co^2%

Fig. 21

18.3 first *firing*

NOTE:

Test period expires after 10 minutes - if this expires whilst commissioning is still in progress, press Engineers button twice to reset and carry on with necessary checks and adjustments. To exit “10 min Low’ test period - press Engineers button once, this will set controls to auto.

h) Turn the green potentiometer (whilst still in “10 min Low operation) fully anti-clockwise (20°C). This will set the burners to maximum output.

i) Check CO2% of upper heat exchanger and adjust as necessary screw (4) Q max of right hand valve, to obtain required value. (See table 1)

NOTE:

Adjustment of either (3) Q min or (4) Q max will affect the other adjustment to a lesser or greater extent. Following either adjustment of (3) or (4) check the effect on the setting of the other adjustment and correct as necessary.

j) Remove analyser from upper heat exchanger and refit cap/plug to test point.

k) Repeat operations described in i) and j) but on lower heat exchanger and left hand gas valve.

l) Press Engineer’s test button once to exit 10 minute test mode.

m) Turn off electricity and gas supplies and remove manometer from inlet pressure test point and refit test point screw.

n) Turn on gas and electricity supplies.

18.4 setting weather *compensation*

a) If direct-on-boiler weather compensated flow temperatures are required, then ensure the (supplied) outside air temperature sensor has been installed and Dip switch No2 has been set to “on”.

   The boiler is supplied with the compensation slope shown overleaf set as a default.

   NOTE: The default slope is obtained when the red and blue potentiometers are set in the vertical position.

b) If the default settings are not applicable to the needs of the system user, then the angle of the slope may be changed by adjustment of either the blue or red potentiometers or both.

Adjustment of the red potentiometer raises or lowers the flow temperature at low outside (design) air temperature.

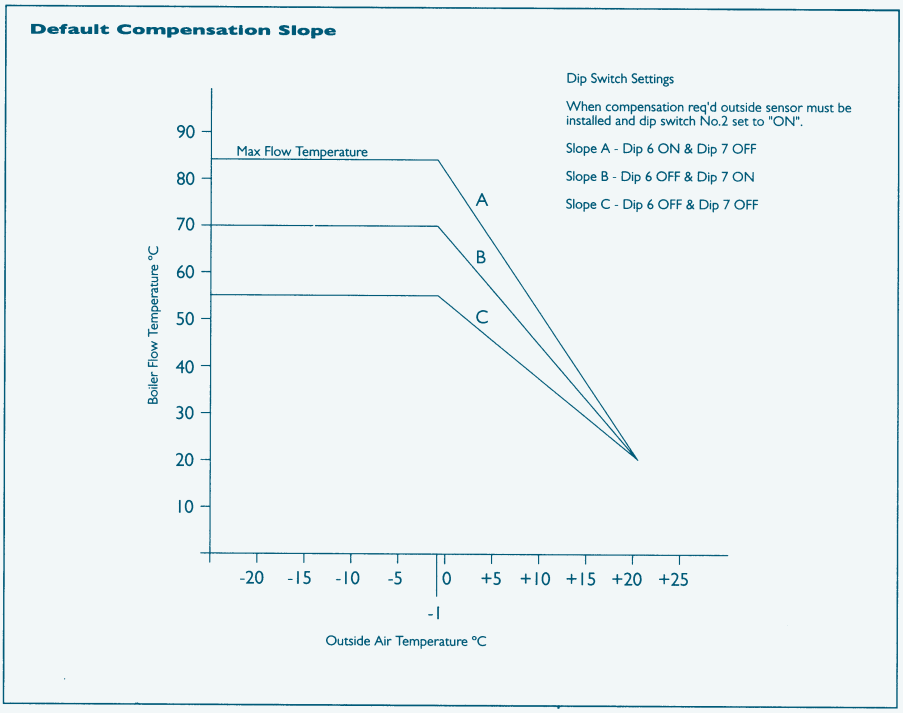
Adjustment of the blue potentiometer raises or lowers the flow temperature at the end point (high) outside air temperature.

Each potentiometer has the range of +200C and -200C about the default point but with a limiting factor that the maximum flow temperature is 85oC.

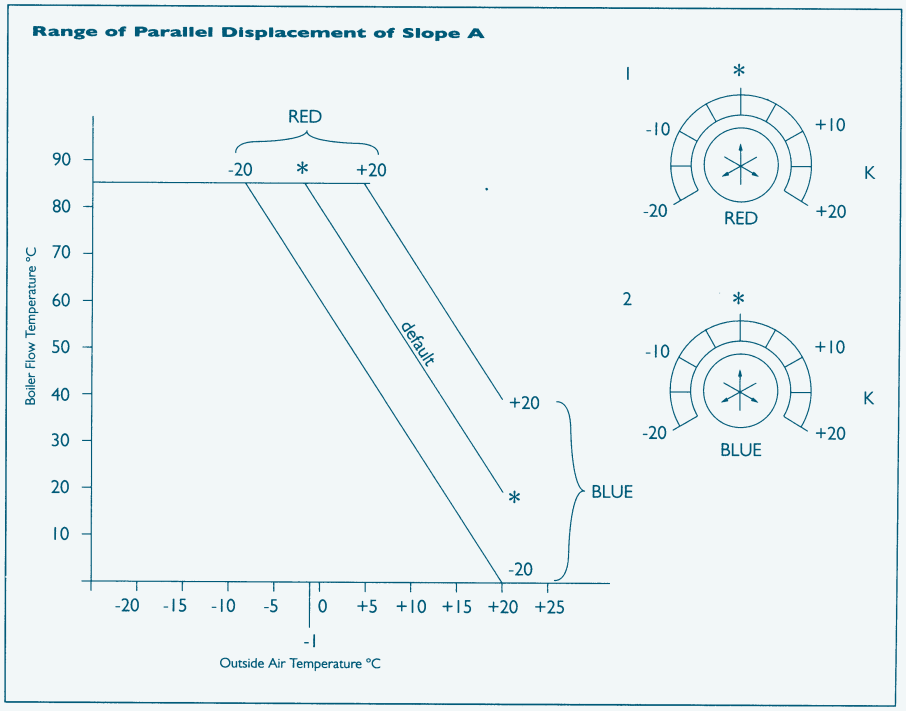
See graphs following showing range of parallel displacement of the compensation slopes.

18.4 setting weather *compensation*

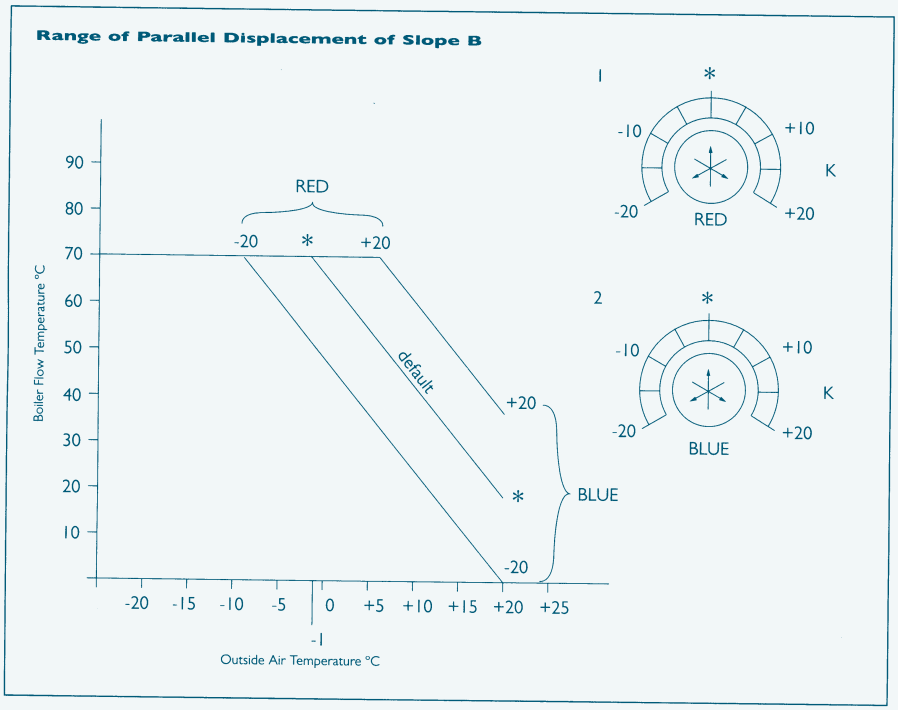
Default Compensation Slope

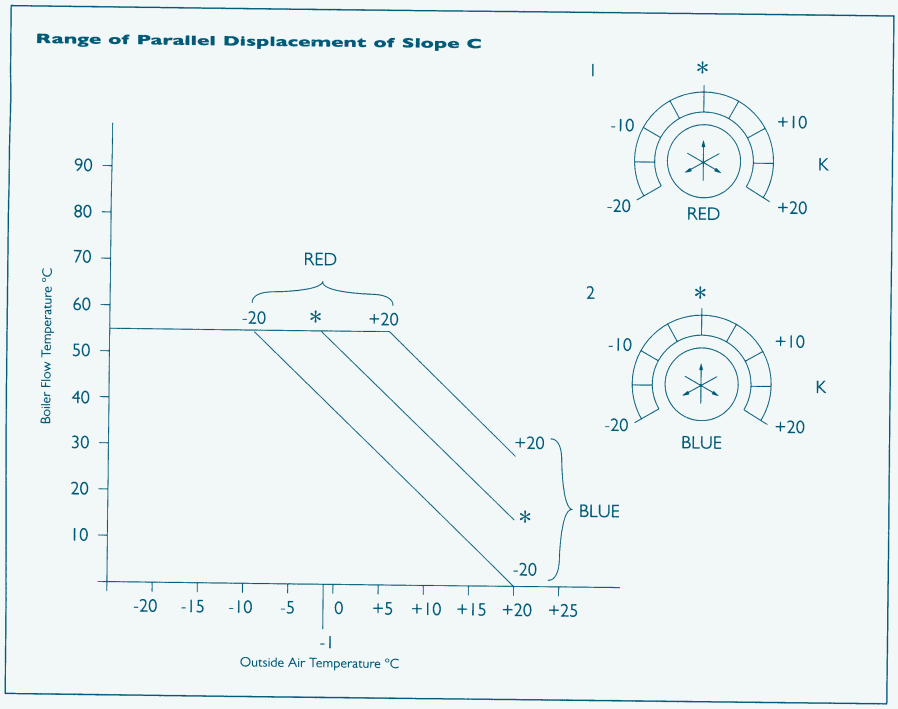


Range of Parallel Displacement of Slope A



18.4 setting weather *compensation*





18.5 setting domestic hot water temperature

A) With HWS sensor in/on DHW Calorifier

- Set desired stored hotwater temperature by using the “green” potentiometer on the boiler control panel. This arrangement will give the potential to charge hot water continuously (24 hour/day) with priority over the heating demand. This arrangement is recommended only with high/quick recovery type caloriflers.

B) With cylinder thermostat in/on DHW Calorifier

- Set desired stored hot water temperature by the adjustment of the cylinder thermostat. With this arrangement the “green” potentiometer on the boiler control panel has no function. With this arrangement time control of hot water charging is possible by installing a time switch in series with the cylinder thermostat, but hot water charging always takes priority over the heating demand.

18.6 service button/setting heating output pump speeds and minimum mixed flow temperature

The service button is located adjacent to the Dip switch block (bottom right hand of control panel) and has a number of functions

a) Setting maximum output to heating.

The output to heating may be limited if required and may be set between 20% and 100%, by performing the following:

i) Press “red” reset button once.

Press service button once.

Screen display will show “Mxhea”???>??%

The figures to the left of the “>” symbol are the current settings for maximum heating output as a percentage of the maximum output of the boiler

ii) To change the output, turn the “red” potentiometer and the figures to the right of the “>” symbol will change. Set the required % output by adjusting the “red” potentiometer. - - equals 100%.

iii) To “store” the new setting; press the service button once.

iv) If no further adjustments are required then set “red” potentiometer back to it’s original position as this affects the compensation slope setting if compensation is active.

b) Setting maximum pump speed. (Normal setting 100%)

If it is required to limit the maximum speed of the in built boiler pumps then this may be done by the following:

i) Press “red” reset button once.

Press service button once.

Press “red” reset button twice.

Screen display will show “Mx pum”???>??%.

ii) To change maximum pump speed (not recommended, normally left at - - (100%) follow procedure as

18.6 service button/setting heating output *pump speeds and minimum mixed flow temperature*

c) Setting minimum pump speed.

If it is required to limit the minimum pump speed of the in built boiler pumps then this may be done by the following:

i) Press “red” reset button once.

Press service button once.

Press “red” reset button three times.

Screen display will show “Mn pum”???<??%

ii) To change minimum pump speed then follow procedure as in a) ii)-iv) above.

d) Setting minimum mixed flow temperature.

Only applicable where MRO3 underfloor zone controller is installed.

If it is required to set a minimum mixed flow temperature at the outlet of underfloor zone VT value, then this may be done by the following:

i) Press “red” reset button once.

Press service button once.

Press “red” reset button four times.

ii) To set minimum mixed flow temperature follow procedure as in a) ii-iv) above.

e) Clearing “service” message from screen display.

After a default of 365 days of an electrical supply being applied to the boiler, a message to the user is shown on the screen displaying “service”, reminding the user that the appliance should now be serviced.

Following a service visit by the specialist engineer, the service message may be cancelled by pressing and holding the service button for approximately 10 seconds.

18.7 output for charging *hot water*

There is no adjustment necessary or possible, as the boiler controls are self learning and will self adapt the optimum output to hot water according to the heat transfer capabilities of the connected hot water calorifier or cylinder.

18.0 setting the boiler *to work*

1. To fit casing to boiler ensure hooks on top rear edge of boiler case engage properly into rear chassis assembly. Latch bottom case fixings and tighten central locking screw.

2. Turn ON on/off switch and set any external controls to auto operation.

3. Set ECO/ECO plus switch to ECO position for systems without additional heating circuit pump OR Set ECO/ECO plus switch to ECO plus position for systems with a local low velocity header and additional heating circuit pump.

4. With boiler operating (burners on) press “Test” button on boiler control panel to test overheat controls in the boiler. The boiler must shut-down and then re-ignite.

20.0 servicing *instruction*

GENERAL

In general, maintenance/inspections should take place:

a) When the display on the unit indicates that inspection is required (status shows [SERVICE]).

b) At least every 18 months, before carrying out any maintenance the unit must be inspected.

20.1 inspection

a) Ask the user about any problems with the boiler unit or any other comments.

b) Check the water pressure of the installation.

c) Remove the casing of the unit and inspect all pipes and connections for water leaks.

d) Inspect the top of the casing and/or the top of the upper heat exchanger for water leaks or signs of water from the flue air supply tube.

e) Open the siphon cleaning rinsing point at the base of the unit.

f) If you have a notebook computer, connect it and check the service page for any errors, messages, starts and successful restarts. (Special communication lead and service software required)

g) Run the unit at maximum capacity and measure the input and the $C0^2$%.

h) Run the unit at minimum capacity and measure the input and the CO^2%.

i) Listen to the sound of the in built pumps.

j) Disassemble each burner by removing the six M6 nuts around the burner door, removing the ignition cable and pulling the burner forwards.

When the burner has been pulled forwards to halfway across the burner area, the plug on the fan cable must be removed from the fan motor

Check the interior of the heat exchanger

k) Disassemble the plastic box at the suction side of the fan, inspect the fan blades.

l) Check the distance between the electrode and the burner; this should be 4 to 5 mm.

20.2 maintenance

Depending on the results of the inspection carry out any maintenance and if necessary any preventive maintenance.

Possible actions include:

at a) The remarks and comments of the client must be taken seriously and the cause(s) of any faults or problems must be found.

at b) The pressure of the installation must be between 1 and 2 bar: any possible leaks in the system must be identified; if necessary, have a pipework engineer solve the problem.

at c) Possible leaks or weeping must be resolved immediately.

at d) In case of water leakage or ingress from the air supply pipe, the cause must be found.

at e) If the condensation in the siphon is highly contaminated, the siphon must be rinsed. With the burners removed, use a filling hose to insert water into the heat exchanger, which will automatically reach the siphon.

at f) Draw your conclusions from the service screen and attend to those parts that have caused any faults.

at g) and at h)

If necessary, adjust the gas setting on the gas valves.

at i) If the in built pumps make an un-natural noise, and in particular if the pumps are more than 5 years old, it is recommended that the pumps should be replaced by way of preventive action.

Note the pumps are fully modulating and do have characteristic a “yet yet” noise which is normal at low speeds.

at j) NEVER CLEAN THE BURNER ITSELF

If the interior of the heat exchanger is contaminated and/or there is a deposit on the surfaces of the coiled stainless steel pipes, the latter must be removed with a hard brush or citric acid. (DO NOT USE A STEEL BRUSH!) Then remove any dirt with a vacuum cleaner

at k) If dirt has deposited on the fan blades, each blade must be carefully cleaned, until the blade material is visible again. If this is not done evenly the fan will not rotate properly and be out of balance.

at l) Carefully bend the electrode without touching the burner, until the correct distance has been reached

IMPORTANT NOTE

IF ANY WATER CARRYING JOINT WITHIN THE BOILER IS DISASSEMBLED THEN THE “0” RING SEAL MUST ALWAYS BE REPLACED, LIKEWISE IF ANY OTHER SEAL IS NOTED TO BE DEFORMED THEN THEY SHOULD ALSO BE REPLACED.

WATER SEALING “0” RINGS ARE A ONE TIME USE ONLY AND SHOULD NOT BE RE-USED.

Cancelling the Service Message

Following the maintenance operations, the service message (when

displayed) must be cancelled. This is done by pressing and holding in the service button for at least 10 seconds.

21.0 screen display *diagnosis of faults*

The control panel of the MICROMAT EC boiler has an LCD screen, displaying two lines of data. This screen provides information about the operation of the appliance; it shows operation messages (non flashing) and fault messages (flashing display). The first line contains text information about the status of the unit.

It shows:

STATUS MESSAGES (NON FLASHING) FOR NORMAL OPERATION

Standby	No heat demand (boiler not required to be on)
Pre-purge	Combustion chambers are being pre-ventilated with air from the burner fans
Ignition	The ignition sequence of the burners is initiated
Heat-operate	The boiler is operating in central heating mode
Tap-operate	The boiler is operating to produce domestic hot water
Flue-emission	The boiler is operating in test mode at mid output to enable flue gas emissions to be checked(auto expires after 10 mm)
10mm Low	The boiler is operating in engineers test mode for adjustment purposes (auto expires after 10 min)
Post-purge	Combustion chambers are being post-ventilated with air following boiler operation
Limit F/R	The flow and/or return temperature is too high (currently)
Fan 1 high	The lower burner fan is running too fast (currently)
Fan 1 low	The lower burner fan is running too slow (currently)
Fault room u	There is a fault with the modulating unit (RE2132) or Cascade manager (KKM2) or a fault in the wiring to these controls (in these circumstances the boiler runs continuously in heating mode to protect the building)
Fault outside	There is a fault in the outside air sensor or in the wiring to the sensor or the dip switches are incorrectly set to ask the boiler to look for an outside sensor when there is none installed
Service	The service interval time has expired and the boiler should now be maintained
Serv. Button	The service button is being depressed
Fan 2 high	The upper burner fan is running too fast (currently)
Fan 2 low	The upper burner fan is running too slow (currently)
Venting	The in built pumps are operating to remove any possible collection of air from the heat exchangers. (Occurs when power turned off/on and after reset of fault)

The second line of text displays values such as temperature, percentages etc and the red reset button may be used to scroll through (for information) the values of the various sensors that are/may be connected in the boiler plus fan speeds and pump speed etc.

21.1 screen display *diagnosis of faults*

STATUS MESSAGES (FLASHING DISPLAY) INDICATING A FAULT

A flashing display indicates a fault and that the boiler has shutdown (lockout). The boiler will not attempt to operate until the red' reset button is pressed.

Any repetitive flashing fault message should be investigated, the cause found and corrective action taken.

For each flashing display message there is a possible cause, see list of cause numbers following the flashing status' list.

DISPLAY MESSAGE FLASHING	MEANING	CAUSE NUMBER/S
Wat 1 Lockout	Lower ht/exch high limit stat has tripped.	5,6,7,8,21,24,25,26,31
Wat 2/Flue Lo	Upper ht/exch high limit or flue limit stat has tripped	2,5,6,7,8,21,24,25,26,31
Fan 1 High	Lower burner fan speed is too high	9,11,29,31,33
Fan 1 Low	Lower burner fan speed during pre-purge is too low	9,10,11,14,18,29,31,33
Fan 1 oper	Lower burner fan is detected as operating when should be idle	3,4,11,29,31
Ignit 1 fault	Ignition to lower burner has not been successful after 4 attempts	12,13,15,16,17,19,22 23,27,29,30,31,35
Flame 1 out	Flame at lower burner has been lost on 4 consecutive occasions during operation	13,15,17,19,20,23
Flame 1 on w/	Flame is detected at the lower burner when there should be no flame	17,19,30
S1 interrupt	Lower ht/exch flow temperature sensor interrupted	3,5,33
S3	Upper ht/exch flow temperature sensor interrupted	3,5,33
S4	Return temperature sensor Interrupted	3,5,33
S7	Mixed flow temperature sensor Interrupted. Only when MR03 Unit installed	1,3,5,33
Program end	Follows reprogramming of control panel with laptop PC, not a fault -just press reset button	
Fan 2 High	Upper fan speed too high	9,11,29,31,33

21.1 screen display *diagnosis of faults*

DISPLAY MESSAGE FLASHING	MEANING	CAUSE NUMBER/S
Fan 2 low	Upper burner fan speed too low during pre-purge	9,10,11,14,18,29,31,33
Fan 2 oper	Upper burner fan is detected as operating when should be idle	4,11,29,31
Flame 2 on/w	Flame is detected at the upper burner when there should be no flame	17,30
Ignit 2 fault	Ignition to upper burner has not been successful after 4 attempts	12,13,15,16,17,20,22 23,27,29,30,31,35
Flame 2 out	Flame at upper burner has been lost on 4 consecutive occasions during operation	13,15,17,20,23
Gas valve	Connection to gas valve interrupted	16,26,28,29,31,33
Soft fault	Error in software in the control	29
Reset button	There is a fault with the reset button	29,31,34
Eeprom	There is a fault in the EEPROM in the control	29

21.2 (possible) causes of fault *&corrective action*

CAUSE No.	REASON/ACTION
1	Dip switches not set correctly / Check and correct settings
2	Unsound electrical connections to flue limit stat / Check and correct
3	Sensor not correctly connected or sensor defective/Check connections and or replace sensor
4	Short circuit in wiring / Check and rectify
5	Short circuit in wiring to sensor / Check and rectify
6	Boiler pumps not rotating (seized or defective)/Free seized shaft or if defective replace pump
7	System lacks water / Investigate, refill and vent
8	Connections to heat exchanger limit stat unsound /check & rectify
9	Unsound electrical connection to fan / Check integrity of fan connection plug
10	Fan blades heavily contaminated / Clean fan

21.2 (possible) causes of fault &corrective action

CAUSE No.	REASON/ACTION
11	Fan is defective / Replace fan
12	There is no gas supply available / Investigate, restore gas supply
13	Low gas pressure / Investigate and rectify
14	Fuse defective / Check fuses and replace as necessary
15	Gas valve min output setting is incorrect / Check and adjust min output $C0^{2}$%
17	Poor ignition lead connection to electrode or damp connection or lead damaged and shorting to earth / Check and rectify
18	Transformer defective / Replace transformer
19	Condense siphon is blocked or condensate blocked or frozen / Clear siphon or waste pipe
20	Flue gas leakage from connection at rear of heat exchanger / Check, reposition or replace seal
21	System strainer blocked, isolation valve closed. Or some other interruption to waterflow / Check and rectify
22	Unacceptably high resistance in flue or air supply tubes or flue blocked / Check flue for suitability or clear obstruction
23	Leakage of flue gas from flue gas tube into air tube vitiating the combustion air / Strip out flue system and remake joints
24	Zone pumps not running / Check and rectify
25	Heat exchangers fouled internally with silt or scale / Clean, descale heat exchangers and system and re-dose system with water treatment
26	Heat exchanger high limit stat defective / Replace limit stat
27	Boiler set for wrong gas type / Convert boiler to burn the gas being supplied
28	Flue gas limit stat defective / Replace limit stat
29	Boiler control panel defective / Replace control panel
30	Incorrect position of ignition electrode / Reset gap 4-5mm
31	moisture in-on electrical connections or components / Dry carefully using warm air from a hair dryer
32	Incorrect electrical connection / Check and rectify
33	Wiring interrupted (broken wire) / Check and rectify
34	reset button stuck / Press button in attempt to free sticking contacts. If no success then replace control panel
35	Ignition electrode damaged or broken / Replace electrode

MAN B&W
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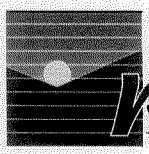

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