INSTALLATION OPERATION AND MAINTENANCE MANUAL

Part number M7889

COMBIflo

Indirect High Efficiency Boiler & Stainless Steel Storage Water Heater

100/300
150/300

Please read and understand these instructions before commencing installation and leave this manual with the customer for future reference

Andrews. Built to perform.

ANDREWS
WATER HEATERS

Technical Parameters

Model			COMBIflo 100/300	COMBIflo 150/300
Space heating parameters				
Condensing boiler	-	-	Yes	Yes
Low-temperature boiler(1)	-	-	Yes	Yes
B1 boiler	-	-	No	No
Cogeneration space heater	-	-	No	No
Combination boiler	-	-	Yes	Yes
Rate heat output	P_{rated}	kW	99	147
Useful heat output at rated heat output and high temperature regime(2)	P_4	kW	91.5	136.8
Useful heat output at 30% of rated heat output and low temperature regime(1)	P_1	kW	29.9	43.9
Seasonal space heating energy efficiency in active mode (weighted average of useful efficiency)	n_{son}	%	96.5	95.8
Seasonal space heating energy efficiency	n_s	%	93	94
Useful heat output at rated heat output and high temperature regime(2)	n_4	%	87.7	88.0
Useful heat output at 30% of rated heat output and low temperature regime(1)	n_1	%	98.1	97.2
Auxillary electricity consumption				
Full load	elmax	kW	0.285	0.425
Part load	elmin	kW	0.099	0.139
Standby mode	P_{SB}	kW	0.013	0.014
Other items				
Standby heat loss	P_{stby}	kW	0.140	0.170
Ignition burner power consumption	P_{ign}	kW	0.000	0.000
Annual Energy consumption	Q_{HE}	GJ	283	419
Sound power level, indoors	L_{WA}	dB	61	62
Emissions of nitrogen oxides	NO_X	mg/kWh	< 40	< 40
Domestic hot water parameters				
Declared load profile			3XL	3XL
Daily electricity consumption	Q_{elec}	kWh	0.755	0.754
Annual electricity consumption	AEC	kWh	166	166
Water heating energy efficiency	n_{hw}	%	75	75
Daily fuel consumption	Q_{fuel}	kWh	60.395	60.748
Annual fuel consumption	AFC	GJ	48	48
Weekly fuel consumption with smart controls	$Q_{fuel, week, smart}$	kWh	-	-
Weekly electricity consumption with smart controls	$Q_{elec, week, smart}$	kWh	-	-
Weekly fuel consumption without smart controls	$Q_{fuel, week}$	kWh	-	-
Weekly electricity consumtion without smart controls	$Q_{elec, week}$	kWh	-	-
Storage volume	V	l	300	300
Mixed water at 40 °C	V40	l	700	∞
Harmonised standards applied	EN: 13203-2			
(2) High temperature regime means 60°C return temperature at heater inlet and 80°C feed temperature at heater outlet (1) Low temperature means for condensing boilers 30°C, for low temperature boilers 37°C and for other heaters 50°C return temperature (at heater inlet)				
Specific precautions that shall be taken when the water heater is assembled, installed or maintained:	Before any assembly, installation or maintenance the installation and operation manual has to be read attentively and is followed			

Table of Contents

1.1 DESCRIPTION OF APPLIANCE

This Andrews COMBIflo is a gas fired, low Nox, multi-heat engine cascading boiler system, with an integrated 5" Low Loss Header for the supply of a low temperature hot water space heating system. The COMBIflo range of appliances also features an integrated stainless steel tank and plate heat exchanger for the supply of hot water.

Fully automatic electronic controls are integrated into the appliance, with a wide range of control and sensor options available. The controls also provides voltage free outputs for Enable, Burner On, Fault and 0-10V input for remote BMS use.

Access to the controls of the appliance via the internet and/or mobile phone app, is available through an optional device from Andrews Water Heaters.

Each heat engine module consists of a stainless steel combustion chamber, premix burner, modulating fan, gas valve, ignition and flame detection electrodes and a NTC flue sensor for safety supervision.

Each heat engine module is equipped with NTC sensors for precise temperature control on flow and return manifolds. Fully premixed, radiating, modulating burner, integrated with gas valve to deliver precise gas/air mixture throughout the full modulation range.

Common combustion air intake manifold, takes air from boiler room (type B23 flue) or directly from outside via a combined flue system (C13 & C33). An air control non-return flap is integrated into the air supply of each heat engine, to ensure that flue products cannot contaminate the air supply, when a heat engine is not in operation.

The safety and operation functions of each heat engine are managed by micro processor controlled circuit boards, one for each heat engine. The upper controller also acts as the cascade controller, switching/modulating the heat engines according to the demand and data from the systems sensors. Control is performed using comparison parameters between the requested temperature and the global flow temperature.

CONTROL LOGIC:

At full demand, each heat engine is ignited one at a time, until all heat engines are operating at full output. As flow and return temperatures increase, all heat engines will begin to modulate down together, until all are operating at minimum input rate. As flow temperatures begin to approach the calculated set point, one of the heat engines will stop, leaving the others operating at minimum input rate. This will continue until all heat engines have stopped and temperature flow requirements have been fully satisfied.

1.2 FOR WHOM IS THIS MANUAL INTENDED?

This manual is intended for the heating specialist who installs commercial/industrial heating plant and equipment.

1.3 SYMBOLS USED IN THIS GUIDE

DANGER!

Indicates serious danger to personal safety and life

DANGER of electric shock!

Indicates serious danger from electricity to personal safety and life

CAUTION!

Indicates a potentially dangerous situation for the boiler and the environment

INFORMATION

Suggestions to assist the user in implementing instructions in this guide

ADDITIONAL READING

Reference to additional information in other documents

2.0 SAFETY
2.1 USAGE AND COMPETENCY

2.1.1 IMPROPER USE

This Andrews Water Heaters product has been designed and manufactured to comply with current European standards of safety. However, following an improper use, dangers could arise concerning the safety and life of the user or of other people, or damage could be caused to the appliance or other objects. This appliance is designed to be used in a pumped hot water space heating system and potable hot water supply and storage. Any other use of this appliance will be considered improper. Andrews Water Heaters declines any responsibility for any damage or injuries caused by an improper use. In order to use the appliance according to its designed scope, it is essential to carefully follow the instructions given in this guide.

2.1.2 USER COMPETENCY

This appliance is not intended for use by persons with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they are given supervision or Instruction concerning the use of it by a person responsible for their safety. Children under the age of 12 years should not be permitted to use the appliance.

2.1.3 ENGINEER COMPETENCY

The installation, adjustment & servicing of this applaince must be carried out by a competent person (In the UK by a Gas Safe Registered Engineer and in IE by a (RGII) Registered Gas Installer) and installed in accordance with current standards and regulations. Failure to correctly install or maintain this appliance could cause injury to persons or damage to property. The manufacturer shall not be held liable for any such injury and/or damage.

2.2 GENERAL SAFETY

2.2.1 SMELL OF GAS

If you smell gas - follow these safety instructions:

- **Do NOT** turn off or on any electrical switches (including light switches)
- **Do NOT** smoke
- **Do NOT** use the telephone
- **DO** evacuate persons away from the source of the gas smell
- **DO** close the main gas shutoff valve
- **DO** open all the windows and doors where the gas leakage has occurred
- **DO** inform the gas authority or a competent specialist as soon as possible

2.2.2 FLAMMABLE SUBSTANCES

Do not store or use explosive or easily inflammable material (such as petrol, paint or paper) in the same room where this appliance has been installed.

2.2.3 APPLIANCE INSTALLATION AND MAINTENANCE

This appliance has been designed for use with G20 natural gas and is manufactured to give an efficient, safe and long service life. To ensure continued trouble-free operation of this appliance at maximum efficiency, it is essential that correct installation, commissioning, operation and service procedures are carried out strictly in accordance with the instructions given in this manual (see section 7.0)

Only original parts and accessories from the manufacturer may be used on this appliance. Using non-approved parts may compromise the safety of the appliance and invalidate any warranty.

In the event of failure and/or suspected faulty functioning of the appliance. Switch off the appliance and contact suitable qualified technicians. Do not attempt to make any repairs unless you are suitably qualified and competent to do so.

2.3 REGULATIONS AND STANDARDS

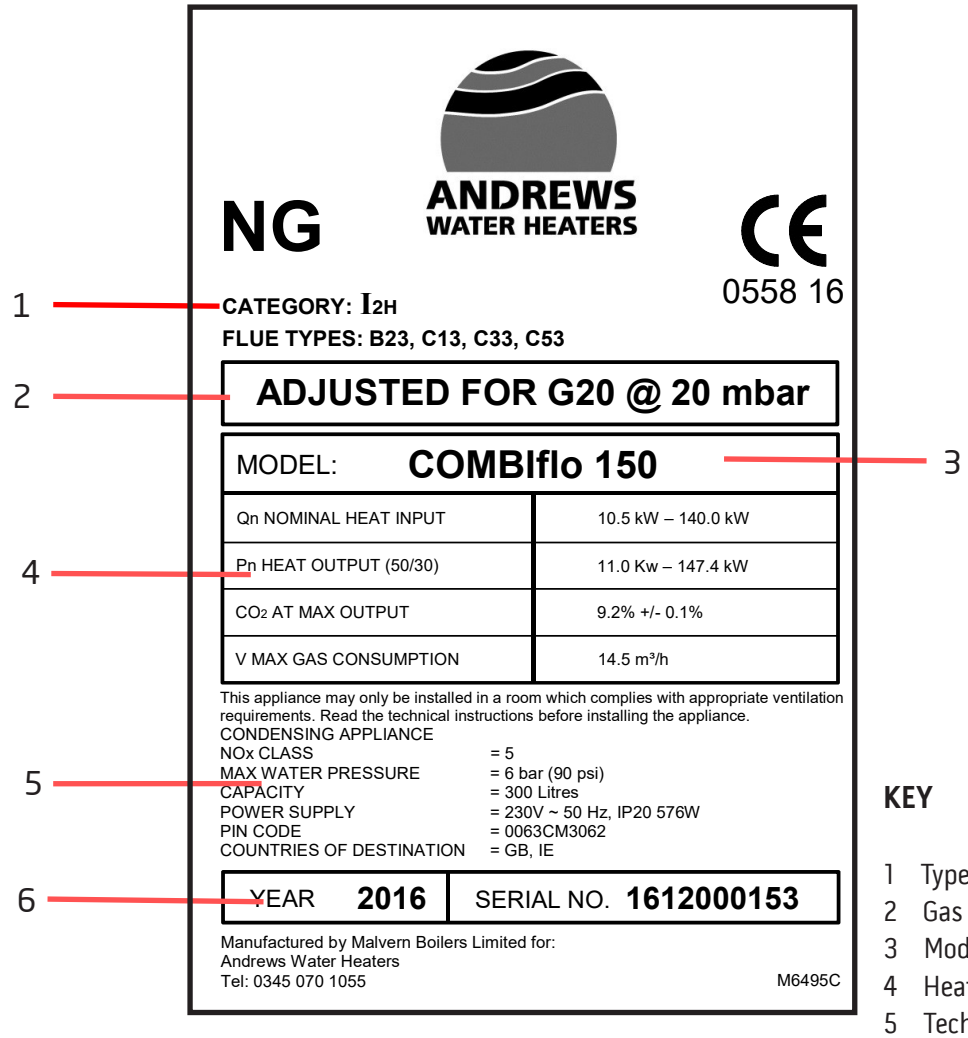
This appliance must be installed in accordance with relevant British Standard Specifications, Codes of Practice and current Building Regulations, together with any special regional requirements of the Local Authorities, Gas undertaking and Insurance I.E.E. Regulations for the Electrical Equipment of Buildings. The installation of the appliance must be in accordance with the relevant requirements of:

- Health and safety at work act 1974
- Building regulations 2010
- Electricity at work regulations 1989
- Management of health and safety at work regulations 1998
- Manual handling regulations 1992
- Model water byelaws 1986
- BS 7671 - Requirements for electrical installations, IEE wiring, regulations
- BS 6644 - Specification for the installation of Gas fired hot water boilers for rated inputs between 70kW (net) and 1.8 MW
- BS 7074-2 - Applications selection and Installation of expansion vessels and ancillary equipment for sealed water systems.
- BS 6880:1 Code of practice for low temperature hot water heating systems of output greater than 45kW. Fundamental and design considerations.
- BS 6880:2 Code of practice for low temperature hot water heating systems of output greater than 45kW. Selection of equipment.
- BS 6880:3 Code of practice for low temperature hot water heating systems of output greater than 45kW. Installation, commissioning and maintenance.
- CP 342:2 Code of practice for centralised hot water supply. Buildings other than individual dwellings.
- IM/11 - Flues for commercial and Industrial Gas Fired Boilers and Air Heaters
- IGE/UP/1 - Soundness Testing and Purging Procedure for Non Domestic Installations
- IGE/UP/2 - Gas Installation Pipe work, Boosters and Compressors for Industrial and Commercial Premises
- IGE/UP/10 - Installation of flued gas appliances in industrial and commercial premises.

These manufacturer's notes must not be taken in any way as over-riding statutory obligations.

2.4 CE MARKING

There is one data plate located on the appliance . This is mounted on the outside of the appliance (left hand side, next to the document holder)



KEY

1 Type approval designation
2 Gas type and pressure
3 Model Name
4 Heat, gas flow & CO ² data
5 Technical data
6 Serial number and year

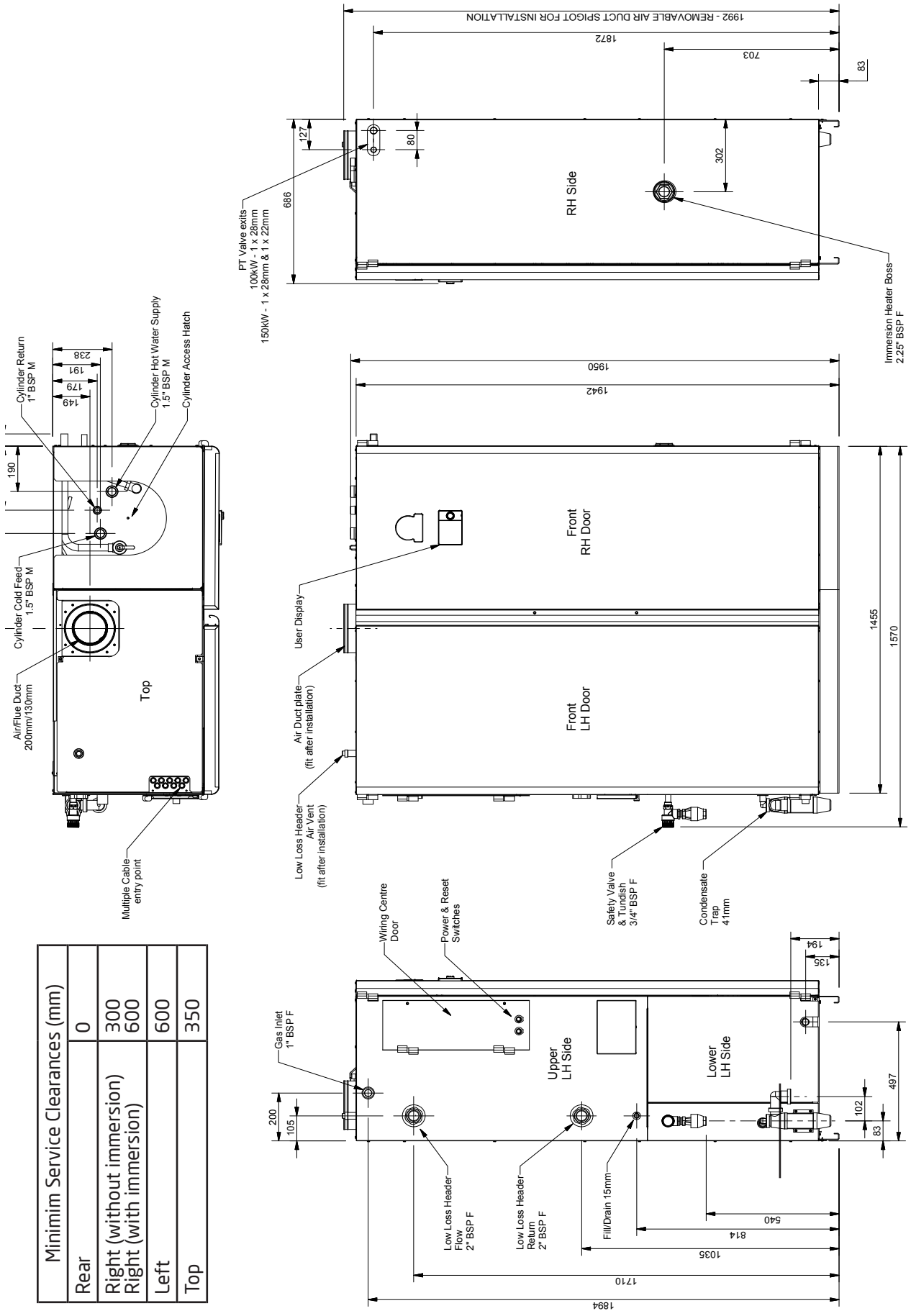
The CE marking documents that the appliance complies with the essential requirements of the following directives:

- Gas appliance directive (2009/142/EC)
- Ecodesign directive for energy related products (2009/125/EC)
- Electromagnetic compatibility directive (89/336/EEC)
- Low voltage directive (2006/95/EEC)
- Efficiency requirements directive (Council Directive 92/42/EEC) for condensing boilers
- Protection requirements (04/108/EG) is only guaranteed when operating the appliance for its correct purpose.

This manual is an integral and indispensable part of the appliance and it is suggested that this manual is kept in a safe place for future reference.

3.0 TECHNICAL DATA

3.1 GENERAL DIMENSIONS & CONNECTIONS

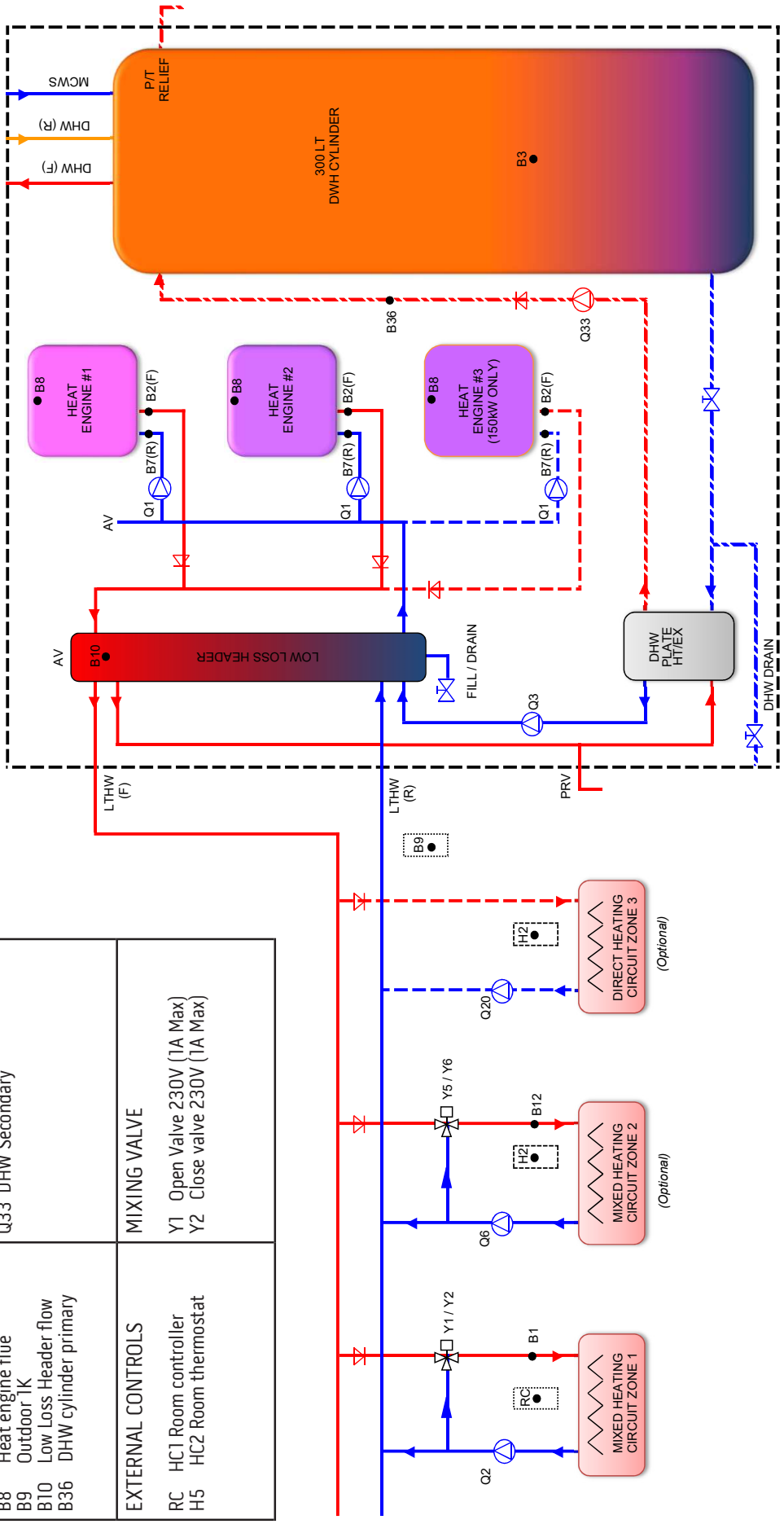


Minimim Service Clearances (mm)	
Rear	0
Right (without immersion) Right (with immersion)	300 600
Left	600
Top	350

3.2 PERFORMANCE DATA

PERFORMANCE	Unit	COMBIflo 100/300	COMBIflo 150/300
Category gas types		I_{2H} G20 @ 20 mbar or I_{3P} G31 @ 37 mbar (5.2mm Orifice)	
Q Nominal Heat Input net (gross)	kW	94.0 (102.2)	140.0 (152.1)
Q Minimum Heat Input net (gross)	kW	10.5 (11.3)	10.5 (11.3)
P Nominal Heat Output at 50°c/30°C	kW	11.0 - 99.0	11.0 - 147.4
V Maximum Gas Consumption G20 / (G31)	m^3/h	9.8 / (3.9)	14.5 / (5.7)
Flue gas temperature max (min)	°C	85 (50)	85 (50)
CO_2 at max output G20 / (G31)	%	9.2 +/- 0.1 / (10.2 +/- 0.2)	9.2 +/- 0.1 / (10.2 +/- 0.2)
Max CO at max output	ppm	180	180
NOx emission at 0% O_2 (EN15420)	mg/kWh	< 40	< 40
NOx Class	class	6	6
Sound level (EN15036-1 Average @ 1m)	LAeq	61.1dB	62.0dB
HEATING			
Efficiency heat output at Part load (EN15502-1)	net % (gross %)	108.9 (98.1)	107.9 (97.2)
Efficiency heat output at 50°c/30°C (EN15420)	net % (gross %)	105.3 (94.9)	105.3 (94.9)
Efficiency heat output at Full load (EN15502-1)	net % (gross %)	97.3 (87.7)	97.7 (88.0)
Seasonal efficiency (Building regs Part L2)	%	96.1	95.9
PMS Operating pressure max (min)	bar	3.5 (0.5)	3.5 (0.5)
Tmax Max permitted operating temperature	°C	82	82
Flow / Return connections	BSP	2"	2"
Low Loss Header resistance	kPa	0.5	0.5
HOT WATER			
Tank capacity	litres	300	300
Standby losses	Watts	140	170
Recovery rate through 50°C	l/hr	1,520	2,240
PMS Inlet / Operating pressure max (min)	bar	5.5 (0.2)	5.5 (0.2)
In / Out connections	BSP	M $1^1/_2$"	M $1^1/_2$"
Water return connection	BSP	M 1"	M 1"
ELECTRICAL			
Electrical supply voltage / Hz	V / Hz	240 / 50	240 / 50
Power consumption - standby	W	12.8	13.9
Power consumption - maximum	W	516	576
Fuse rating on mains supply	A	5	5
Insulation protection rating	IP	20	20
FLUE			
Flue connection - single	mm	130	130
Flue connection - concentric	mm	130 / 200	130 / 200
Max flue equivalent length - single	m	30	30
Max flue equivalent length - concentric	m	14	14
Flue systems permitted	type	B23, C13, C33 & C53	
Approx flue gas volume @ 90°C	m^3/h	160	242
OTHER CONNECTIONS			
Gas	BSP	F 1"	F 1"
Condensate	mm	40	40
Immersion Heater	BSP	2 1/4"	2 1/4"
Tank drain	mm	28	28
WEIGHTS & CLEARANCES			
Weight empty (full)	kg	290 (608)	320 (641)
Service clearance - rear	mm	0	0
Service clearance - right (with immersion)	mm	300 (600)	300 (600)
Service clearance - top	mm	350	350
Service clearance - left	mm	800	800

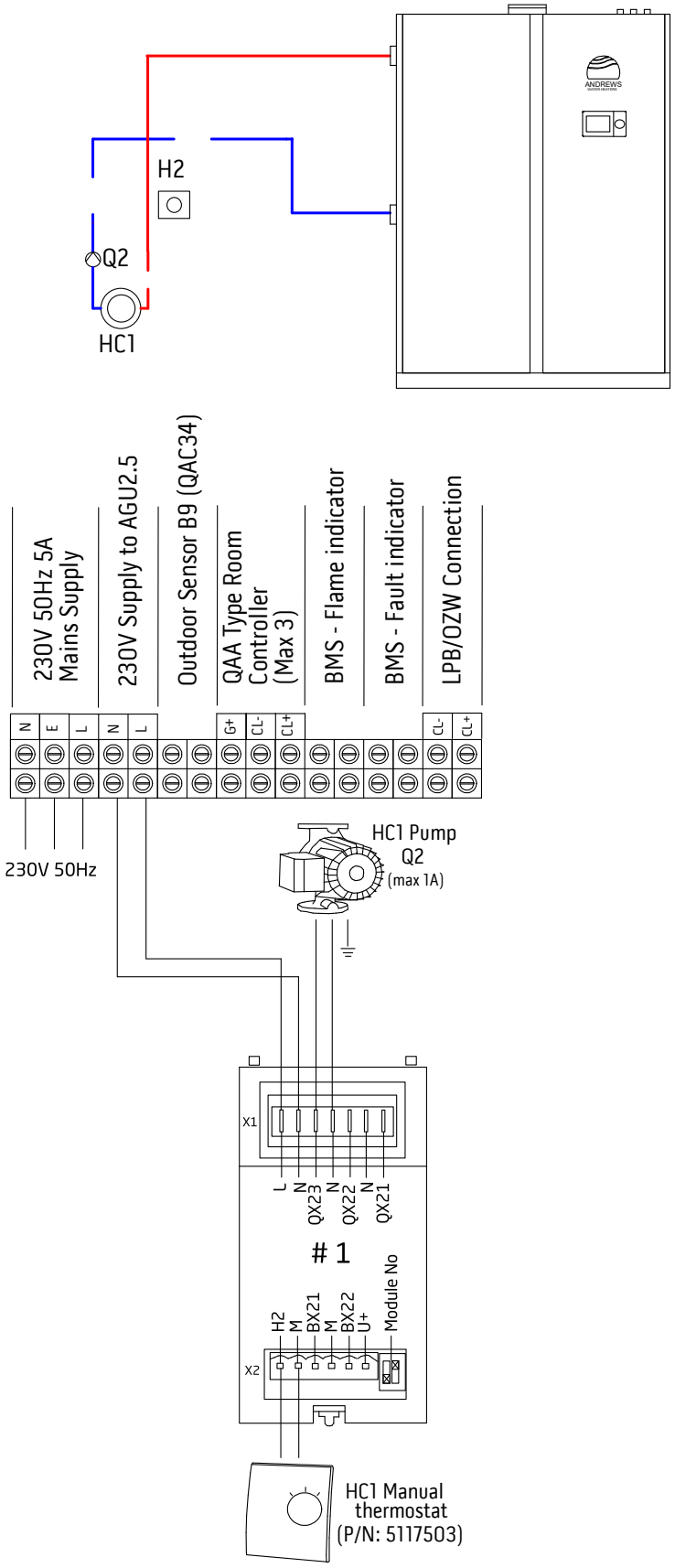
3.3 SYSTEM SCHEMATIC



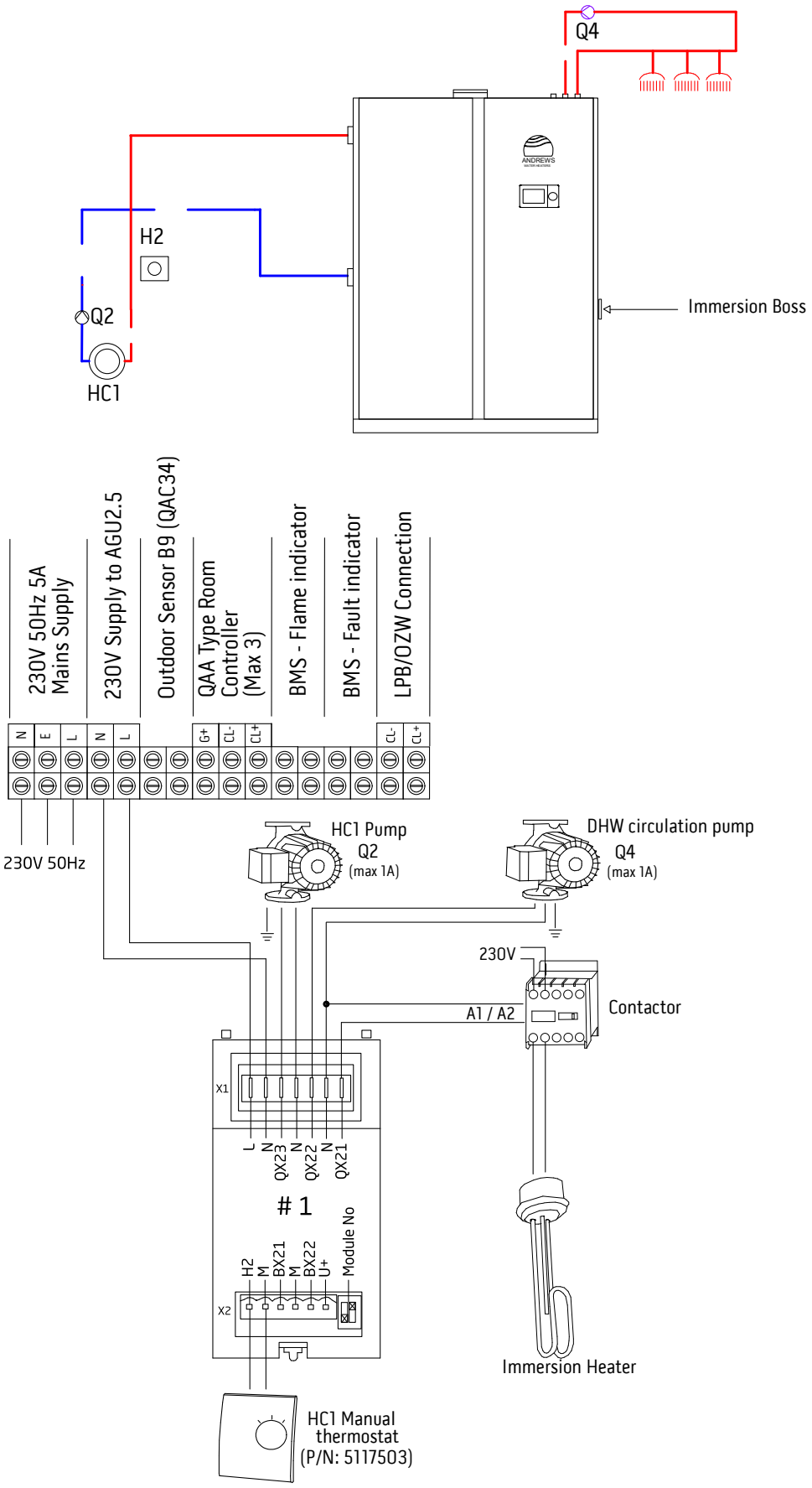
TEMPERATURE SENSORS	CIRCULATION PUMPS
B1 Mixed heating circuit	Q1 Heat engine
B2 Heat engine flow	Q2 HC1 Heating
B3 DHW cylinder	Q3 DHW Primary
B7 Heat engine return	Q6 HC2 Heating
B8 Heat engine flue	Q33 DHW Secondary
B9 Outdoor 1K	
B10 Low Loss Header flow	
B36 DHW cylinder primary	
EXTERNAL CONTROLS	**MIXING VALVE**
RC HC1 Room controller	Y1 Open Valve 230V (1A Max)
H5 HC2 Room thermostat	Y2 Close valve 230V (1A Max)

3.4 APPLICATION EXAMPLES

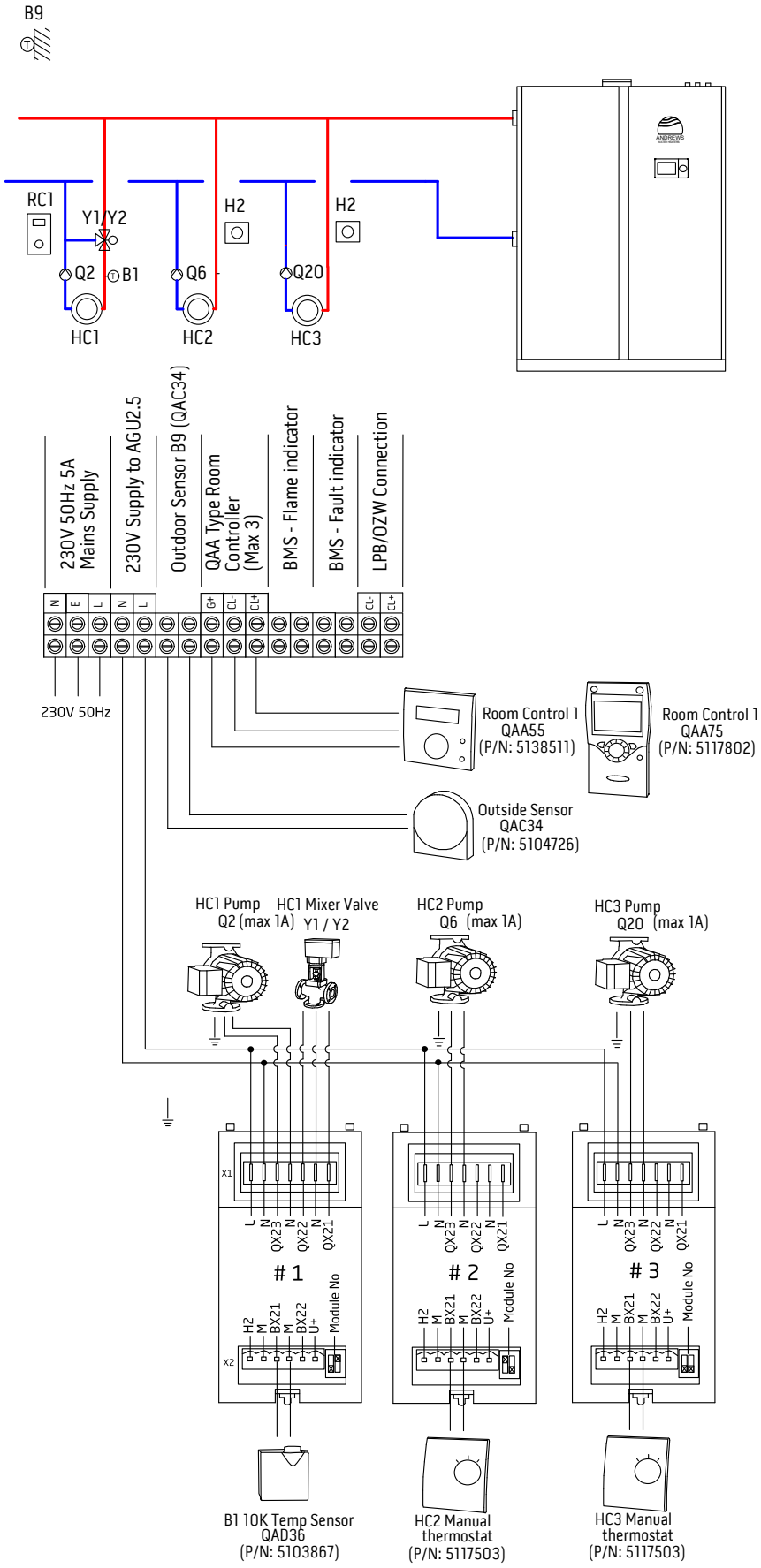
Single Heating Circuit (Simple)



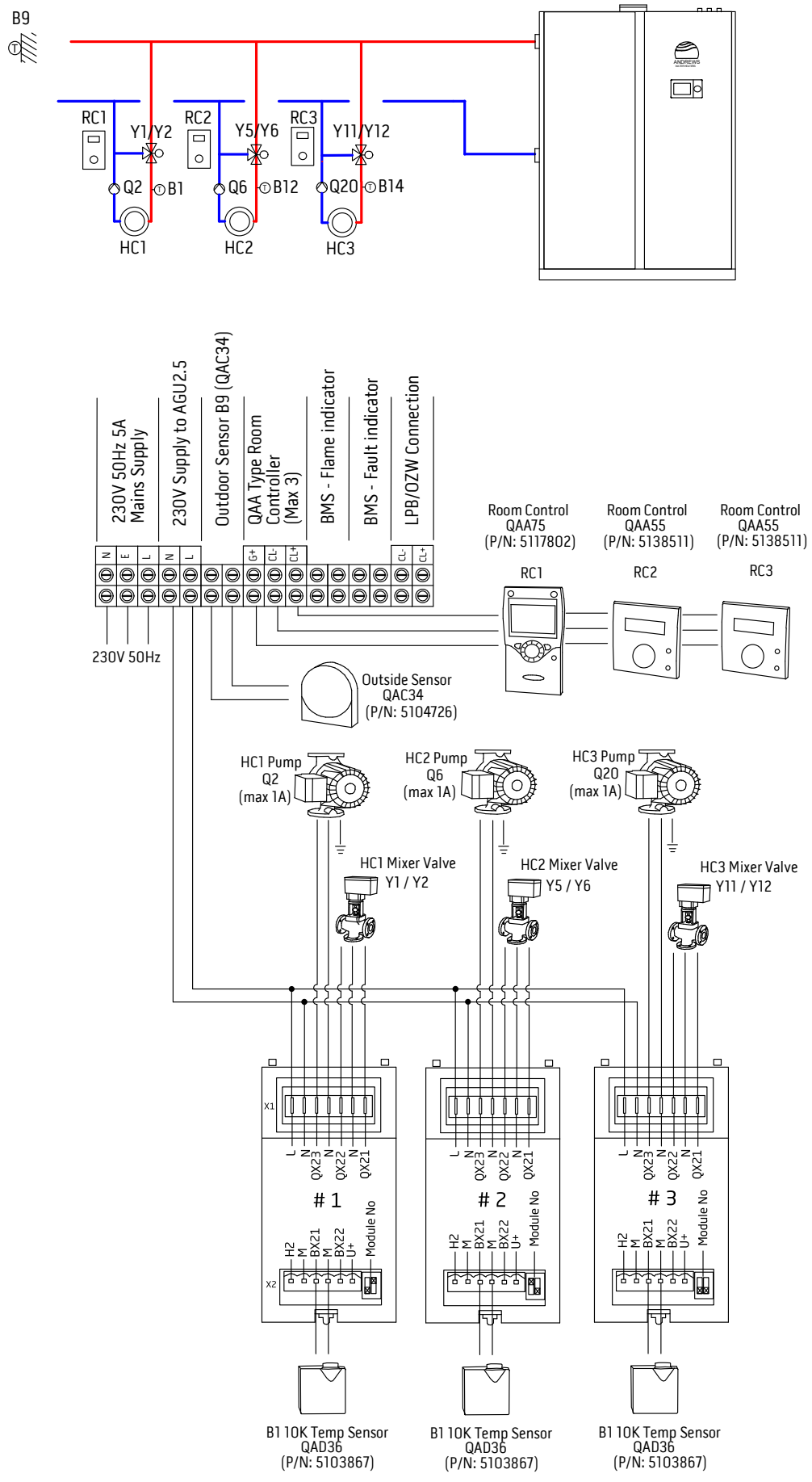
Single Heating Circuit + Immersion + DHW Circulation pump



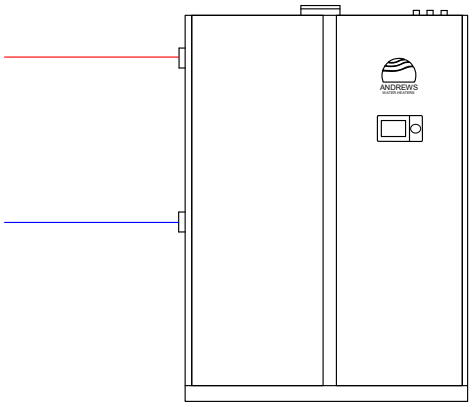
Mixer Heating Circuit 1 with Room Control + Heating Circuit 2 + Heating Circuit 3 (Weather Compensation)

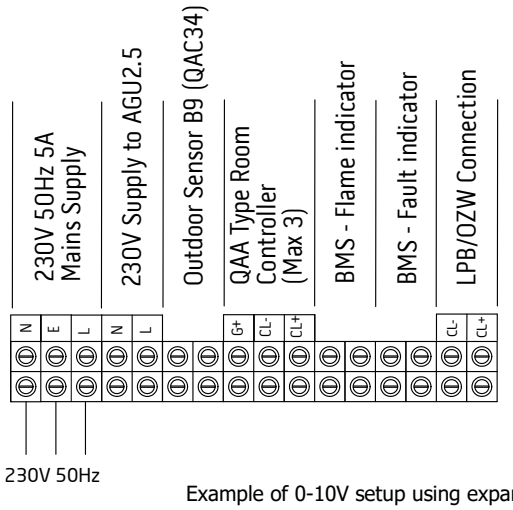


Mixer Heating Circuit 1 + Mixer Heating Circuit 2 + Mixer Heating Circuit 3 (Room + Weather Compensation)

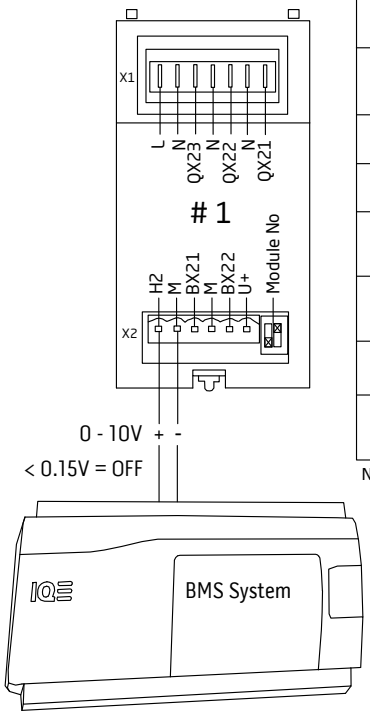


Heating Circuit - External 0-10V control





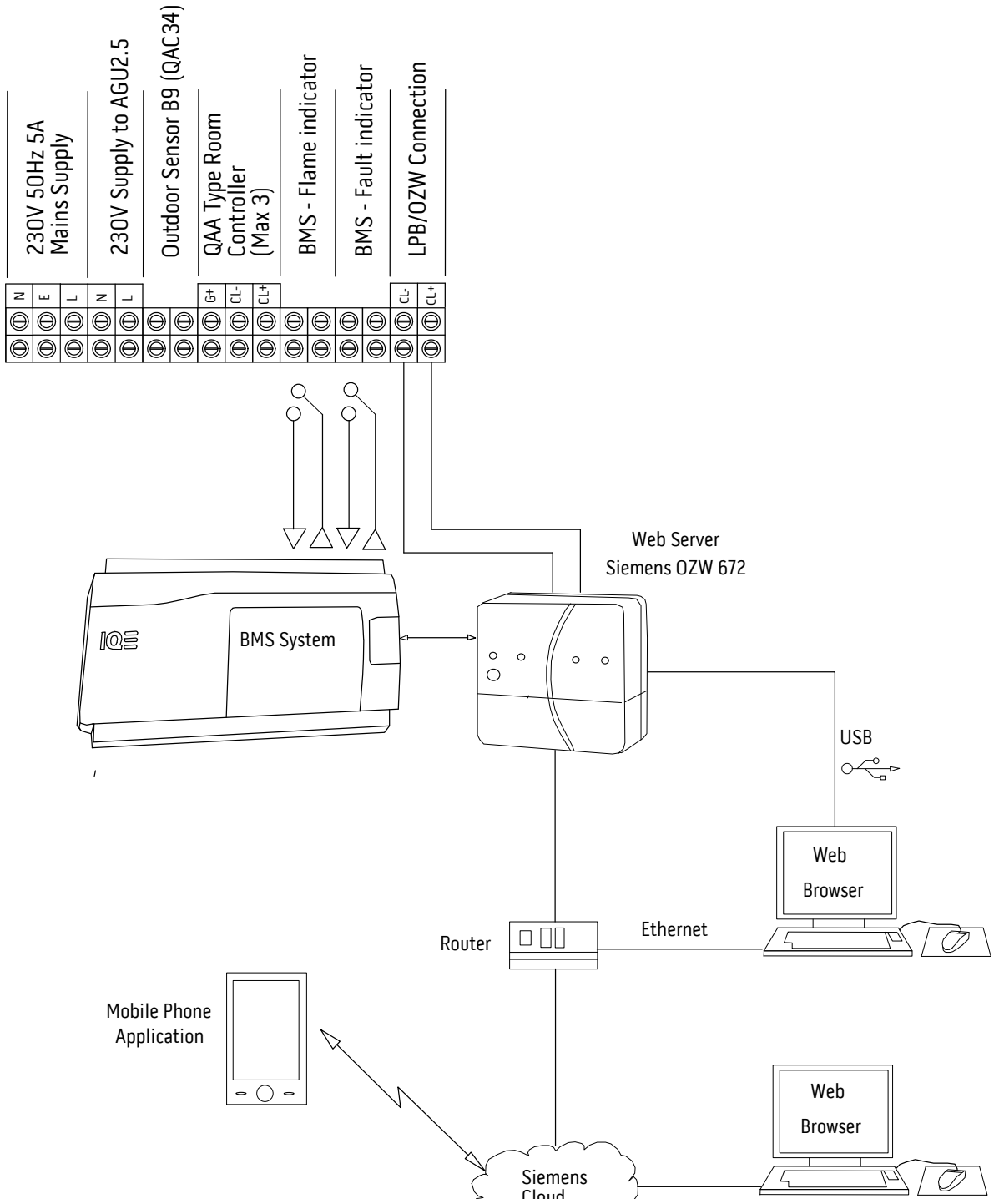
Example of 0-10V setup using expansion module 1



Siemens Parameter	Parameter Description	Parameter Setting	Notes
6020	Function extension module 1	Multifunctional	H2 can be freely configured in any setting
6046	Function of input H2 module 1	Consumer request VK2 10V	Input now ready for a 0 - 10V input
6047	Contact type H2	NO or NC	Not relevant to function
6049	Voltage value 1 H2	0.5	Below 0.5V no heat demand is generated (boiler is off)
6050	Function value 1 H2	355	At 0.5V input the flow temperature setpoint is 35.5oC
6051	Voltage value 2 H2	10.0	Maximum 10.0V input value
6052	Function value 2 H2	820	At 10.0V input the flow temperature setpoint is 82.0oC

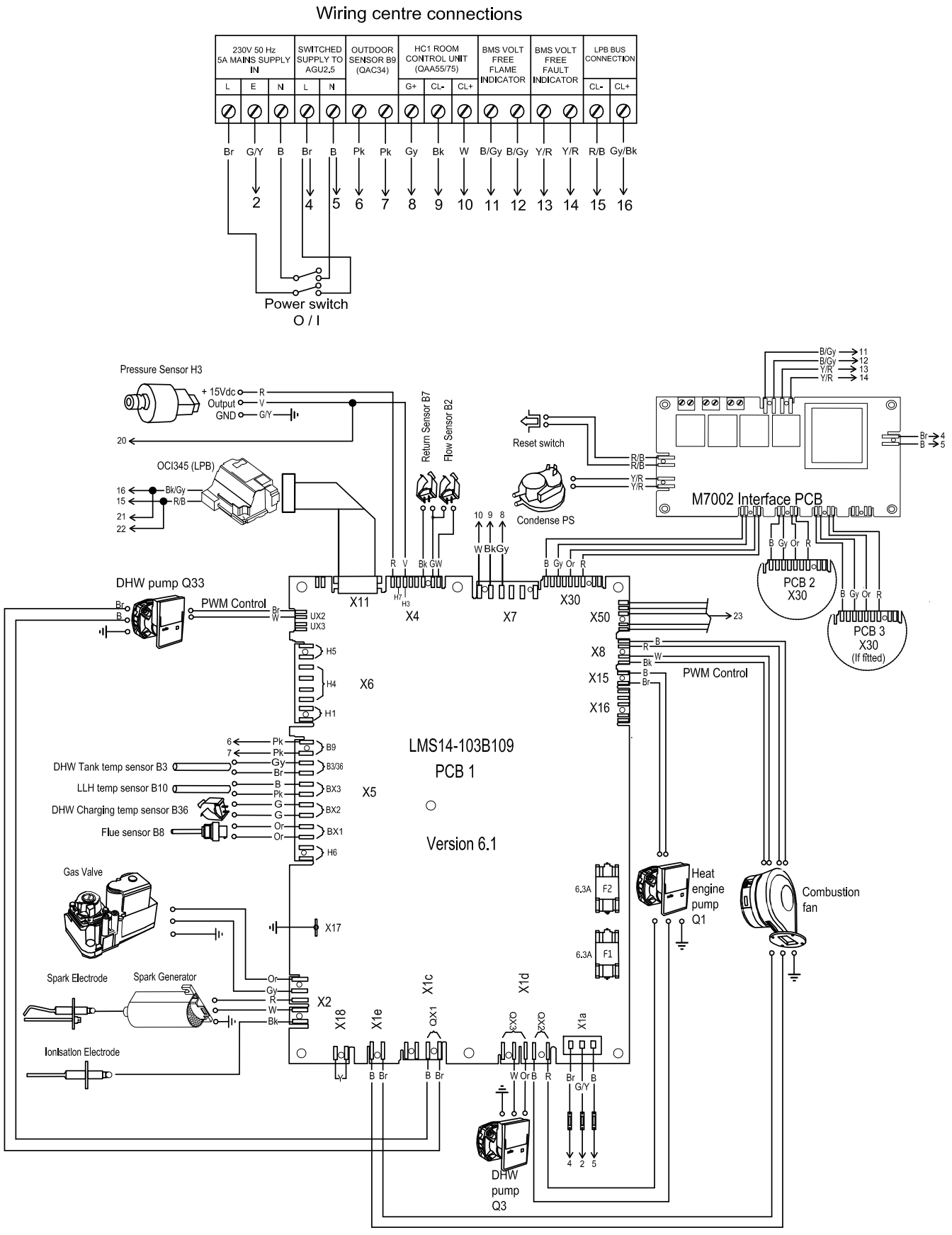
NB. Heating Circuit must be in standby mode for 0-10V to function

BMS & INTERNET CONNECTIONS

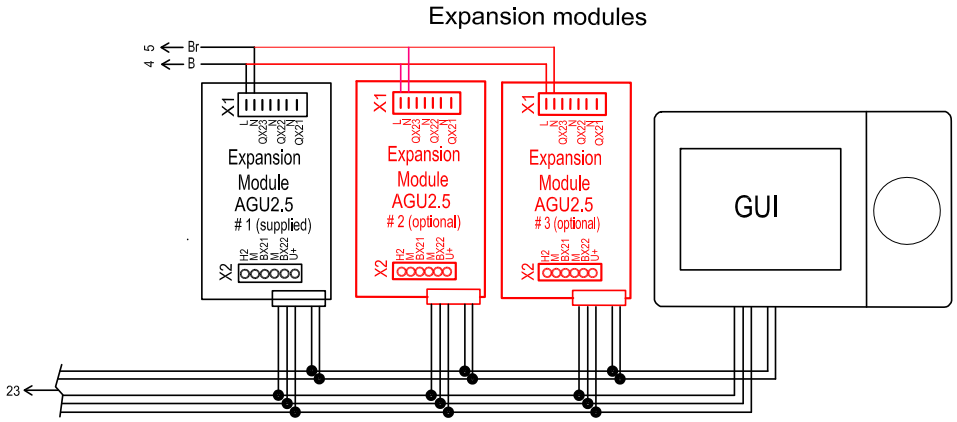


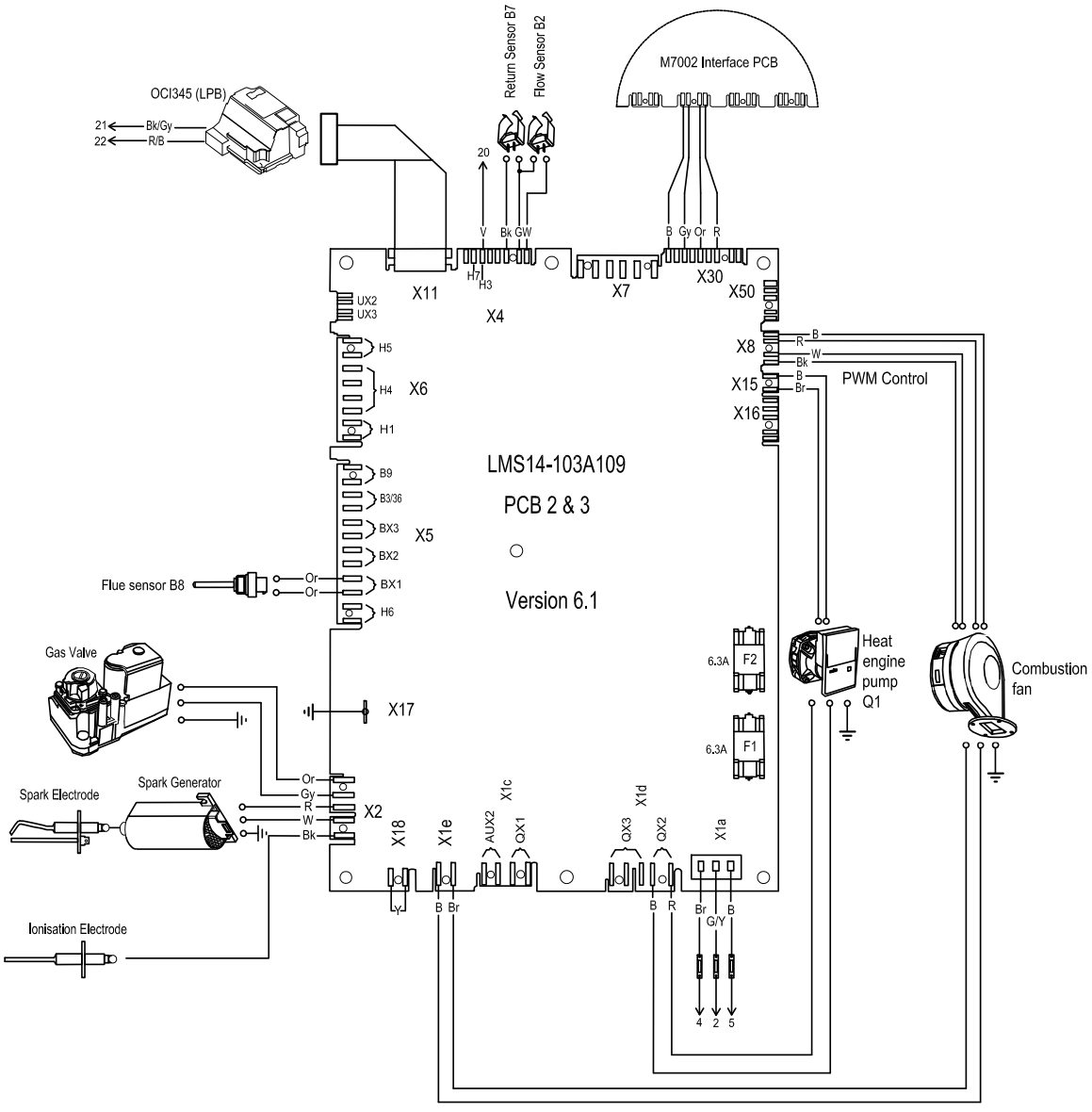
3.5 WIRING DIAGRAMS

PCB 1



PCB 2 & 3


Expansion modules
Br
B
X1
X2
Expansion Module AGU2.5 # 1 (supplied)
Expansion Module AGU2.5 # 2 (optional)
Expansion Module AGU2.5 # 3 (optional)
GUI
23


OCI345 (LPB)
21 Bk/Gy
22 R/B
Return Sensor B7
Flow Sensor B2
M7002 Interface PCB
20
V Bk GW
B Gy Or R
X11
X4
X7
X30
X50
X8
X15
X16
PWM Control
X6
X5
LMS14-103A109
PCB 2 & 3
Version 6.1
Flue sensor B8
Gas Valve
X17
Spark Electrode
Spark Generator
X2
Ionisation Electrode
X18
X1e
X1c
X1d
X1a
6.3A F2
6.3A F1
Heat engine pump Q1
Combustion fan

3.6 SENSOR VALUES

3.6.1 10K SENSORS (ALL FLOW/RETURN SENSORS):

Temperature (°C)	Resistance (Ohms)	Temperature (°C)	Resistance (Ohms)
-30	175203	50	3605
-25	129269	55	2989
-20	96360	60	2490
-15	72502	65	2084
-10	55047	70	1753
-5	42158	75	1481
0	32555	80	1256
5	25339	85	1070
10	19873	90	915
15	15699	95	786
20	12488	100	677
25	10000	105	586
30	8059	110	508
35	6535	115	443
40	5330	120	387

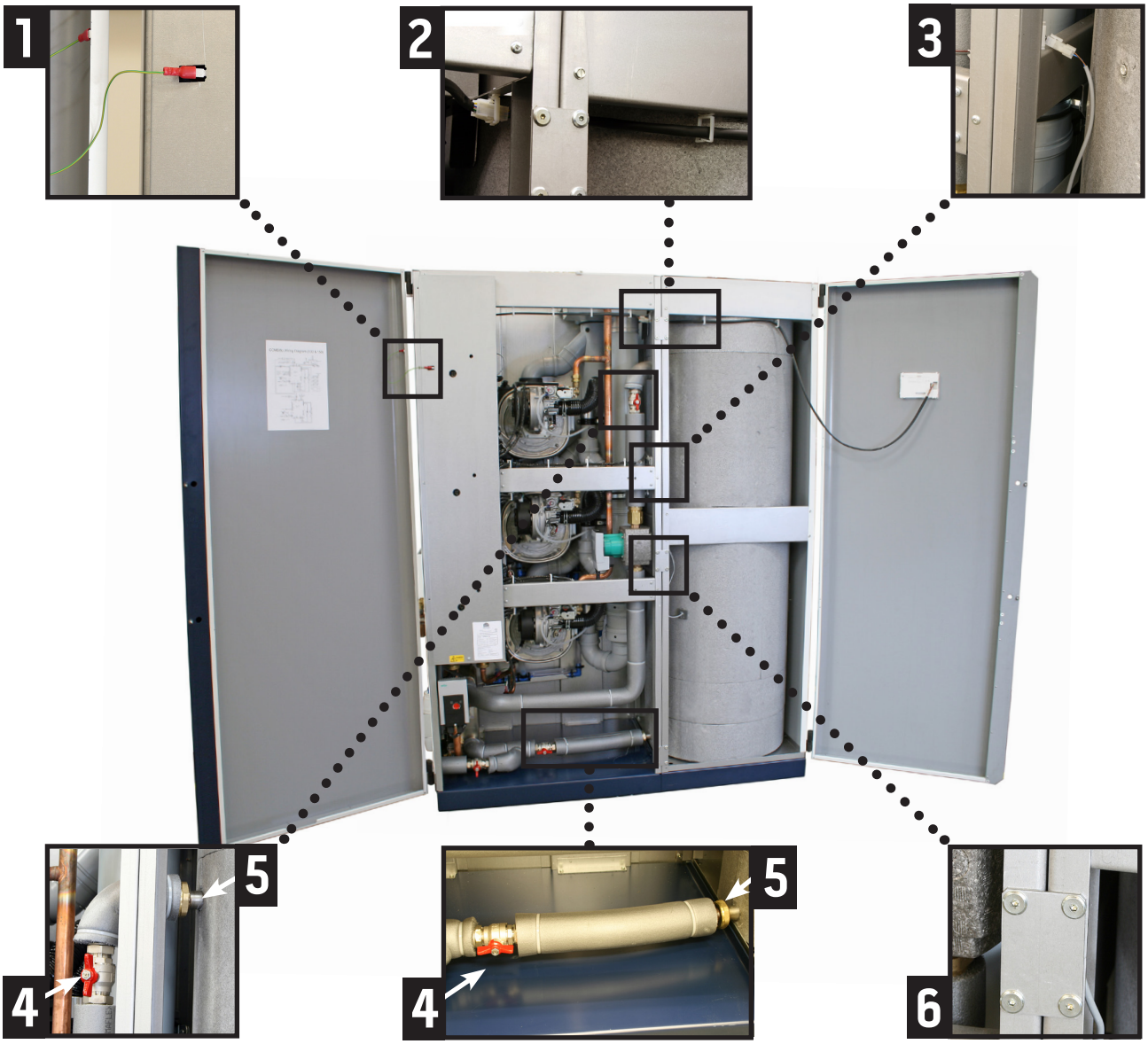
3.6.2 1K SENSOR (OUTSIDE TEMPERATURE SENSOR):

Temperature (°C)	Resistance (Ohms)	Temperature (°C)	Resistance (Ohms)
-20	7578	12	1690
-15	5861	13	1621
-10	4574	14	1555
-5	3600	15	1492
-4	3435	16	1433
-3	3279	17	1375
-2	3131	18	1320
-1	2990	19	1268
0	2857	20	1218
1	2730	21	1170
2	2610	22	1125
3	2496	23	1081
4	2387	24	1040
5	2284	25	1000
6	2186	26	962
7	2093	27	926
8	2004	28	892
9	1920	29	859
10	1840	30	827
11	1763	35	687

4.0 INSTALLATION

4.1 SPLITTING THE APPLIANCE

If required, the COMBIflo can temporarily be separated (split) into two parts, manoeuvred and then re-assembled. Refer to instructions below.



1. Remove LH Front Door - disconnecting Earth Tab before removing.
2. Remove RH Front Door - disconnect the Electrical loom, and remove from 2 cable retaining clips before removing.
3. Disconnect Tank Sensor Electrical loom.
4. Close Tank Isolation Valves at high and low level.
5. Disconnect Tank connections at high and low level. (BEWARE: Water may still be present in pipework and leak whilst disconnecting) Retain tank connection washers.
6. Remove 6 connection plates, (3 on front & 3 on back).
7. Unit can now be pulled apart.
8. Re-assembly is the reverse of above. Remember to open any Isolation Valves you have closed.

SPLIT UNIT WEIGHT & DIMENSIONS	
LH HEATER SECTION	RH TANK SECTION
100 Weight = 175 kg 150 Weight = 205 kg	100 Weight = 85 kg 150 Weight = 85 kg
1090mm(L) x 655mm(W) x 1950mm(H)	600mm(L) x 600mm(W) x 1950mm(H)

4.2 LOCATING THE APPLIANCE

The location selected for installation of the appliance must allow the provision of a satisfactory flue, an adequate air supply (for type B_{23}), a drain and be well illuminated. A purpose built plant room or compartment is strongly recommended.

If a purpose built plant room is not available, measures should be taken to protect the appliance from damage and prevent any extraneous matter from being stored on or around the Heater. See BS 6644 Clauses 4, 5 and 6 for details. Any combustible material adjacent to the appliance must be so placed and shielded as to ensure that it's temperature does not exceed 66°C (150°F).

There must be easy access to the plant room and boiler at all times. The appliance must be located in an area where leakage from the tank, water connections or the combined temperature and pressure safety valve will not result in damage to the area adjacent to it. When such locations cannot be avoided, a suitable drain tray must be installed under the Heater. The drain tray must be no deeper than 38mm and must be 100mm wider and longer than the boiler. It should be piped to an adequate drain using 20mm (0.75in) diameter pipe, angled for proper drainage.

Access must be provided to the front of the boiler with adequate clearance for servicing and operation (See 3.1). The floor on which the boiler is installed must be flat, level and of sufficient strength to withstand the weight of it when filled with water, and should satisfy the requirements of the Local Authority & Building Regulations.

4.3 FIXING TO FLOOR

This appliance has been supplied with metal plates to fasten the appliance securely to the floor. There are four floor fixing plates (M6644) included with this appliance and these have been packed separately with the Flue/Air Duct kit. Fix the appliance to a level floor using the following method:

1. Slide a plate into position so that it interlocks onto one of the front supports. Mark floor with hole position and remove plate.
2. Drill marked position on floor to allow installers preferred method of fixing.
3. Refit plate and fasten through using preferred fixing method.
4. Repeat method for the other three corner fixing points.

Slide plate onto corner support

4.4 NEW AND EXISTING HEATING SYSTEMS

*Whether connecting to an existing or a new heating system, a filter/strainer (with two isolation valves) **must be** fitted in the return pipe. When necessary it can be removed and cleaned, which will help protect the appliance from contaminants, from within the heating system.*

4.4.1 EXISTING SYSTEMS

Before replacement of an existing boiler, it is necessary to thoroughly clean out the old system first. This is best achieved by introducing a basic cleaning solution up to 4 weeks before the substitution.

When the appliance is installed on existing systems, please ensure you have considered the following before commissioning:

- If you intend to use the existing flue on a B23 category system, check that flue outlet is suitable for condensing boilers, is the correct size, is correct for the temperature of the products of combustion and is manufactured according to current regulations. It must be tested for soundness and must not have any restrictions or defects. Also ensure that the flue outlet pipe has a connection for the discharge of condensate. For all other flue types, it is recommended that a completely new flue system is installed.
- The boiler room has a suitable outlet for the discharge of condensate produced.
- The electrical connections comply with the current electrical standards and the work has been completed by a suitably qualified person.
- The gas supply pipe work is constructed to the current regulations in force.
- The expansion vessels and associated fittings are correctly sized to absorb the total expansion of the system and is in tested working order.
- The circulation pump' s output, the head and flow direction are suitable for the system.
- The complete system has been cleaned of impurities and lime scale.

4.4.2 NEW SYSTEMS & WATER QUALITY

It is recommended to thoroughly clean out the new system with a system flush product, before commissioning the appliance. It is essential, for the long life of the appliance that the following water quality limits are not exceeded:

Water Hardness	**<250ppm**
Chloride levels	**<200mg/l**
pH levels	**7.5 to 9.5**

If the system contains aluminium parts, the pH level must be less than 8.5. The pH value inside the system should only be measured after a steady state has been achieved (i.e. all filling and bleeding operations have been completed)

Chloride values of the system water and the supply water should be compared at regular intervals. If the Chloride value of the system water is considerably higher than the supply value, this would indicate that there is system leakage and water is being lost to evaporation. This will result in Chloride concentration and premature boiler failure if left untreated. If Chloride concentration levels have exceeded 200mg/l, the system should be flushed clean and refilled with low Chloride water and appropriate system treatments.

After cleaning and flushing of the system, it should be filled with an appropriate inhibitor or antifreeze treatment to maintain water quality levels. The following system treatments have been tested and are recommended for use with this appliance:

	FERNOX	SENTINEL
Inhibitors	Protector/ Alphi 11	X100, X500
Noise reducer		X200
Universal cleaner	Restorer	X300
Sludge remover	Protector, Restorer	X400
Antifreeze	Alphi 11	X500

4.4.3 RECOMMENDED HEATING PUMP - MINIMUM FLOW REQUIREMENTS

The following minimum flow rates are recommended for use with the COMBIflo 100 & 150 models :

Heating Load (kW)	Min flow rate (ltrs/hr)	Heating load (kW)	Min flow rate (ltrs/hr)
10	429	90	3,861
20	858	100	4,290
30	1,287	COMBIflo 150 only	
40	1,716	110	4,719
50	2,145	120	5,148
60	2,574	130	5,577
70	3,003	140	6,006
80	3,432	150	6,435

4.5 WATER CONNECTIONS

The cold water inlet and hot water outlet connection nipples are identified on top of the appliance. Connect the cold water feed and hot water outlet to these nipples with union adaptors for ease of servicing. Connect the supplied isolating valve to the drain connection and pipe to a suitable discharge point. *(See 3.1 for connection locations)*

Do not apply excessive torque to these nipples when making connections. The use of an appropriate pottable water pipe sealing compound is recommended.

4.5.1 COLD WATER SUPPLY - SYSTEM

The appliance may be connected to an open vent or sealed system supply. When connected to a sealed system an unvented water kit must be installed with a minimum water pressure of one bar. This appliance is factory fitted with temperature and pressure relief valves. An unvented system must be fitted by an approved installer.

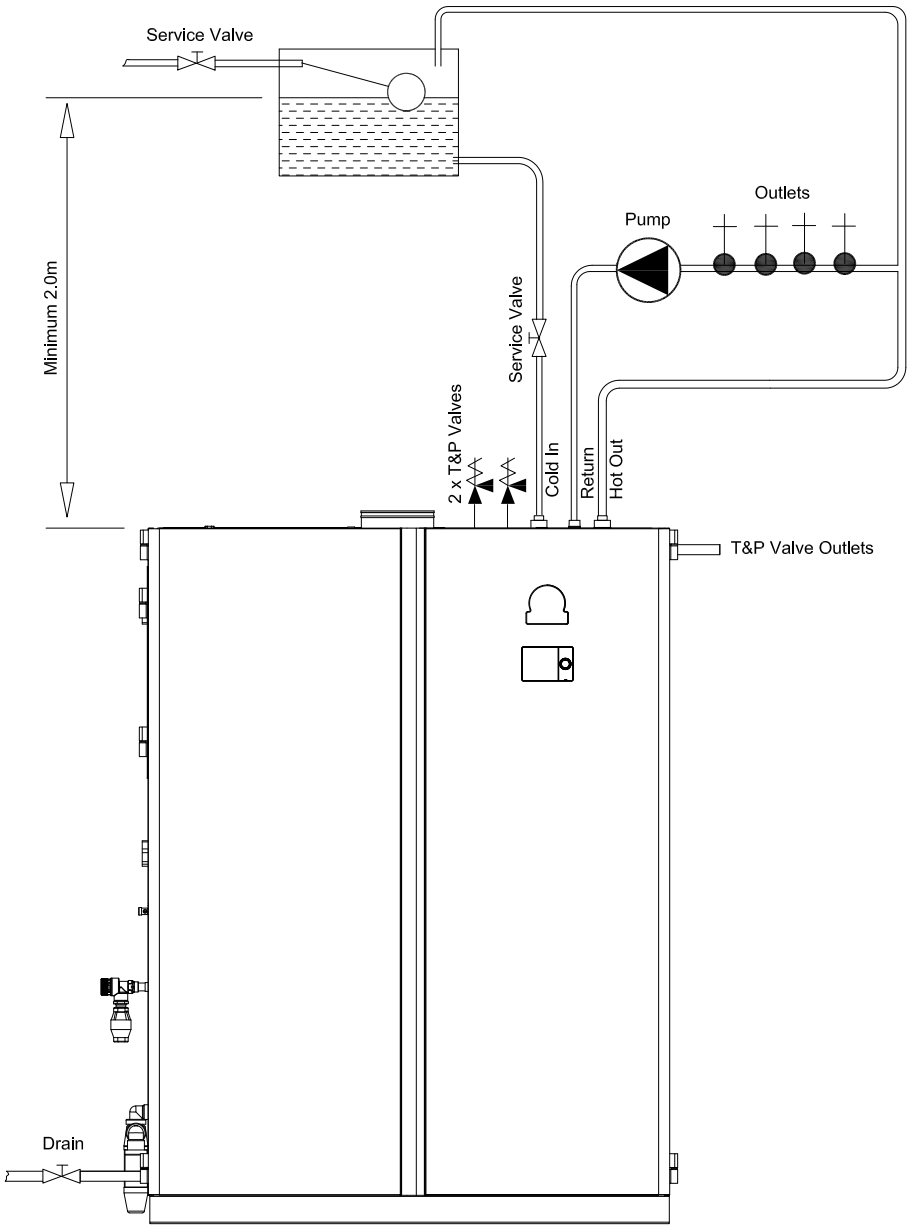
4.5.2 COLD WATER SUPPLY - QUALITY AND TREATMENT

In hard water areas scale formation can occur in all hot water systems and the higher the volume and hotter the water used, the greater and more problematic the scale build-up can be. Water treatment is usually recommended when the hardness levels measures greater than 150 ppm. For this reason, base exchange water treatment is strongly recommended in hard water areas.

4.6 OPEN VENT DESIGN

The tank must be supplied from a cold water feed cistern and the hot water supply pipe must be fitted with an open vent pipe in accordance with BS 5546 and BS 6644. The Water Supply (Water Fittings) Regulations must be observed when installing the system. The cold water feed cistern must have an actual capacity greater than the hourly recovery rate of the heater or heaters to which it is fitted, the minimum actual capacity allowed for a feed cistern being 227 litres (50 gallons). The actual cistern capacity is the capacity to the normal water level of the cistern. All cisterns should be manufactured to the relevant Standard.

The distance from the normal water level to the top of the cistern should comply with that specified by the Water Authorities.



4.6.1 DE-STRATIFICATION PUMP

By virtue of its design, an internal DHW tank de-stratification pump is not required.

4.7 UNVENTED DESIGN

Unvented Systems should only be fitted by an Approved Installer

When using the Heater on an unvented hot water storage system, the Unvented System Kit, part number B328, available from the manufacturer **must** be fitted. See section 4.4. When used in an unvented system, the Heater will supply hot water at a maximum of 3.5 bar or at the pressure available at the mains feed if this is lower. During conditions of no-flow, system pressure may rise to a maximum of 6 bar, whilst the burner is operating. When testing the system, it is recommended that a maximum test pressure of 7 bar is used.

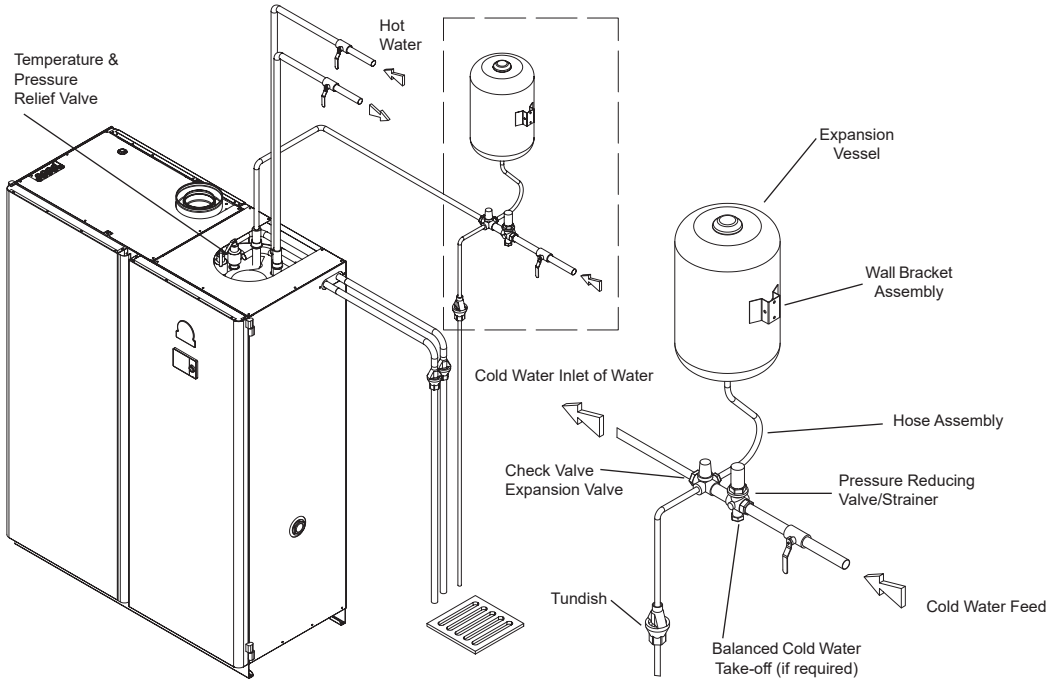
For the hot water supply, a 25 litre expansion vessel is suitable for the stored volume of all models of the Heater and an average pipework system. For systems with larger pipe volumes or additional storage, expansion vessels with greater capacity are available. Assemble the components of the unvented system kit as shown below

For the Central Heating supply the expansion vessel must comply with BS4814 and must be sized on the basis of total system volume and initial charge pressure. Initial minimum charge should not be less than 0.5 bar and just take into account static head and specification of any pressurising equipment.

When assembling the Pressure Reducing Valve and Double Non-Return Valve, ensure that the flow arrows marked on the components are pointing in the direction of flow, that is towards the appliance.

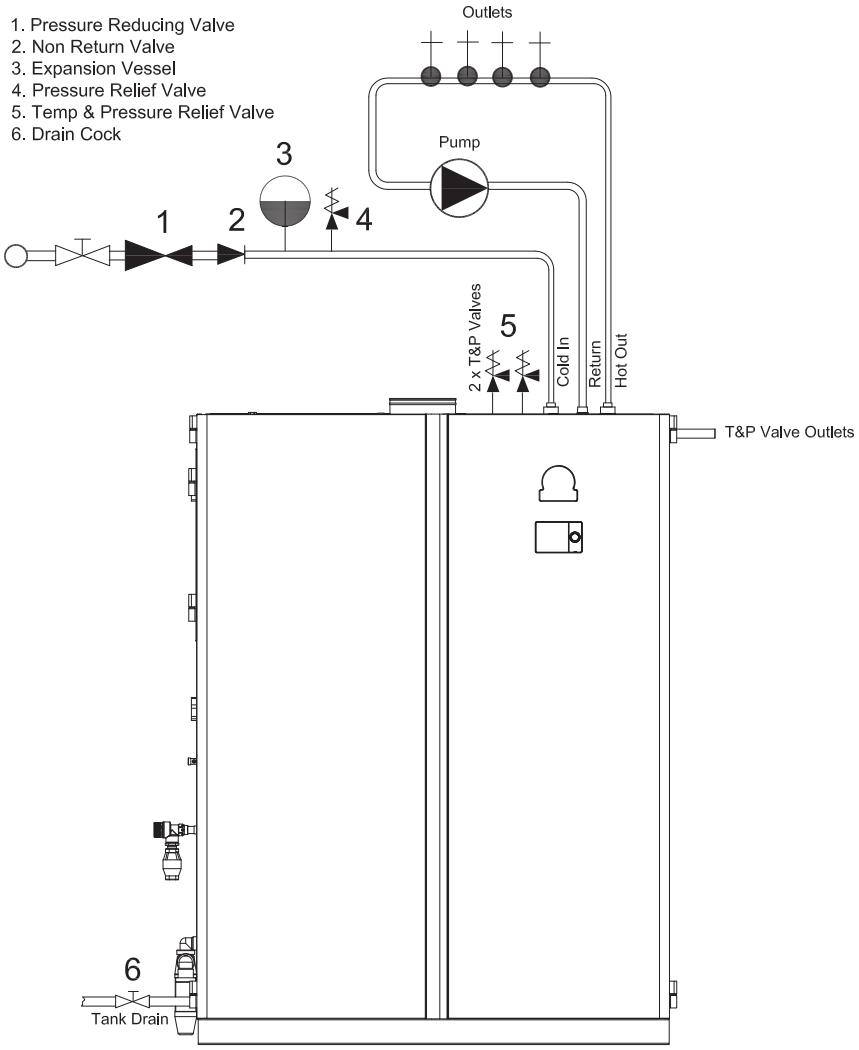
The relief valves fitted to this appliance must not be used for any other purpose. No fitting should be installed between the expansion valve and the cylinder. The cold water for services may be drawn from the 22mm compression port up stream of the Pressure Reducing Valve. The water pressure at this point will be similar to that available at the hot water outlet of the water heater. If higher flow rates are required for the cold water services, a suitable tee fitting should be fitted to the pipework, upstream of the Pressure Reducing Valve.

The pipework fitted to the tundish outlet should be at least 28mm diameter, made of metal and should be terminated at a suitable drain (see Building Regulations Approved Document G3). All fittings and materials supplying water to the storage vessel must be suitable for use with drinking water and listed in the current Water Research Centre "Materials and Fittings Directory". Installation of unvented hot storage water systems must comply with Part G of Schedule 1 of the Building Regulations.



4.8 SECONDARY RETURN DESIGN (DHW CIRCULATION PUMP)

A Secondary Return circuit may be fitted to the 1" nipple at the top of the appliance. In all cases, for serviceability, the recirculation pipe must be fitted with a stop valve immediately before the connection point.



4.9 CONDENSATE DISPOSAL

Condensation is formed in the normal operation of the appliance and this must be continuously discharged into a drain. Given the acidity level of condense discharge (pH 3.5 - 4.5) only plastic material can be used for the discharge pipe work.

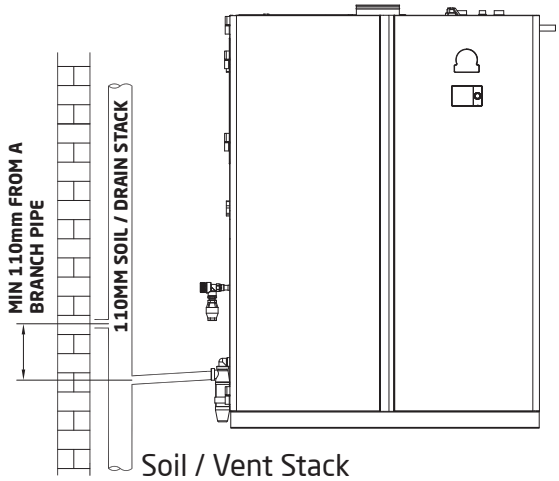
40mm pipe with a drop of at least 30 mm for every metre of pipework should be used. A trap is supplied which should be connected into a drain via a tundish or air break.

External pipework and that passing through a wall to the outside should be run in a minimum of 40mm diameter. External pipework should be insulated to protect against frost and freezing temperatures.

The condensate trap must be filled with water before operating the appliance.

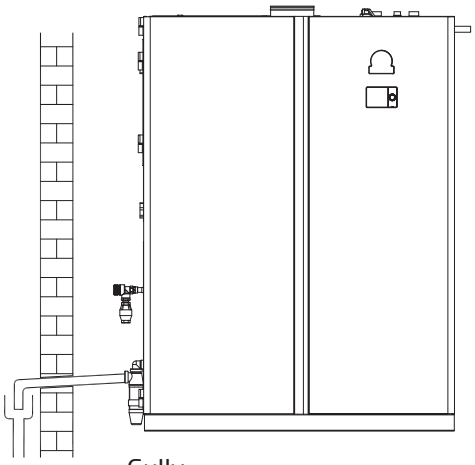
It is important that the condensate flow must be maintained, even in freezing conditions. In the event that the condensate becomes blocked, the appliance will shutdown completely, and will not operate again until the flow has been restored.

CONDENSATE DISPOSAL EXAMPLES



Soil / Vent Stack

There is no requirement for an additional trap or air break when connecting drain pipework to an internal or external soil or vent stack



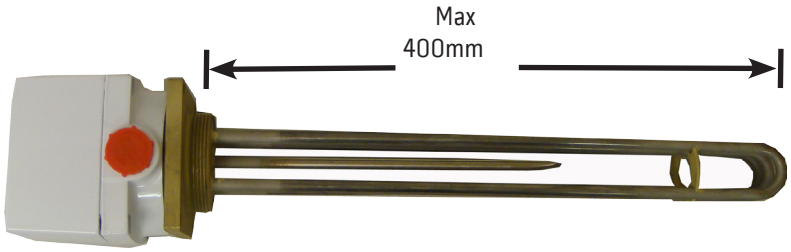
Gully

There is no requirement for an additional trap if discharging direct into an open gully.

4.10 IMMERSION HEATER

An immersion heater boss is fitted in the side of the DHW tank in order to facilitate the fitting of an electric immersion heater.

This immersion heater must have a 2 $^{1}/_{4}$" BSP male thread and a nominal length of no greater than 400mm



Fitting

Switch off the DHW circuit and with the tank drained of water, remove the threaded bung

Place a suitable supplied gasket around the heater base. Keeping the heater element horizontal and square with the boss, insert the heater into the opening. Secure by turning the heater onto the threads.

Once heater is firmly screwed into boss, fill the tank with water and check for leaks at maximum operational pressure.

Install electrical supply to immersion heater according to the manufacturers instructions, ensuring that the heater is wired with heat resisting or mineral insulated cables complying with BS6207.

4.10.1 INTEGRATION WITH APPLIANCE CONTROLS

The appliance controls have the facility to activate an immersion heater as a backup for the normal generation of DHW. e.g. The immersion heater would be automatically switched on if the appliance was unable to generate DHW for any reason

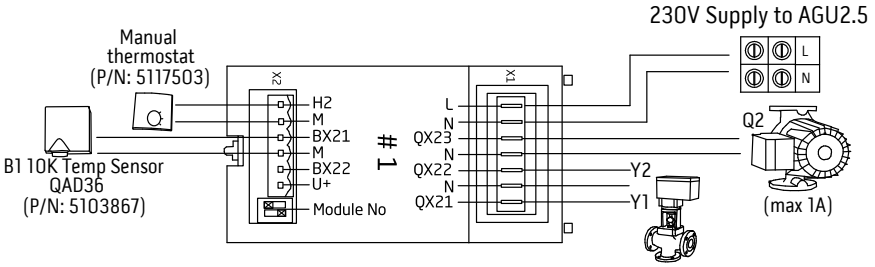
Refer to page 14 for a suggested diagram on how to wire an integrated immersion heater.

Example setup: An optional purchased AGU2.5 "module" (setup as module 3) would require to be defined under parameter 6022 as "Multifunctional". The output QX23 and other settings would be defined according to the following table:

Menu	Line no	Setting
Config (QX23)	6038	El imm heater DHW K6
To configure as a backup heater		
DHW storage tank	5060	Substitute
	5061	Time program 4 / DHW
	5062	External thermostat
To configure as a summer heater		
DHW storage tank	5060	Summer
	5061	Time program 4 / DHW
	5062	External thermostat
To configure as an independantly controlled heater		
DHW storage tank	5060	Always
	5061	Time program 4 / DHW
	5062	External thermostat

4.11 MIXING VALVE & ACTUATOR CONTROL

The AGU2.5 "Module" can be used to control a 230V valve actuator to regulate the flow temperature of the heating circuit to which it is connected. The actuator uses 3-point control to open and close the valve.



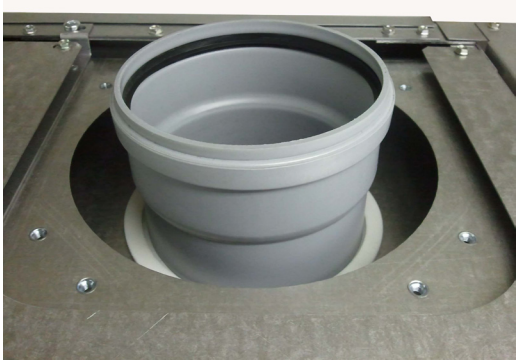
In the above example the setup for "module 1" would be "Heating circuit 1". If the temperature of HC1 needed to be increased, the controls would supply 230V through QX21 (Y1) to open the valve until the temperature rise was detected by the sensor B1. If the temperature of HC1 needed to be decreased the controls would supply 230V through QX22 (Y2) to close the valve until the temperature fall was detected by sensor B1.

Precise temperature control is maintained by alternating 230V via QX21 & QX22 until the desired temperature is maintained, at which point no voltage maintains the valve position.

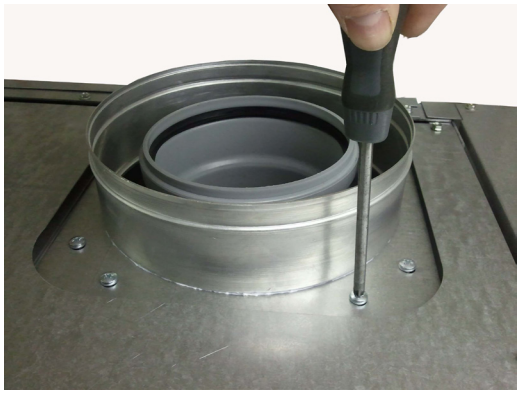
4.12 FLUE SYSTEMS & VENTILATION

In order to minimise the height of this appliance, the flue spigot plate assembly is supplied separately and will have to be installed before fitting the flue system:

- Fully insert (approx 50mm) plastic flue pipe section (supplied) into flue socket (*see below*).



- Screw metal air colar onto the top of the flue socket with the 8 screws (supplied) (see below)



The appliance can be installed using a number of alternative arrangements depending upon the installation requirements It is delivered with a 130/200mm concentric outlet in the centre. Flue components are ordered separately as required.

4.12.1 OPEN FLUE (TYPE B_{23})

This is an open flued arrangement where the air for combustion is drawn from the room and because of this the room must be ventilated. If the Heater is installed in a compartment then it will require both a high level and a low level vent. The flue products are discharged either horizontally or vertically using any of the supplied separate duct components.

Refer to BS 6644 clause 19 and BS 5440 part 2 for detailed recommendations.

The room in which an appliance is installed must have a permanent air vent to outside air or to a room which itself has direct access to outside air.

Installations in boiler rooms require permanent vents for air supply purposes, one at high level and one at low level, direct to outside air. The minimum free areas required are as follows:-

Low level (inlet)	iHE 100 = 376 cm^2 iHE 150 = 560 cm^2
High level (outlet)	iHE 100 = 188 cm^2 iHE 150 = 280 cm^2

Where the appliance is to be installed in a compartment, permanent air vents are required at high and low level. These air vents must either be connected with a room or internal space, or be direct to outside air. The minimum free air requirements in the compartment are as follows:-

Position of air vents	Air from room or internal space	Air direct from outside
High Level	iHE100 = 940 cm ² iHE150 = 1,400 cm²	iHE100 = 470 cm² iHE150 = 700 cm²
Low Level	iHE100 = 1,880 cm ² iHE150 = 2,800 cm²	iHE100 = 940 cm² iHE150 = 1,400 cm²

A compartment containing an open-flued appliance shall be labelled as follows:

IMPORTANT: **Do not block the vents. Do not use the compartment for storage.**

Where an installation is to operate in summer months, the above allowance should be sufficient, provided it does not operate for more than 50% of the time. If the installation is to be operated at 75% then an additional 1cm² will be required per kW at low and high level. If this appliance is to be operated 100% of the time during the summer, an additional 2cm² free-area per kW will be required at low and high level.

There must be sufficient clearance around the appliance to allow proper circulation of ventilation air. The clearances required for servicing will normally be adequate. (see section 3.1 P7). The Effect of any type of extract fan in the plant room must be considered and an additional air inlet may be needed from outside to counter the effect of any such fans.

4.12.2 ROOM SEALED FLUE (TYPE c_{xy})

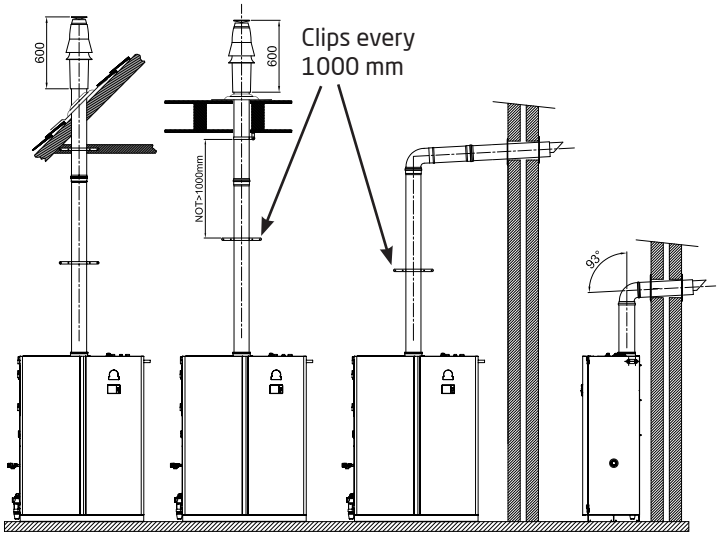
There are three approved room sealed arrangements where both the air inlet and flue discharge terminate outside the building.

TYPE C_{13} & C_{33} FLUE AND AIR DUCTS TERMINATE EITHER HORIZONTALLY OR VERTICALLY IN THE SAME POSITION

Flue and air ducts are supplied to a concentric design (130/200mm). See Fig 3.5 for component choices. Flues should slope back to the Heater by three degrees. Terminal positions must comply with the requirements detailed in section 4.12.2

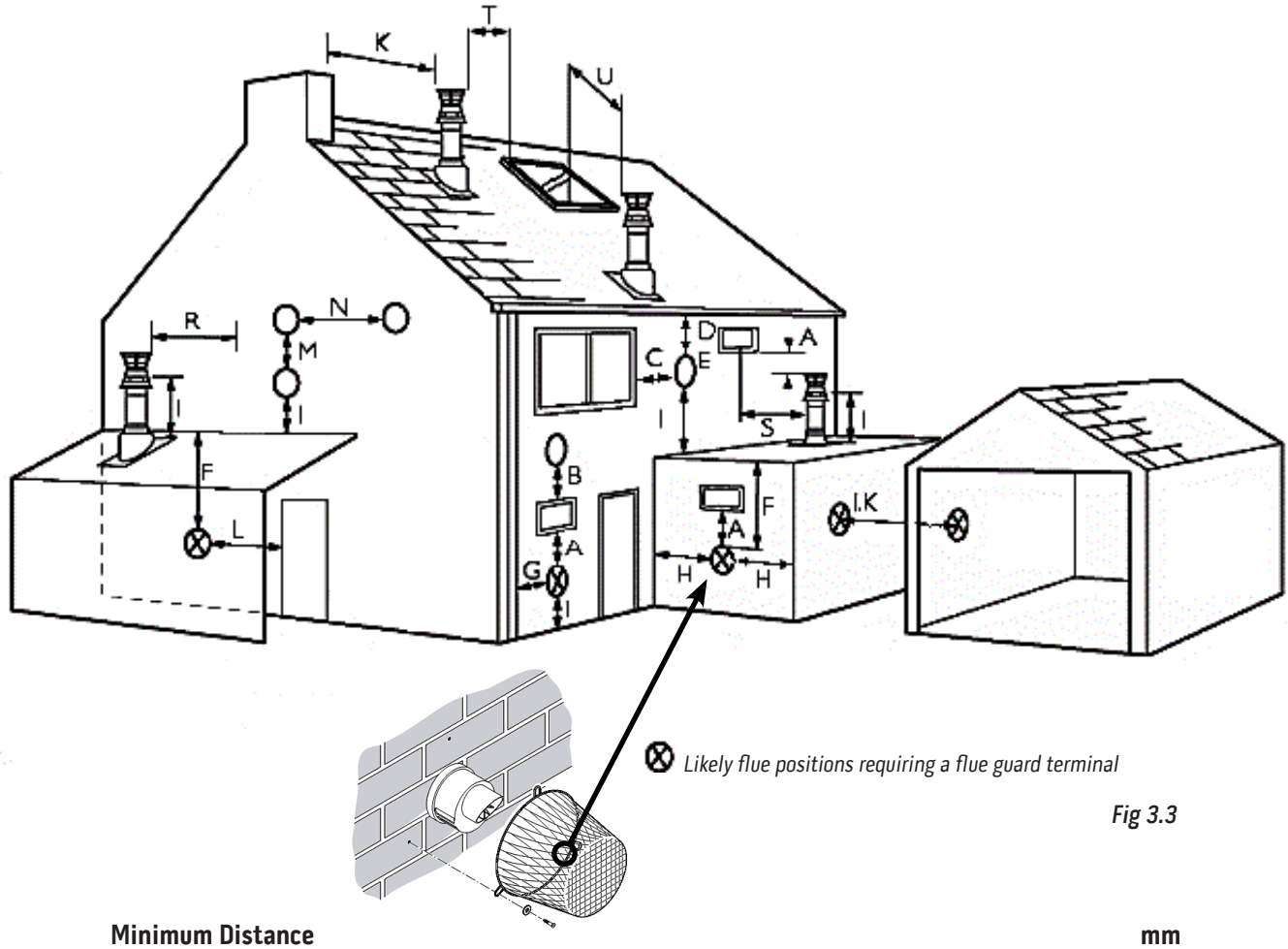
4.12.3 VENTILATION REQUIREMENTS (TYPE $C_{13,}$ C_{33} & C_{53})

Where the appliance is installed in a **ROOM** or **COMPARTMENT** no additional ventilation is required.



4.13 FLUE TERMINAL POSITIONS

The flue discharge position for any flue type must conform to the following requirements:-



Likely flue positions requiring a flue guard terminal

Fig 3.3

Minimum Distance	**mm**
A Directly below an opening, air brick, opening window etc.	300
B Above an opening, air brick, opening window etc.	300
C Horizontally to an opening, air brick, opening window etc.	300
D Below a gutter or sanitary pipework	75
E Below the eaves	200
F Below a balcony or carport roof	200
G From vertical drain or soil pipework	150
H From an internal or external corner	300
I Above ground, roof or balcony level	300
J From a surface or a boundary line facing a terminal	600
K From a terminal facing a terminal (horizontal flue)	1200
K From a terminal facing a terminal (vertical flue)	600
L From a opening in a carport (e.g. door, windows) into the building	1200
M Vertically from a terminal on the same wall	1500
N Horizontally from a terminal on the same wall	300
R From an adjacent wall to flue (vertical only)	300
S From an adjacent opening window (vertical only)	1000
T Adjacent to windows or openings on pitched and flat roofs	600
U Below windows or opening on pitched roofs	2000

4.14 MAXIMUM FLUE EQUIVALENT LENGTHS

Item	F.E.L.	Flue Parts	Part Number
1m length	1.0	1.0 m Concentric Length	E212
45° bend	0.5	0.5m Concentric Length	E214
90° bend	1.0	Concentric 90° Bend	E215
Horizontal Terminal	1.0	Concentric 45° Bend	E216
Vertical Terminal	1.6	Flue Condense Trap	E220
		Horizontal Terminal kit	E240
		Terminal Guard	E630
		Vertical Terminal kit	E670
		Wall Clamp 200mm	E219

Permitted Flue Equivalent Length (FEL) for type C_{13}, C_{33} & C_{53} flue = 18 meters
Permitted Flue Equivalent Length (FEL) for type B_{23} flue = 30 meters

Each flue accessory such as bends and straight lengths restrict the flue system and have a **FEL** which must be added together to determine the total. Referring to the table above, select a suitable flue system for the particular installation requirement and then calculate the **FEL** of the system, this must not be greater than that stated above.

The flue duct can discharge either vertically or horizontally by selection of the correct flue terminal. The flue pipe can be fitted with 90 and 45 degree bends as well as extensions.

Example C_{33}: A flue system that uses ten straight lengths, three 90° bends, two 45° bends and a horizontal terminal.

10 x 1m straight lengths	10.0
3 x 90° bends	3.0
2 x 45° bends	1.0
1 x Horizontal Terminal	1.0
Total (within 18m limit)	**15.0**

Example B_{23}: A system that rises from the Heater and uses seven straight lengths, four 45° bends and a vertical terminal.

12 x 1m straight lengths	12.0
4 x 45° bends	2.0
Vertical Terminal	1.6
Total (within 30m limit)	**15.6**

Flue type B_{23} - The air inlet connection to the appliance must be fitted with a Debris Guard. Air is drawn from the room or compartment in which the heater is installed and therefore the room or compartment **must be ventilated** (see 4.12.1 on P27)

Flue type C_{53} - The terminals used for the supply of air and for combustion products must not be installed on opposite walls of a building

When the combustion flue system required is longer than 5m, it is recommended that a separate system to capture excess condensation formed inside the flue is fitted.

4.15 GAS CONNECTIONS

4.15.1 GAS SUPPLY

The installation of the gas supply must conform, to the British Standards and Codes of Practice listed in Section 2.3 of this manual.

The gas meter, regulator and supply pipework must be sized so as to provide an adequate supply to the appliance in addition to any other appliances connected to the supply (see 3.2 "V Maximum gas consumption" on P8) for flow rate requirements.

A 1" male BSP threaded galvanised steel gas connection is provided on the left hand side of the appliance. A minimum of 19mb running pressure, must be available at the appliance inlet, with this appliance and other connected appliances operating at maximum load.

This will require a test point on the supply to the appliance. Alternatively the gas valve inlet on one of the heat engines can be used, but a pressure loss of 2 - 2.5 mb across the valve must be allowed for, when calculating the final pressure drop.

4.15.2 GAS PIPE WORK

A manual valve for isolation of the gas supply to the appliance should be installed nearby and it should be clearly identified and readily accessible for use at all times. Where this appliance is installed in a plant room or purpose built compartment, a manually operated valve must be fitted in accordance with the Gas Safety (Installation and Use) Regulations. The valve must be easily identified and readily accessible.

The gas supply pipework should be fitted with suitable unions so the Heater can be safely removed for major service or repair.

Check for gas tightness (BS. 6891) in pipework to the appliance by connecting a manometer to the inlet pressure tapping point.(*See Fig. 4.1*) Gas and combustion soundness within the appliance should be checked using sense of smell and leak detection fluid. Ensure gas tightness before moving onto commissioning.

4.16 ELECTRICAL CONNECTIONS

This appliance must be earthed

Isolate the mains electrical supply to the appliance before starting any work and observe all relevant safety precautions

External wiring to the appliance must be installed in accordance with current I.E.E. Regulations for the wiring of buildings and to any Local Regulations that may apply.

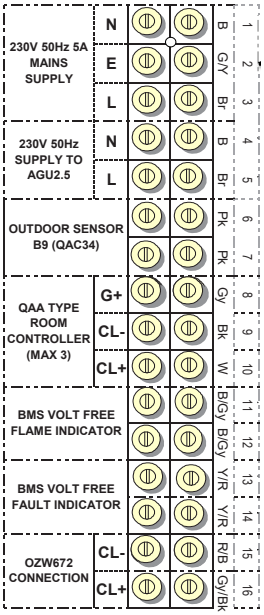
This appliance is designed to operate from a 230V, single phase supply fused at 5 amps. Mains input cable should be at least 0.75mm^2, 3 core cable.

The method of connection to the mains electricity supply should facilitate complete electrical isolation of the appliance. A fused double pole switch or fused spur box serving only the heater should be used.

The point of connection and isolation to the mains electricity supply should be readily accessible and adjacent to the appliance, and should be connected to the mains supply as detailed above.

4.16.1 ACCESS TO THE TERMINAL CONNECTIONS

Open the wiring centre access door of the left hand side to reveal the electrical connections inside (see illustration below).



4.16.2 REMOTE INDICATORS

The appliance has volt free outputs (or can be used with voltages up to 230v), which can be connected to a Building Management System or a remote indicator panel. These volt free outputs are pre-configured to perform the following functions:

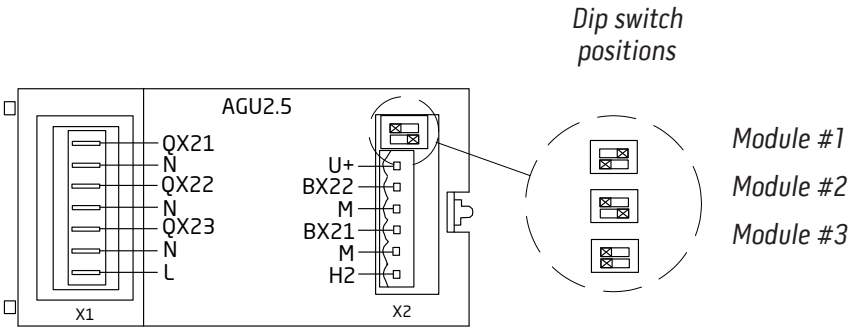
Fault Indication - Immediately after a fault or maintenance warning has been detected by the control system, an internal relay will activate and close the circuit to indicate that a fault has occurred.

Burner On - When any of the appliances heat engines are in operation, an internal relay will activate and close the circuit to indicate that at least one heat engine is in operation.

4.17 AGU2.5 EXPANSION MODULES (P/N 5139793)

Expansion modules are used to create additional heating zones or add extra functions to the appliance and its system. One module is supplied inside the electrical access panel, but a further two can be purchased and added at any time.

The expansion module fitted inside the electrical access panel is pre-configured to be Module #1. When extra expansion modules are fitted they need to be configured as Modules #2 & #3. This is done using the two dip switches located in the corner of the modules (see illustration below).



Before use, the purpose of each expansion module must first be defined under engineer login in the configuration menu (parameter lines 6020 – 6022). The following table details the 7 different configuration modes and their pre-configured inputs and outputs:

Please see separate guide for details on how to access engineer mode

CONFIGURATION OF AGU2.5 EXPANSION MODULE (line 6020 to 6022)	QX21 (230v output)	QX22 (230v output)	QX23 (230v output)	BX21 (Analogue input)	BX22 (Analogue input)	H2 (digital input)
0. None						
1. Multifunctional	*	*	*	*	*	*
2. Heating circuit one	Y1 (open mixer valve)	Y2 (close mixer valve)	Q2 (pump)	B1 (flow sensor)	*	*
3. Heating circuit two	Y5 (open mixer valve)	Y6 (close mixer valve)	Q6 (pump)	B12 (flow sensor)	*	*
4. Heating circuit three	Y11 (open mixer valve)	Y12 (close mixer valve)	Q20 (pump)	B14 (flow sensor)	*	*
5. Solar DHW	*	*	Q5 (pump)	B6 (Collector sensor)	B31 (DHW tank sensor)	*
6. Primary controller	Y19 (open mixer valve)	Y20 (close mixer valve)	Q14 (pump)	B15 (flow sensor)	*	*

* Can be freely configured

4.17.1 EXPLANATION OF CONFIGURATION MODES

None
Where there is no module fitted to the appliance, the parameter setting should be "none". If this parameter is configured for example as "Multifunctional" and there is no module fitted, an error message will result.

Multifunctional
Defining the module as "multifunctional" means that the module can be freely configured to perform any number of input and output control tasks required. It is possible to define the parameters of a heating circuit and configure the AGU2.5 as "multifunctional", but if the module is defined as e.g."heating circuit one" then no other parameter settings are required and this removes the possibility of an incorrect parameter being set. *[1]

Heating Circuit One, two or three
The heating circuit will turn on the corresponding heating pump (QX23) in response to a demand for heating from a Siemens room controller (such as a QAA55) or a wall thermostat using the H2 input. Here the input H2 on the module can be configured (parameter lines 6046, 6054 & 6062) as a "room thermostat". A demand received on input H2 will run the pump and will activate the heat engines (subject to other factors which may hold off the heating demand).

If you want to control the temperature of a heating circuit with a mixing valve (e.g. underfloor heating) then you have no choice but to define the AGU2.5 as a heating circuit. As soon as a 10K sensor is connected to BX21, the appliance controls will detect its presence and activate the extra functions (QX21 & QX22). These two outputs can be connected to a 230v (max 1A) 3-point control actuator to accurately control the temperature of the flow around a heating circuit. *[1]

There are five parameters relating to the mixer valve that can be set to match the system to the valve. Depending on the heating circuit being defined, these parameters are in the ranges: 832 – 836, 1132 - 1136 and 1432 – 1436. *[1]

SOLAR DHW
A module can be configured as a dedicated Solar collector system for DHW. Here Q5 is the collector pump, B6 is the collector temperature sensor and B31 is the DHW tank temperature sensor. Parameters (such as charging priority, dealing with excess heat, collector start temp, pump overrun, frost protection, energy yield etc) may need to be configured to suit the installed application. *[1]

PRIMARY CONTROLLER
A module can be configured to operate a Primary controller / System pump. It operates in the same way as the "heating circuit" setting. There are options to define parameters for the type of mixer valve being used (2 or 3 position), differential, opening time, proportional band, action time delay and also whether the valve is located before or after any buffer storage tank.

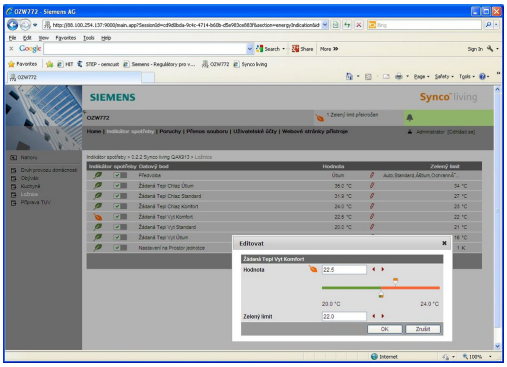
If no temperature sensor is fitted to BX21 then the primary controller will just operate the primary pump at every instance of heat demand from any heat source. Once a sensor is installed the extra function of being able to control a mixer valve will become activated and the parameters 2110 to 2150 need to be configured to match the system being operated. The operation of the primary pump with each heating circuit and DHW will need to be determined by setting parameters 872, 1172, 1472 or 1880. *[1]

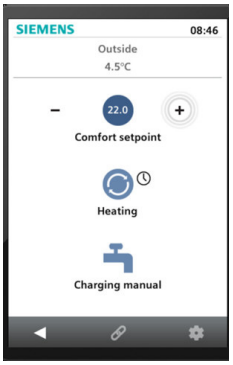
[1] Please see separate guide for further details on how to configure these modes

4.18 WEB SERVER OZW672.01 AND OZW672.04 (P/N 5142798 & 5142799)

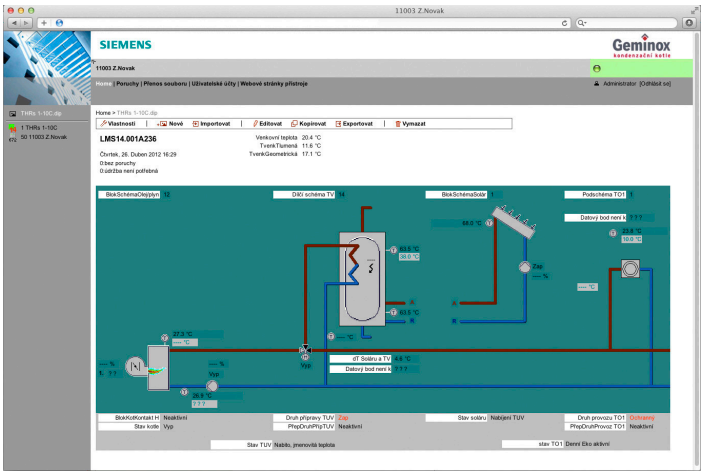
This web server can be connected directly to the COMBIflo and allows for remote plant control and monitoring via the web and Smartphone-App. A summary of the features available are as follows:-

- Operate the appliance via web browser, using a PC or Smartphone-App through the “cloud” from anywhere in the world (subject to web access availability).





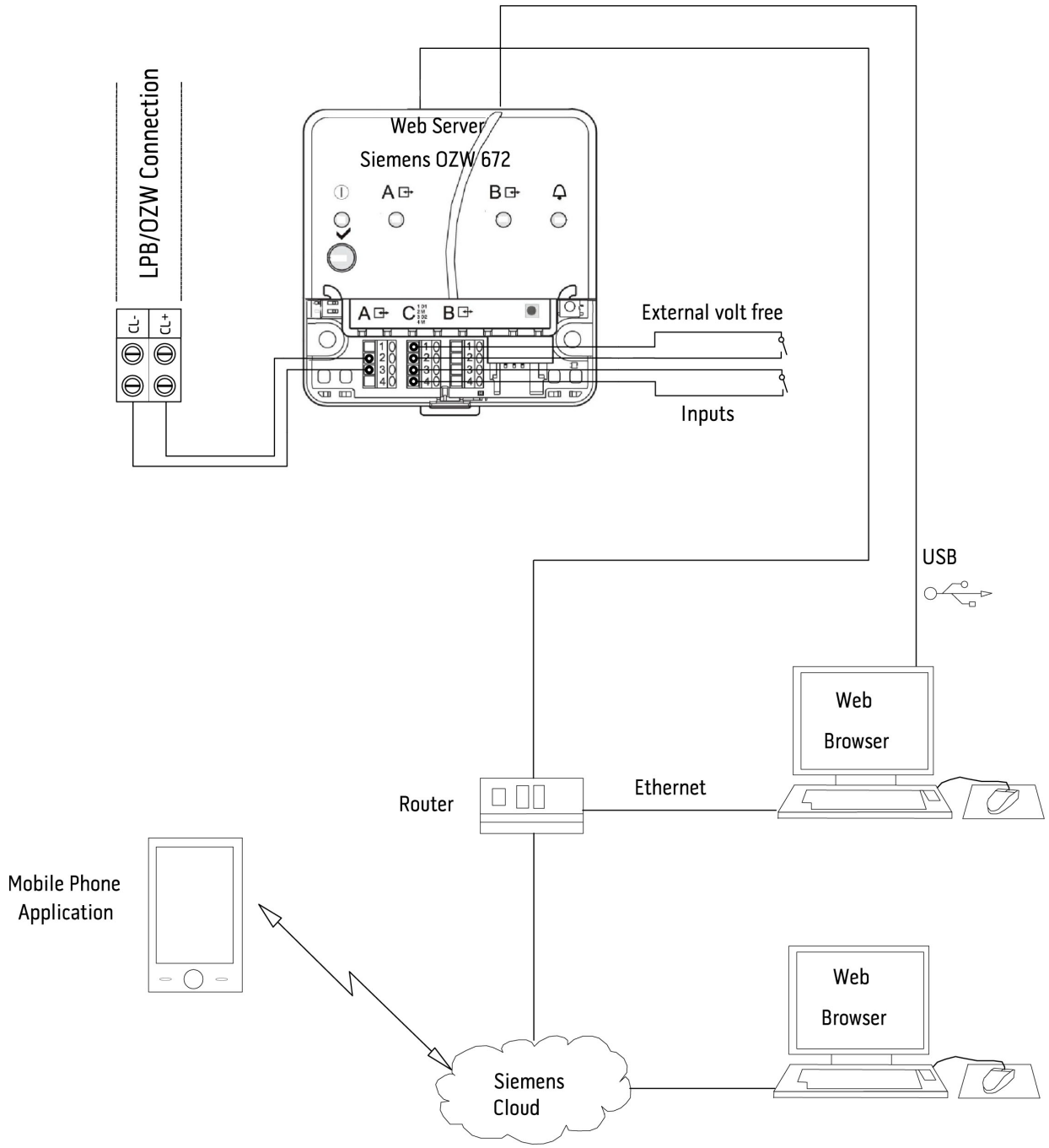
- Change parameters and view fault messages through PC and Smartphone.
- Plant visualisation in the web browser or customised plant web pages.
- Operation via ACS790 PC Tool.



- Send fault messages to maximum of 4 e-mail recipients.
- Create custom system monitoring logs over hours, days or weeks and send them automatically to 2 e-mail recipients.
- 2 digital inputs for reporting plant room failures or limitations, which are outside of the COMBIflo direct
- control (e.g. water booster failure).
- Function “Energy indicator” to monitor data points for energy-related limit values, or “Green limits” and send to 2 email recipients.
- Periodically (daily, weekly or monthly) send system reports to a maximum of 4 e-mail recipients.

4.18.1 CONNECTING WEB SERVER OZW672 TO THE APPLIANCE

Paying careful consideration to the manufacturers instructions which accompany the OZW672, the following wiring options are recommended:



For commissioning and operation of the OZW672 please refer to the Siemens guide accompanying the device.

4.19 OUTSIDE SENSOR & WIRED ROOM UNITS

4.19.1 OUTSIDE SENSOR B9 (OPTIONAL)

This outside sensor is a NTC 1K resistance type. It is a passive sensor for monitoring of outside air temperature and to a small extent - solar radiation.

It should be mounted so that it is not exposed directly to the sun (especially in the morning). In case of doubt it should be located on a wall facing North to North-West. The influence of the wind and the temperature of the wall must also be considered.

If an outside sensor is not fitted to the appliance, a default value of 0°C will be used by the controls when calculating compensated flow temperatures. It will also be necessary to access parameter 6200 under the "configuration" menu to save the sensors without an outside sensor.

4.19.2 ROOM UNITS QAA55, QAA75 & QAA75 (OPTIONAL)

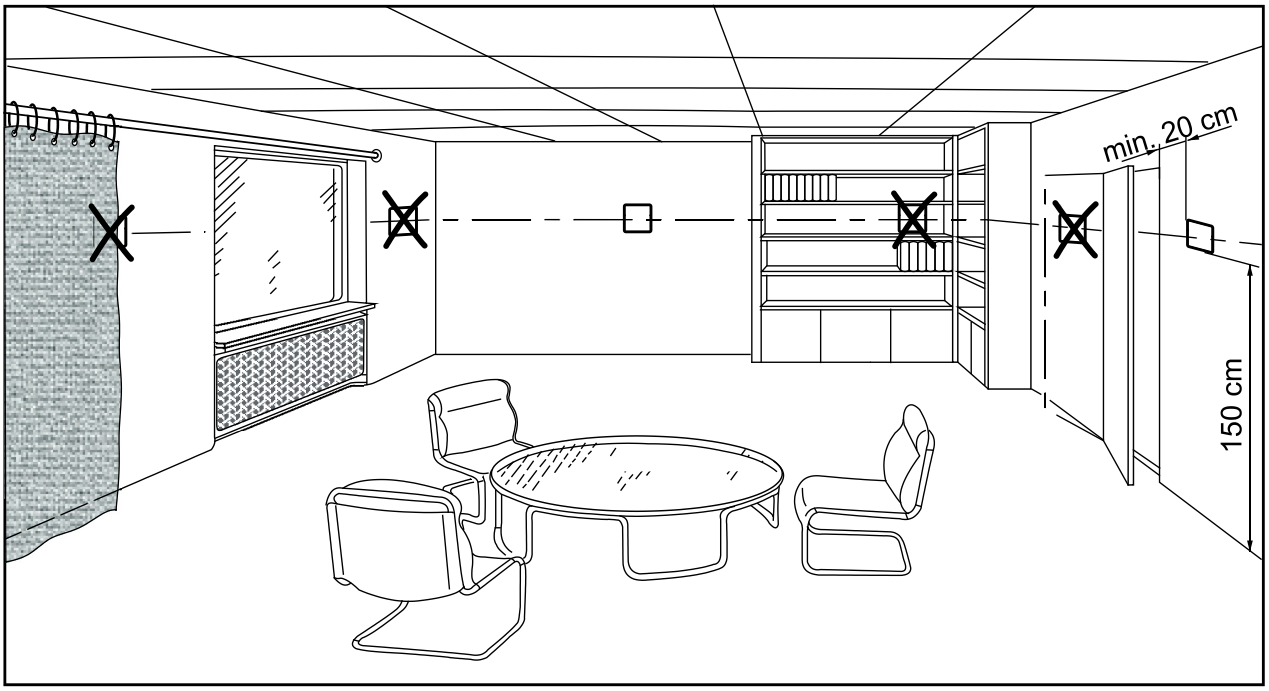
QAA55
(P/N 5138511)

QAA75
(P/N 5117802)

4.19.3 POSITIONING OF ROOM UNITS

Install room units in the main occupancy rooms. The place of installation should be chosen so that the sensor can capture the room temperature as accurately as possible without getting adversely affected by direct solar radiation or other heat or refrigeration sources (about 1.5 metres above the floor)

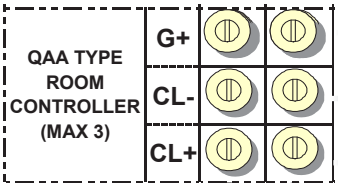
See illustration on the following page for guidance on sensor positioning



4.19.4 ROOM UNIT CONNECTIONS

Paying careful consideration to the manufacturers instructions which accompany the room sensor, the following wiring options are recommended:

COMBIflo connections



	Pin Reference	
Room unit	**QAA55**	**QAA75**
DC 12V	Not used	3
BSB ground	2	2
BSB data	1	1

Up to a maximum of three room units can be connected to the same set of QAA connections inside the COMBIflo wiring centre.

The base provides the power for QAA55 and QAA75. When the room units are removed from the base, power is cut off (i.e. the units are out of operation).

4.19.5 ROOM UNIT SETUP - QAA75

Using the room unit itself, enter "Commisioning mode" (see User Levels section in "Users Operating and Programming guide") and select "Operator section".

Use the following parameter lines to define the setup of this room unit:

Line	Display	Notes
28	Define adjustment confirmation message	With, Without
40	Define Unit as "Room Unit 1"	Supports HC1
	Define Unit as "Room Unit 2"	Supports HC2
	Define Unit as "Room Unit 3"	Supports HC3
42	Assign device (in line 40) to a heating circuit	HC1, HC2, HC3
44	Defines whether HC1 operates with HC2	Together or independent
46	Defines whether HC1 operates with HC3	Together or independent
48	Defines which HC the occupancy button operates	HC1, HC2, HC3, ALL
54	Room temperature adjustment (engineer level only)	+/- 3°C

The following example illustrates applications available using the settings "Defined as" (operating line 40) together with "Heating circuit assignment" (operating lines 42 to 48).

Existing heating circuits 1 and 2 are controlled centrally from room unit 1 for logistical reasons. The room temperature sensor in room unit 1 is relevant to only heating circuit 1 since climatic conditions for heating circuit 2 may differ from heating circuit 1. Room unit 2 allows for separate temperature measurements and individually setting of heating circuit 2. However, operating the occupancy button of unit 1 will activate all heat circuits.

Example settings:-

QAA75, UNIT 1		**QAA75 UNIT 2**	
Line 40	*Room unit 1*	*Line 40*	*Room unit 2*
Line 42	*Heating circuits 1 and 2*	*Line 42*	*Heating circuit 2*
Line 44	*Independently*	*Line 44*	*Independently*
Line 46	*Independently*	*Line 46*	*Independently*
Line 48	*Commonly*	*Line 48*	*None*

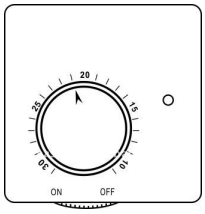
4.19.6 ROOM UNIT SETUP - QAA55

Perform the following to access the room unit parameters:

1. Press the occupancy button (> 3 seconds). The room unit switches to the service level. The first parameter is selected; the present value blinks.
2. Use the setting knob to set the required parameter.
3. Briefly press the occupancy button. The next parameter is selected for setting.
4. Exit service level:
   - After 8 seconds without activity, the room unit exits the service level automatically.
   - Briefly press the operating mode button.

Parameter	Dis-play	Function
Used as	ru = 1	The room unit is addressed as RU1 (default setting).
	ru = 2	The room unit is addressed as RU2.
	ru = 3	The room unit is addressed as RU3.
Direct adjust-ment	P1 = 1	Automatic storage: (default)
	P1 = 2	Save with confirmation
Operation Lock	P2 = 0	OFF: All operating elements released (default)
	P2 = 1	ON: The following elements are locked: - Operation changeover heating circuit. - Readjustment of comfort setpoint. - Changeover of operating level (occupancy button)
A setpoint readjustment with the knob is adopted either by pressing the operating mode button or without any further confirmation (timeout).		

4.19.7 MANUAL THERMOSTAT (OPTIONAL)



RGB Room sensor
P/N 5117803

Using the Main GUI on the appliance, enter "Commissioning mode" (see Users operating and programming guide for details) and select "Configuration" menu.

Depending on which number of the AGU2.5 expansion module being used (see section 4.17 for details of the AGU2.5), the setup of the RGB room sensor, for the control of a heating zone is as follows:

Line	Display	Notes
6046/6054/6062	Define function input H2	Setup as "Room thermostat HC1, HC2 or HC3"
6047/6055/6063	Define contact type H2	Normally open or normally closed

5.0 COMMISSIONING GENERAL

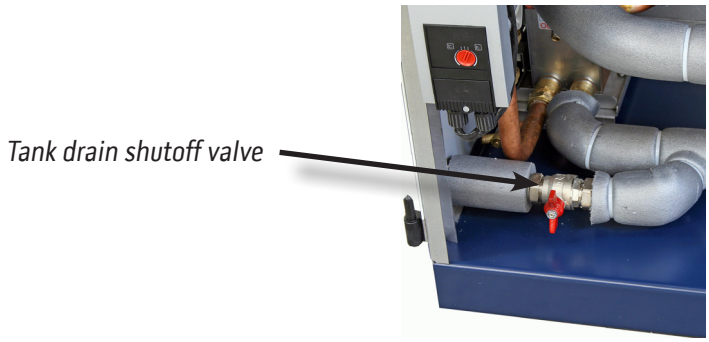
After installation of pipe work and fittings the water systems can then be filled and evacuated of all air before commissioning the heat engines using gas can commence.

5.1 FILLING AND REMOVAL OF AIR

5.1.1 DHW TANK AND SYSTEM

In order to ensure safe removal of air from the hot water system, please perform the following:

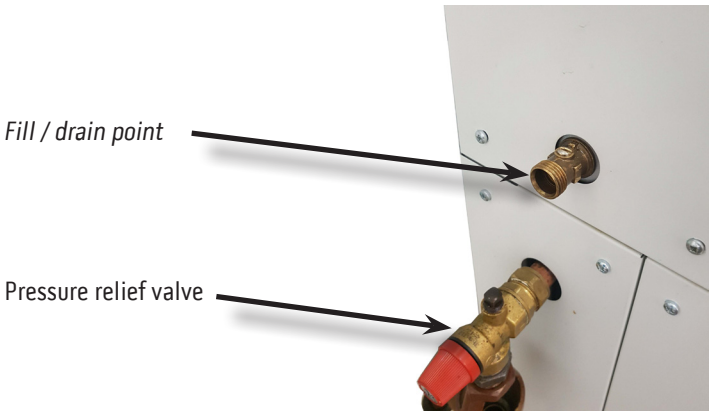
1. Check that the tank drain shut off valve is closed.



2. If the appliance is connected to a hot water recirculation system, open the isolation valve immediately before the connection point to the tank.
3. Turn on the entire hot water draw off taps.
4. Turn on the cold water supply and fill the DHW tank.
5. Close each hot water draw off tap when water is discharged.
6. After initial filling, open each hot water draw off tap in succession and check that all the air is vented from the system.
7. Check for leaks inside and outside of the appliance.

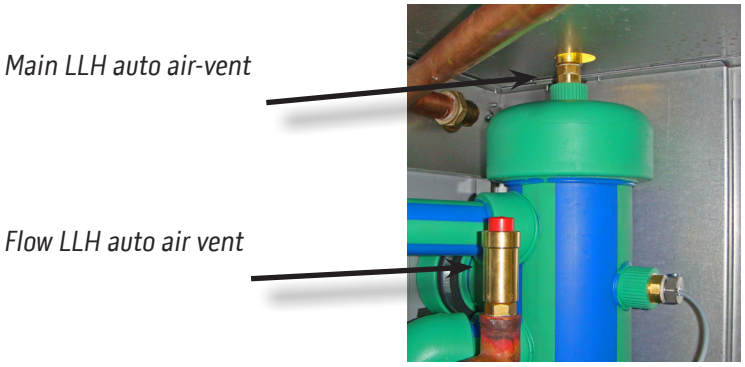
5.1.2 PRIMARY SPACE HEATING CIRCUIT (FILLING AND BLEEDING)

The heat engines and Low Loss Header (LLH) must be completely full of water and devoid of all trapped air. Failure to remove air from the heat exchangers can result in permanent damage and failure of the appliance.

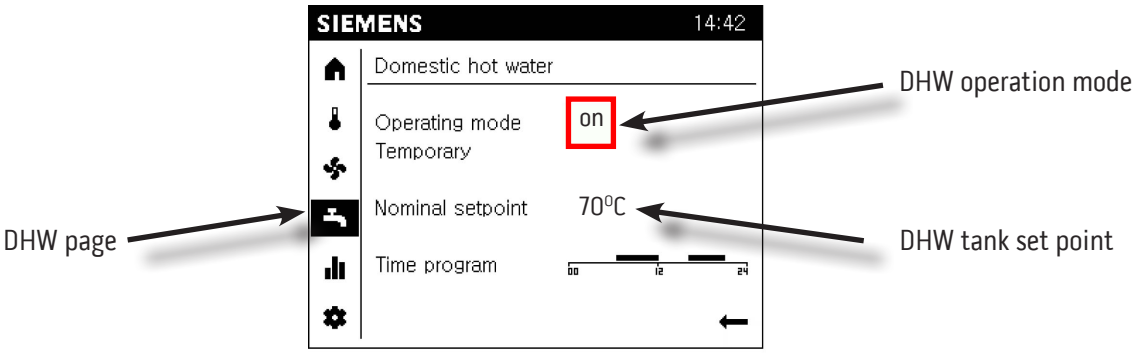


Please preform the following actions to ensure that as little air as possible remains inside the primary water circuit:

1. Ensure that the supplied auto air-vent has been fitted to the top of the main LLH and the auto air-vent fitted to the flow LLH is in place and the caps of both vents have been loosened (approx one turn anticlockwise).



2. Connect a water supply to the fill/drain point of the appliance (see previous page for illustration) and fill with water, until the auto air vents stop venting. Do not exceed 4 bar as this will open the automatic pressure relief valve.
3. With the gas supply to the appliance turned off, Use the Graphical User Interface (GUI) to turn DHW on (see below)



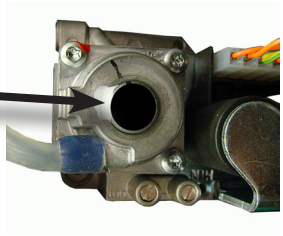
4. Allow the appliance to cycle through five attempts per heat engine. This will operate all internal pumps, until all heat engines are locked out. Pressing the reset button for a second will start the ignition sequence process again.
5. Repeat until all air has been removed and the appliance pumps are running quietly. Confirm that the circulation pump of each heat engine is operating correctly by checking that a solid green LED is illuminated on the front of each heat engine pump and "C3" is displayed on the primary DHW pump. Do not proceed if the LED lamp is flashing green or red/green (see 6.4, items 24 & 25 for location details).
6. Turn DHW off (see illustration above) and allow the pumps to overrun and turn off
7. Recommended fill pressures: Min 0.5 bar, Max 3.5 bar.
8. Check for water leaks inside and outside of the appliance and retighten joints as necessary.
9. Top up inhibitor levels as necessary (see 4.4 for details)
10. At the end of this filling and bleeding process press the reset button for one second before moving onto the next phase of commissioning.

5.2 COMMISSIONING THE HEAT ENGINES

5.2.1 IMPORTANT NOTES

The gas mixture and burner off-set gas rate (minimum load rate) is preset by the manufacturer. Please <u>do not</u> attempt to change the settings of the off-set governor behind the sealed cover.

Off-set governor cover
DO <u>NOT</u> REMOVE



It is an essential part of commissioning process to check the full load gas rate of the appliance and the combustion emission levels are correct.

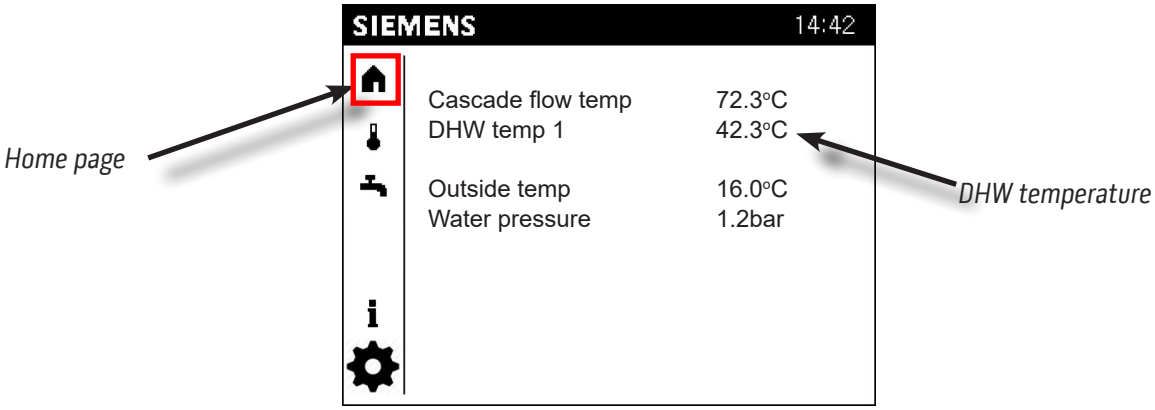
The heat engines on this appliance have been set by the manufacturer, but this will need to be checked again when the appliance has been fully installed into its operating environment. The commissioning process involves the operation of the individual heat engines at the maximum possible heat load. As this appliance contains several heat engines, the manufacturer recommends that commissioning is carried out using Siemens OCI700 service tool or the Andrews commissioning tool, available directly from the manufacturer. If neither of these tools are available to the commissioning agent, then the following manual procedure can be used:-

5.2.2 HEAT ENGINE ONE (TOP MOST UNIT) COMMISSIONING

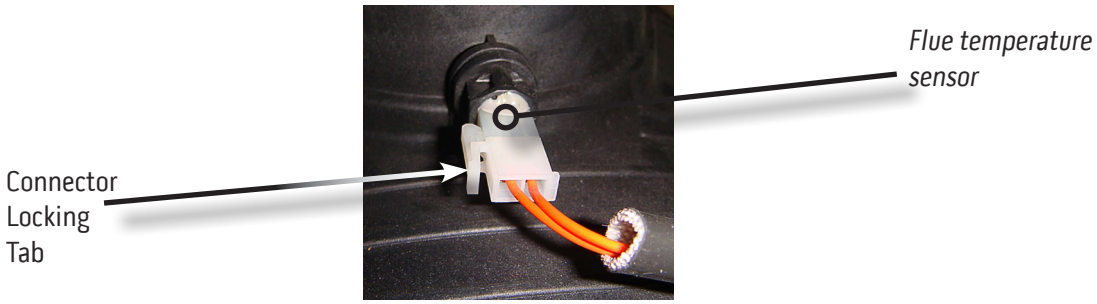
Ensure that all the numbered points included in section 5.1 "Commissioning General" have been completed successfully before proceeding with the following:-

1. Remove the flue sample point bung from the flue duct pipe (see illustration below)

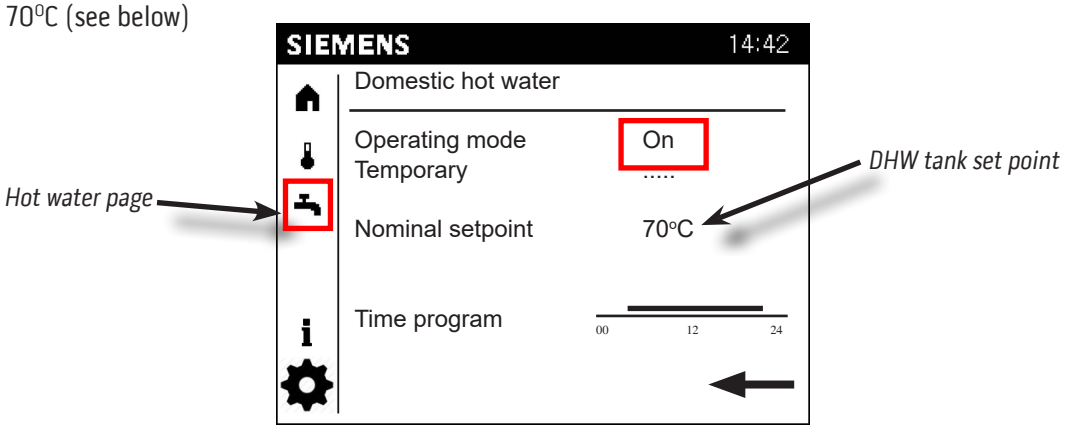
2. Insert a calibrated combustion analyser (approx 65mm) inside the flue sample point
3. Ensure that the DHW tank temperature is below 40^{0}C. Drawer off water until the tank temperature is below this value. The temperature can be checked on the home page of the appliance display (see below)



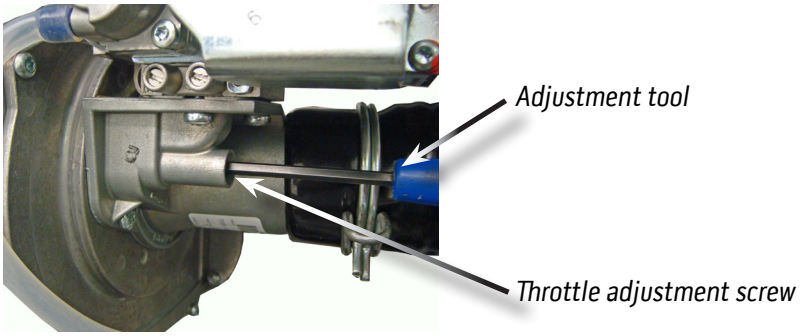
4. Carefully disconnect the flue temperature sensor connectors from heat engines two and three (if 150 model). This will result in these heat engines going into lockout, but this can be ignored during commissioning.



5. Turn on gas supply.
6. Using the display, select the hot water page and turn on DHW. Ensure the DHW temperature set point is at 70°C (see below)



7. Allow three minutes for the heat engine to warm up fully before checking the combustion.
8. Ensuring that the DHW tank temperature remains below 45°C during the commissioning process, if necessary open taps to bring the temperature down. ***The CO^2 combustion figure should be 9.2% +/- 0.1%***. Typical expected valves for CO will be between 130ppm and 180ppm (but may be higher during initial operation). *If you are experiencing CO readings that exceed 250ppm after 30 minutes of burner operation, please first check that your gas analyser is functioning correctly and then contact Andrews Water Heaters on the customer support number given on the rear cover of this manual, for advice*.
9. If adjustment is required, remove dust cover of gas valve throttle adjustment screw and insert a 4mm allen key or medium flat blade screw driver to adjust.



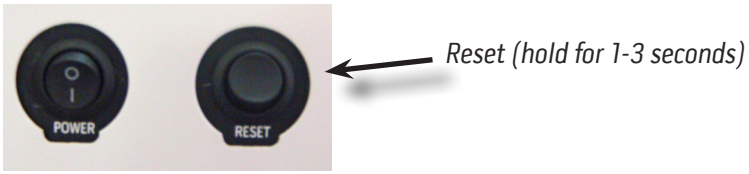
Turn clockwise to reduce CO^2 ***Turn anti-clockwise to increase CO^2***

MAKE ADJUSTMENTS IN 1/4 TURN STAGES AND WAIT ONE MINUTE BETWEEN EACH ADJUSTMENT

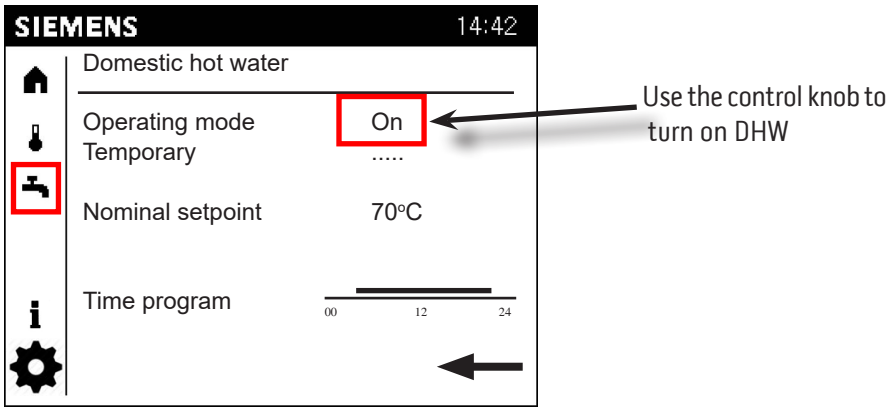
10. When adjustments are complete, turn off DHW (see point 5) and wait for appliance to stop before proceeding

5.2.3 HEAT ENGINE TWO (IMMEDIATELY BELOW TOP UNIT) COMMISSIONING

11. Carefully disconnect the flue temperature sensor connector from heat engine one and replace the connector of the flue temperature sensor from heat engine two (see point 4 illustration) .
12. Ensure that the DHW tank temperature is below 45^{0}C. Drawer off water until the tank temperature is below this value. The temperature can be checked on the home page of the appliance display (see point 3)
13. Press the appliance reset button (on the left hand side) for approximately one second. The heat engine lockouts from the previous heat engine commissioning should now be cleared.



14. Using the display, select the hot water page and turn on DHW



15. Allow three minutes for the heat engine to warm up fully before checking the combustion.
16. Ensuring that the DHW tank temperature remains below 45^{0}C during the commissioning process, if necessary opening taps to bring the temperature down. ***The CO^{2} combustion figure should be 9.2% +/- 0.1%***. Typical expected valves for CO will be between 130ppm and 180ppm (but may be higher during initial operation). *If you are experiencing CO readings that exceed 250ppm after 30 minutes of burner operation, please first check that your gas analyser is functioning correctly and then contact Andrews Water Heaters on the customer support number given on the rear cover of this manual, for advice*.
17. If adjustment is required, remove dust cover of gas valve throttle adjustment screw and insert a 4mm allen key or medium flat blade screw driver to adjust (see point 8).

Turn clockwise to reduce CO^{2} ***Turn anti-clockwise to increase CO^{2}***

MAKE ADJUSTMENTS IN 1/4 TURN STAGES AND WAIT ONE MINUTE BETWEEN EACH ADJUSTMENT

18. When adjustments are complete, turn off DHW (see point 14) and wait for appliance to stop before proceeding

19. **NB If you are commissioning a COMBIflo 100/300 model, proceed directly to point 28 (ignoring points 20 to 27).**

5.2.4 HEAT ENGINE THREE (BOTTOM UNIT) COMMISSIONING FOR 150 MODEL ONLY

20. Carefully disconnect the flue temperature sensor connector from heat engine two and replace the connector of the flue temperature sensor from heat engine three (see point 4 illustration).
21. Ensure that the DHW tank temperature is below 45^{0}C. Drawer off water until the tank temperature is below this value. The temperature can be checked on the home page of the appliance display (see point 14)
22. Press the appliance reset button (on the left hand side) for approximately one second. The heat engine lockouts from the previous heat engine commissioning should now be cleared.
23. Using the display, select the hot water page and turn on DHW (see point 14)
24. Allow three minutes for the heat engine to warm up fully before checking the combustion.
25. Ensuring that the DHW tank temperature remains below 45^{0}C during the commissioning process, if necessary opening taps to bring the temperature down. ***The CO^2 combustion figure should be 9.2% +/- 0.1%***. Typical expected valves for CO will be between 130ppm and 180ppm (but may be higher during initial operation). *If you are experiencing CO readings that exceed 250ppm after 30 minutes of burner operation, please first check that your gas analyser is functioning correctly and then contact Andrews Water Heaters on the customer support number given on the rear cover of this manual, for advice*.
26. If adjustment is required, remove dust cover of gas valve throttle adjustment screw and insert a 4mm allen key or medium flat blade screw driver to adjust (see point 8).
27. When adjustments are complete, turn off DHW (see point 14) and wait for appliance to stop before proceeding

5.2.5 HEAT ENGINE COMMISSIONING COMPLETION

28. Replace all flue temperature sensor connectors
29. Replace all throttle adjustment screw covers
30. Press the appliance reset button (on the left hand side) for approximately one second. The heat engine lockouts from the previous heat engine commissioning should now be cleared.
31. Ensure that the DHW tank temperature is below 45^{0}C. Drawer off water until the tank temperature is below this value. The temperature can be checked on the home page of the appliance display.
32. Turn off all taps.
33. Using the display, select the hot water page and turn on DHW. Set the DHW temperature to 60^{0}C.
34. Allow five minutes for all the heat engines to activate and warm up fully before checking the combustion and checking the gas rating.
35. With the DHW tank temperature below 50^{0}C (see point 3) check the overall CO^2 combustion figure, which should be in the range 9.1% to 9.6%. Also check that CO does not exceed 250ppm (typical expected valves will be between 130ppm and 180ppm) at any time during this commissioning operation.
36. With the DHW tank temperature remaining below 50^{0}C (all heat engines will be operating at full load) check the gas consumption rate at the meter, with only this appliance in operation. The gas consumption should be within 5% of the data plate gross kW input value. Compare the gas consumption rate at the meter against the following table:

G20 Rating Table		**(1040 Btu/ft³) (38.8 MJ/m³)**	
gross kW input	gross *Btu/h input*	*ft³ per min*	*m³ in 2 mins*
102	348,271	5.6	0.32
152	518,992	8.4	0.48

37. With all the heat engines in operation, continue to allow the DHW tank temperature to rise towards the set-point and monitor the CO^2 and CO up until the set-point is reached (this should take around 5 - 8 minutes, depending on current DHW tank temperature). During the last 2^{0}C before DHW set-point is reached, all the heat engines will typically be operating at their minimum modulation level.

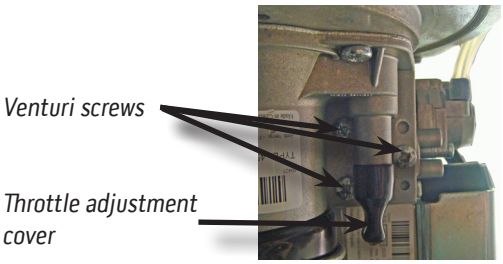
CO^2 levels at minimum modulation level should typically be between 8.4% and 9.0% and CO levels (except immediately after ignition) should not exceed 200ppm. If you are experiencing readings that are outside any of these expected values, please first check that your gas analyser is functioning correctly and then contact Andrews Water Heaters on the customer support number on the rear cover of this manual, for advice.

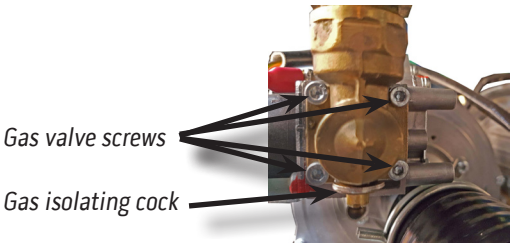
5.3 CONVERSION FROM NATURAL GAS (G20)TO LPG (G31)

The appliance is supplied already set up for natural gas but can be converted on site to operate on Liquefied Propane Gas.

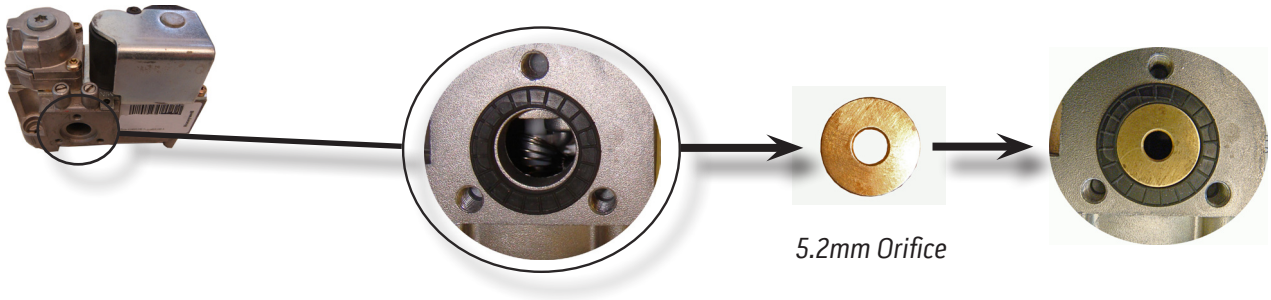
Conversion ***must*** be carried by a competent qualified person using only the parts provided by the manufacturer. This conversion can be achieved by following these actions:

1. With the heater isolated from the gas and electrical supply, undo and remove the three screws securing the air mixing venturi to the gas valve.
2. Turn off the gas isolating cock and remove the 3mm allen bolts securing the gas valve to the gas isolator.

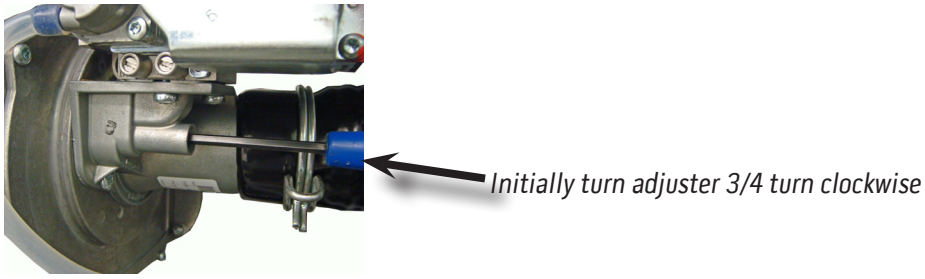




3. Disconnect the gas valve wiring connectors and lift the gas valve up and away.
4. Fit the conversion orifice into the rubber seal that sits in the gas valve (see illustration below).



5. Re-secure the gas valve to the venturi.
6. Re-secure the gas valve to the gas cock, ensuring that the rubber "O" ring remains in place on the gas cock
7. Open gas isolator gas cock and when all conversions are completed, turn supply gas on and check for leaks.
8. Initially turn the throttle adjustment screw 3/4 turn clockwise. Replace the wiring connections.



9. Follow the commissioning procedure in section 5.2.2 (points 1 to 36) from page 43 with the exception that the ***The CO^2 combustion figure should now be 10.2% +/- 0.2% for LPG***

It should not be necessary to turn the throttle screw more than 2 turns clockwise away from the original Natural Gas setting. Also be aware that the gas carrying pipes may need purging before gas is available for ignition at the burner.

10. Allow one minute between adjustments, and do not move the adjuster more than 1/8 turn at any one time.
11. Replace the cover over the throttle screw, when adjustment is complete.
12. Affix the new LPG serial number data label supplied with the heater over the top of the existing NG data plate.

5.4 FROST PROTECTION & LEGIONELLA

5.4.1 FROST PROTECTION

The Heater is fitted with automatic Frost Protection. Provided there is Mains power and Gas connected, if the temperature registered by the Heat Engine, DHW tank or Heating Circuit sensors falls below 5°C the heat engine(s) will ignite to bring the flow temperature up to 16°C and then turn off. ***NB*** *Plant frost protection is turned on by default and will operate the heating zone pumps in two stages once the outside temperature drops below -1°C and -4°C. This plant frost protection function can be turned off if not required.*

5.4.2 ANTI-LEGIONELLA

Water systems in buildings have been associated with outbreaks of Legionnaires' Disease, particularly in health care facilities where occupants are significantly more susceptible to infection. In recognition of the risks in hospitals, a Code of Practice for the Control of Legionella in Health Care premises has been issued by the Department of Health.

Codes of Practice applicable to other premises have been published by other organisations, principally the Health and Safety Executive (HS) (G70) and the Chartered Institute of Building Services Engineers (CIBSE, TM13). All Codes of Practice draw attention to the design and operation of water systems with reference to avoidance of factors that favour colonisation by Legionella bacteria. These factors include stagnation, lukewarm conditions (20°C to 45°C) and the accumulation of debris, scale and corrosion in the base of tanks and calorifiers.

The design of the base of the integral water tank in this appliance, precludes Legionella colonisation, even after build-up of debris. The pumped tank charging process ensures that the water at the bottom of the tank reaches the same temperature as in the rest of the tank. In addition the controls of the appliance provide anti-legionella routines to provide additional protection. A hatch is fitted to the DHW tank to enable inspection and cleaning, should it be required.

The Heater is provided with an Anti-Legionella programme. It is set by default to be off but can be set to be started manually or periodically. Lines 1640 to 1647 control how, and when this function will operate.

5.5 FINAL CHECKS AND USER HANDOVER

5.5.1 CLEANING THE APPLIANCE

The casing is finished with a polyester coating and will mark if abrasive cleaners are used. It should be cleaned using standard non abrasive cleaning products.

5.5.2 USER HANDOVER

When commissioning is satisfactorily completed the user must be instructed on the safe use and operation of the appliance and in particular detail:

- Hand over the "Controls User Guide" as well as this manual and any other literature supplied.
- Explain the importance of air vents and the flue outlet system, and that they should not be altered or interfered with in any way.
- Explain to the user the importance of internal water pressure and how to restore it to the correct value.
- Explain and demonstrate to the user the correct function and adjustment of the temperature, thermostats and radiators for the economic use of the system.
- Remind the user that in order to comply to the regulations in force, the appliance has to be serviced regularly (at least once every 12 months) and only an engineer who is a member of the Gas Safe register should carry out any work on the appliance in the UK.

5.6 FAULT FINDING

5.6.1 OPERATION SEQUENCE

To operate this appliance you must have a mains gas supply, 230v 50Hz electricity supply and a valid demand from either the DHW or the space heating system.

1. The gas control starts the Ignition sequence following a demand for DHW or Space heating.
2. The Fan operates on the first heat engine as a pre-purge of the heat exchanger airways.
3. After 30 seconds of fan operation, a spark is created at the electrode and the gas valve is opened immediately afterwards.
4. The ignition spark will last for 5 seconds, followed by a stabilisation period of a further 5 seconds.
5. At the end of the stabilisation period the controls will check that a flame is present. If no flame is detected stages 1 - 5 will be repeated up to 4 times before a permanent lockout of that heat engine occurs.
6. On successful confirmation of a flame, the fan speed is then changed by the control to suit the demand conditions.
7. After a short delay (normally within 2 minutes, but dependant on demand) the sequencing control will release other heat engines, and these will follow stages 1 - 6.

NB If a heat engine is in a lockout condition , this should not affect the other heat engine/s ability to function and the appliance should continue to operate as normal, using the other heat engine/s.

5.6.2 FAULTS AND LOCKOUTS

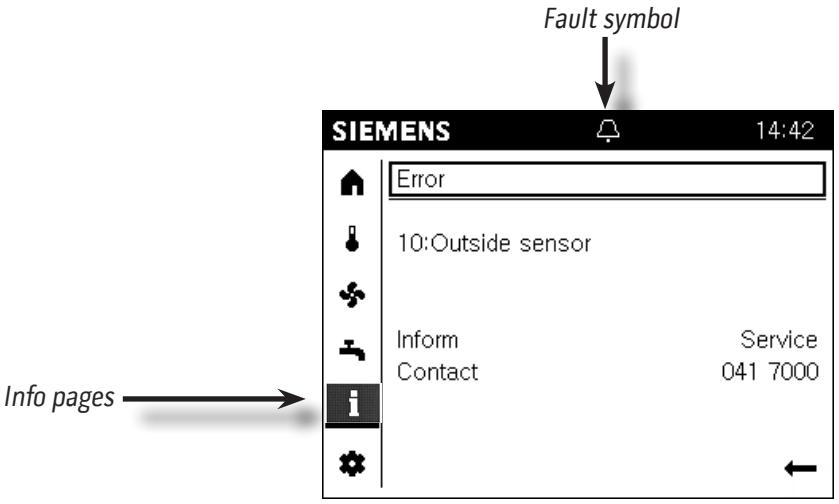
If any heat engine is unable to ignite or detects a safety condition, the control of that heat engine will lockout and will be prevented from firing again, without manual intervention. The display will show the symbol along the top bar of the GUI display to indicate that there is a fault, and the green LED on the appropriate LMS14 control PCB will flash.

The fault will have to be cleared before that heat engine will function again. Selecting from info pages menu will provide the fault detail (see section 6.6 at the end of this manual for the possible fault codes). Press the RESET button and provided the condition has been corrected the heat engine will run through the ignition sequence again.

A Lockout condition should not be repeatedly reset. If the condition persists then a qualified repair engineer should be called.

5.6.2.1 FAULT DISPLAY EXAMPLES

The display will show a if the appliance has recorded a fault. More information can be obtained by selecting the info pages menu . See example screen:



6.0 MAINTENANCE

In all cases, before work commences turn off the Mains Electricity and Gas Supply to the appliance

6.1 ROUTINE INSPECTION INTERVALS AND REQUIREMENTS

To ensure continued efficient operation of the appliance it is recommended that it is checked and serviced at regular intervals. The frequency of servicing will depend upon the particular installation and usage but in every case a maximum of twelve months should be allowed between service inspections.

It is a legal requirement that any service work should be carried out by a suitably qualified and Gas Safe registered personnel.

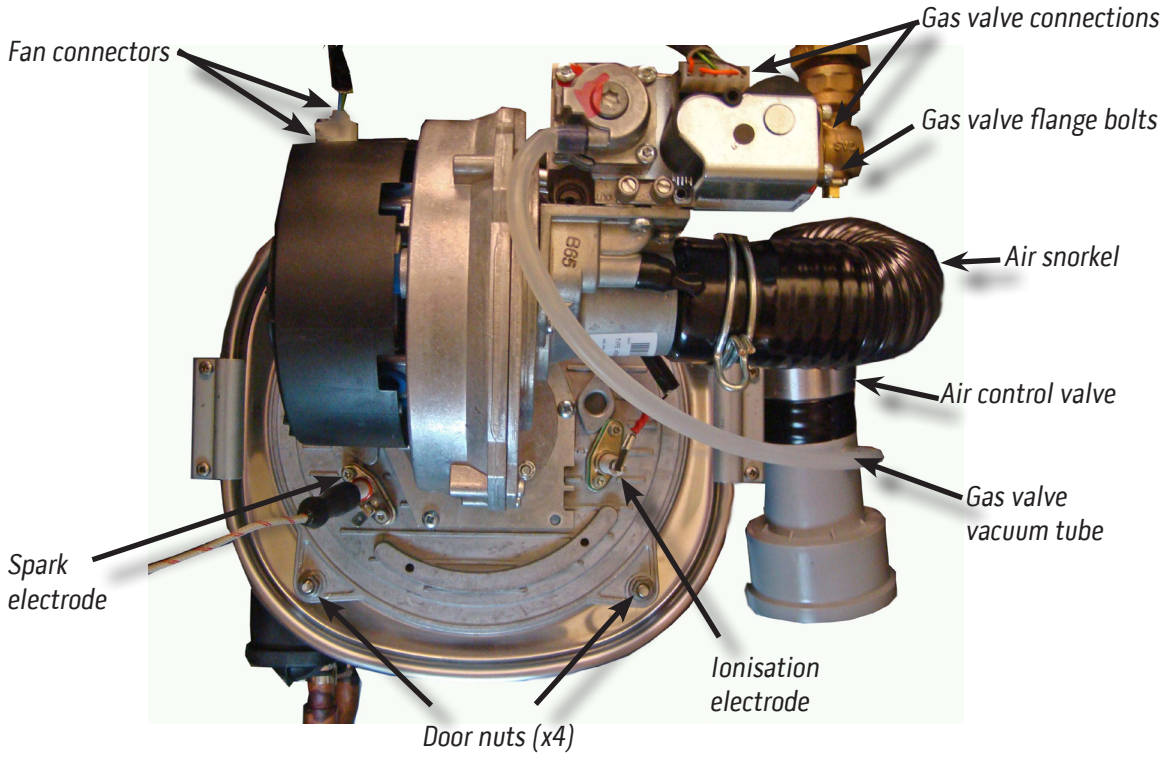
6.1.1 RECOMMENDED MINIMUM SERVICING REQUIREMENTS

1. Check and clean the burner and combustion chamber.
2. Check the combustion CO, CO2 and gas rate
3. Check condition of both electrodes and the gap of the ignition spark electrode. Replace every 24 months.
4. Check the air duct and flue seals.
5. Check condensate syphon and pipework for leaks and clean out condense trap
6. Inspect and if necessary clean the storage tank.

Follow the procedures given in section 6.2 for parts removal in addition to the following notes :

6.1.1.1 CHECK AND CLEAN BURNER & COMBUSTION CHAMBER

To view the burner and the inside of the heat exchanger it is recommended that you remove the front of the heat exchanger complete with the fan, venturi and gas valve.

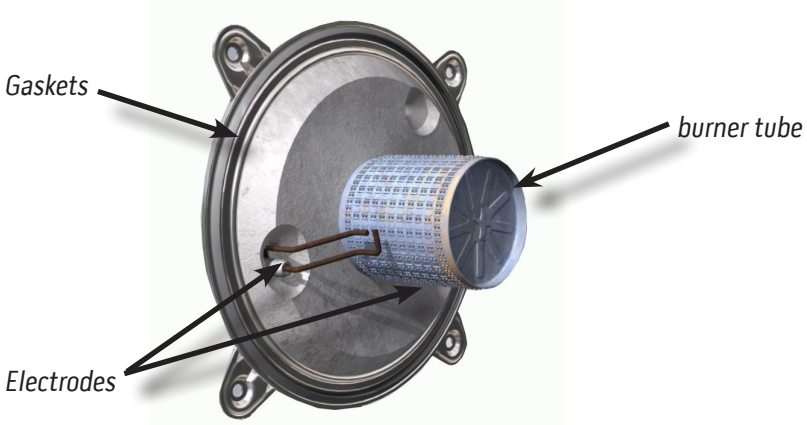


With reference to the drawing on the previous page, the following steps need to be completed before the combustion chamber and burner can be inspected:-

- Isolate appliance from gas and electrical supply.
- Remove the left hand door panel (after removing the earth lead), by lifting it upwards and off its hinges.
- Disconnect the gas cock flange from the gas valve, by unscrewing the four allen bolts.
- Unplug the gas valve electrical connectors.
- Disconnect the vacuum tube from the gas valve
- Unplug both fan electrical connectors.
- Disconnect spark electrode lead.
- Disconnect ionisation electrode lead.
- Remove the air snorkel from the end of the gas valve venturi by removing the spring clip and pulling off the flexible hose.
- Undo the four door nuts and and pull the whole burner assembly forwards.

Once assembly is free from the heat exchanger, carry out the following inspection:

- Inspect the black silicone and rope gaskets on the inside of the heat exchanger door. Replace seals if there are any signs of damage and in any case replacement every two years is recommended.
- Inspect the burner tube for signs of damage. Replace if any damage or burnt areas are found.



- Inspect the inside of the heat exchanger for signs of carbon build up or blockages between the tubes.
- The heat exchanger can be cleaned using a nylon (non-metalic) brush and vacuum cleaner, to remove loose deposits.
- White vinegar can be used to remove stubborn deposits, by spraying the vinegar onto the coils and then waiting five minutes before scrubbing with a nylon brush and finally rinsing away all deposits with clean water, until the condense pipe runs clear.

- At the end of the cleaning process unscrew the condense trap bowl, clean out and refit.

Assembly is the reverse.

6.1.1.2 SPARK ELECTRODE AND FLAME SENSE ELECTRODE

In order to maintain optimum reliability, it is recommended that both sets of electrodes are replaced every two years regardless of their condition. It is recommended that these electrodes are best inspected when they are still in place and the entire heat exchanger door has been removed (see 6.1.1.1), but can also be inspected by carrying out the following :

- Turn off the appliance and pull off the eletrode lead(s).
- Unscrew the two screws retaining the spark electrode in position and carefully withdraw.
- The spark gap should be 5.0 mm ± 0.5mm.
- Undo the two screws retaining the flame sensing electrode.
- Withdraw and inspect for wear or damage.
- Replace electrode(s) if older than 24 months or if worn or damaged.
- Assembly is the reverse, ensure the gasket is undamaged and correctly placed.

6.1.1.3. AIR DUCT & FLUE SEALS

A visual inspection should establish there are no leaks around any of the seals, including the flexible air duct to the venturi. Replace if there is any doubt as to the integrity of the seals.

6.1.1.4. CONDENSATE PIPEWORK & SYPHON

Inspect all joints in the condensate pipework for leaks, repair/replace parts if any defects are found.The lower bowl of the syphon can be unscrewed, examined and cleaned. check its connection to the heat exchanger and pipework for leaks.

6.1.1.5. GAS RATE & COMBUSTION

The gas rate and combustion flue analysis must be carried out when the appliance is operating at maximum loading. ***See Section 5.2 for details on how to check and adjust the CO^2.***

To check, re-establish gas and electricity supply and then operate each heat engine for at least 5 minutes. If adjustment is required remove the cover over the throttle screw and turn anti-clockwise to increase CO_2, clockwise to decrease.

Allow at least a minute between adjustments to obtain stable readings. The gas rate will be correct when the CO and CO_2 figures are to specification.

6.1.1.6. FLUSH & INSPECT STORAGE TANK

Flush the water storage tank by opening the drainage tap. Let the water flow out of the water heater until no more chalk residue comes out with the water. In areas with hard water, it is necessary to flush out the water heater more frequently.

If the water heater is to be drained for any reason,first take the water heater out of operation by isolatiing the power and then proceed as follows: Turn off the water tap in the cold water supply. Open one of the warm water taps that can be found at a point higher than the water heater in order to bleed the warm water pipe section. If the water heater is set up above the level of the drainage points, it will be necessary to open the warm water connection to let the appliance run empty. Open the drainage tap of the water heater so the appliance drains empty. Be careful, the water flowing out can be very hot!

The storage tank should be inspected annually and cleaned if required. To gain access, first drain the tank as above. Disconnect any pipework connections to allow removal of the Tank Inspection Hatch at the top of the unit on RH side. Remove foam insulation to reveal Tank Inspection Hatch. Loosen nut on Tank Inspection Hatch to remove Hatch and inspect storage tank.

6.2 REMOVING AND CHANGING COMPONENTS

NONE OF THE CONTROLS ARE REPAIRABLE . IF THEY ARE NOT FUNCTIONING THEY MUST BE REPLACED
In all cases, before work commences turn off the mains electricity and gas supply.

The following items can be replaced:

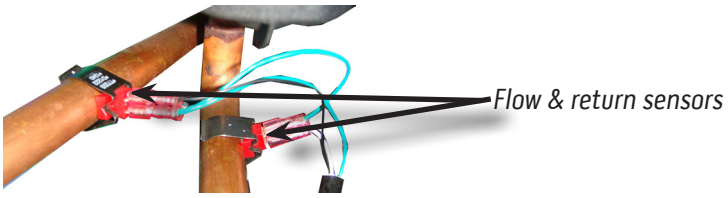
1. Pressure and temperature relief valves
2. Flow, return and DHW Flow sensors
3. Low Loss Header and DHW tank sensors
4. Flue sensor
5. The appliance GUI display
6. Master and slave PCBs
7. Spark generator
8. Spark and sense electrodes
9. Plate heat exchanger
10. Gas valve
11. Air control tube and air control flap
12. Combustion fan
13. Venturi
14. Heat exchanger
15. Water pressure sensor
16. Heat engine circulation pump
17. Primary DHW pump
18. Secondary DHW pump

6.2.1 PRESSURE TEMPERATURE RELIEF VALVE

The removal of this valve will require either the draining or the valving off of the system that is above tank level. Once Isolated the connecting pipework can be removed and the valve unscrewed from the tank.

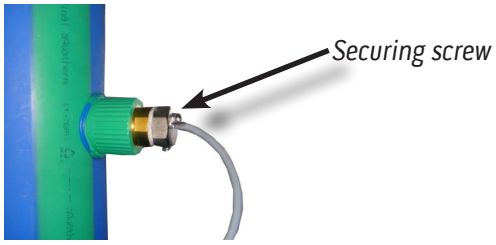
6.2.2 RETURN, FLOW AND DHW FLOW SENSORS

The Flow and return sensors are clipped on to the copper pipework beneath the heat exchangers. The DHW Flow sensor is clipped to the DHW tank charging pipe on the left side of tank.



- Unclip the sensor from the pipe and carefully pull off (do not pull on the wires) the connectors.
- Replacement is the reverse.

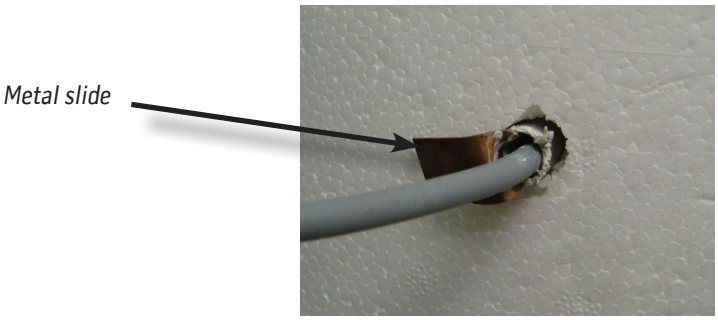
6.2.3 LOW LOSS HEADER AND DHW TANK SENSORS



The LLH sensor is fitted into the top of the LLH in the rear top left hand side of the appliance.

- Undo the securing screw and withdraw sensor from pocket.
- Unplug connector from loom.
- Cut off securing tie and remove sensor.
- Replacement is the reverse.

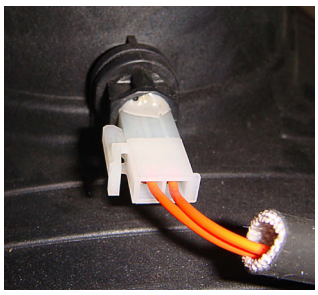
6.2.3 LOW LOSS HEADER AND DHW TANK SENSORS (CONT)



The DHW tank sensor is located in a pocket behind the right hand appliance door.

- Remove the bolt holding the right hand door in place and swing open door to reveal sensor location.
- Remove the securing metal slide and withdraw sensor from pocket.
- Unplug connector from loom and remove sensor.
- Replacement is the reverse.

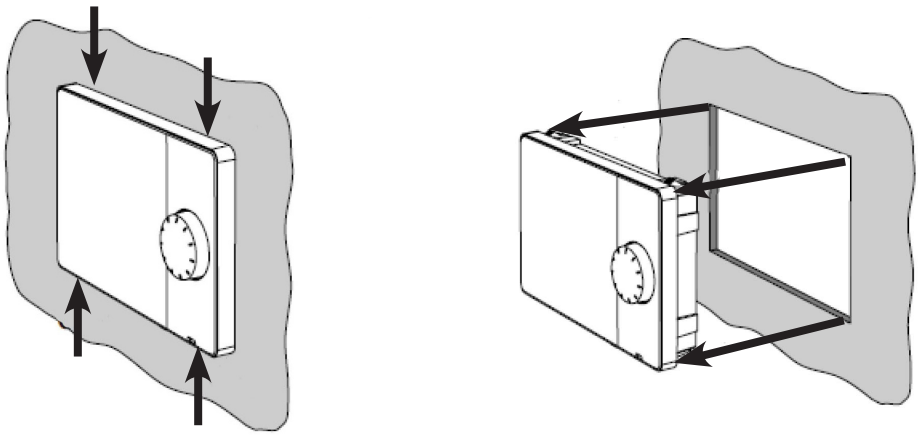
6.2.4 FLUE SENSOR



This is located at the Flue outlet of the heat exchanger.

- Unplug the sensor from the loom.
- Remove sensor by turning anti-clockwise a quarter turn and withdrawing.
- Replacement is the reverse.

6.2.5 AVS37 GUI DISPLAY

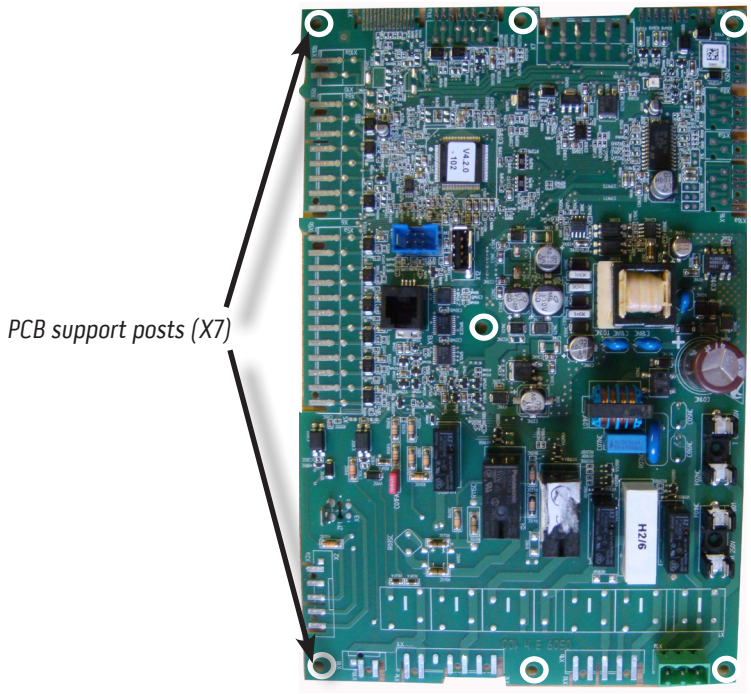


- Remove bolt holding right hand door in place and swing open door to reveal the back of the GUI
- Unplug the cable from the rear of the GUI
- Use a small flat edged screwdriver release the GUI from its opening, by compressing the four plastic edge clips and gently pulling display out the front of the opening
- Replacement is reverse.

6.2.6 LMS14 PCB 1 TO 3

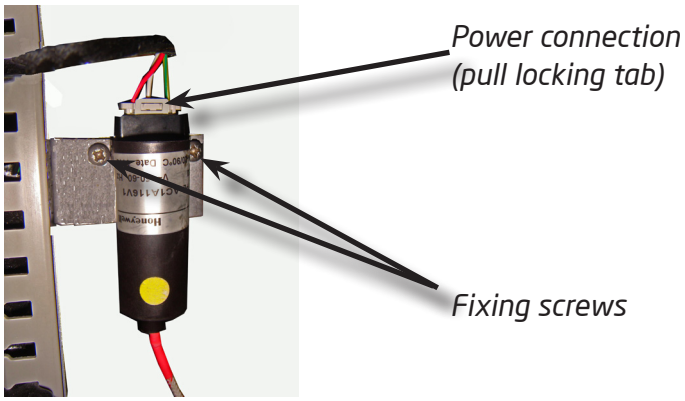
These are located on the front control panel. It is important that the correct PCB replacement is used in the correct place. They are numbered from top to bottom repectively, PCB1, PCB2 and PCB3.

- Carefully pull off all the connectors on the PCB.



- Release in turn, all seven PCB support posts by squeezing together the end of the support and withdrawing the board from each support, in turn.
- Replacement is the reverse.

6.2.7 SPARK GENERATOR

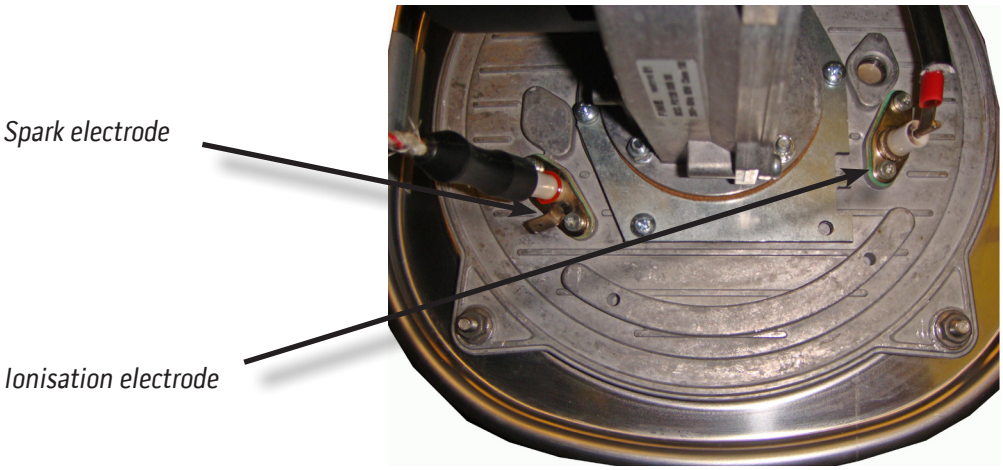


This is located around the rear of the main electronics housing panel. To remove:

- Carefully pull off the mains connections (pull back locking tab) and ignition cable from the spark generator.
- Release the screws holding the spark generator to the bracket (do not fully remove), and remove the spark generator.
- Replacement is the reverse.

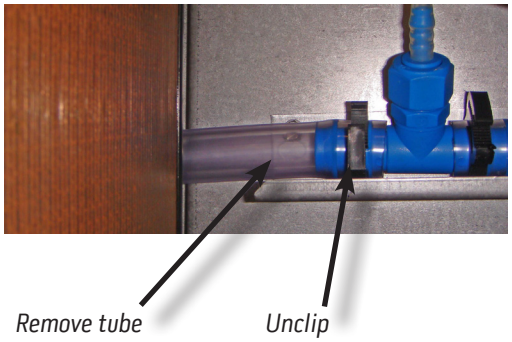
6.2.8 SPARK AND IONISATION ELECTRODES

These are located on the front of the heat exchanger.



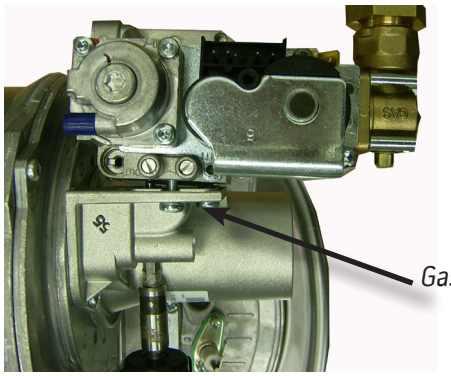
- Carefully pull off the electrical connectors.
- Undo the two screws retaining the bracket and withdraw.
- Replacement is the reverse ensuring that the gasket seal is placed correctly and is in good condition.

6.2.9 PLATE HEAT EXCHANGER



- Remove the lower left hand side cover to gain better access to the heat exchanger
- Remove the condense pipework from behind the heat exchanger.
- Remove the two crosshead screws, located either side of the heat exchanger.
- Drain as much of the primary and secondary systems water as possible, to reduce water spillage.
- Release all four heat exchanger connections and slide the heat exchanger toward the rear, and remove sideways
- Replacement is the reverse.

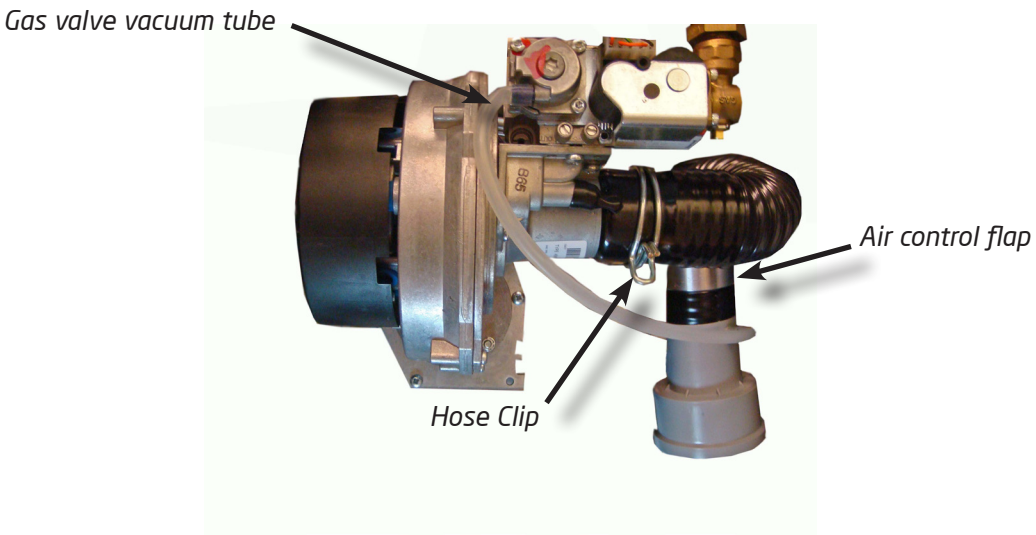
6.2.10 GAS VALVE



- Carefully remove the electrical connector.
- Release the gas cock by undoing the four bolts holding it onto the gas valve.
- Remove the offset tube from the gas valve and unscrew the offset connector (small blue threaded tube) and transfer to the new gas valve.
- Release the gas valve from the venturi by undoing three screws
- Transfer the rubber gasket to the new gas valve.
- Replacement is the reverse.
- Operate the heat engine and check for gas leaks.
- After five minutes check the rate and combustion is correct to the Data table. (*page 8*). Adjust using the throttle adjustment screw on the gas valve if necessary. Turn clockwise to decrease CO_2, anti-clockwise to increase CO_2 (*see 5.2.1 for details)*

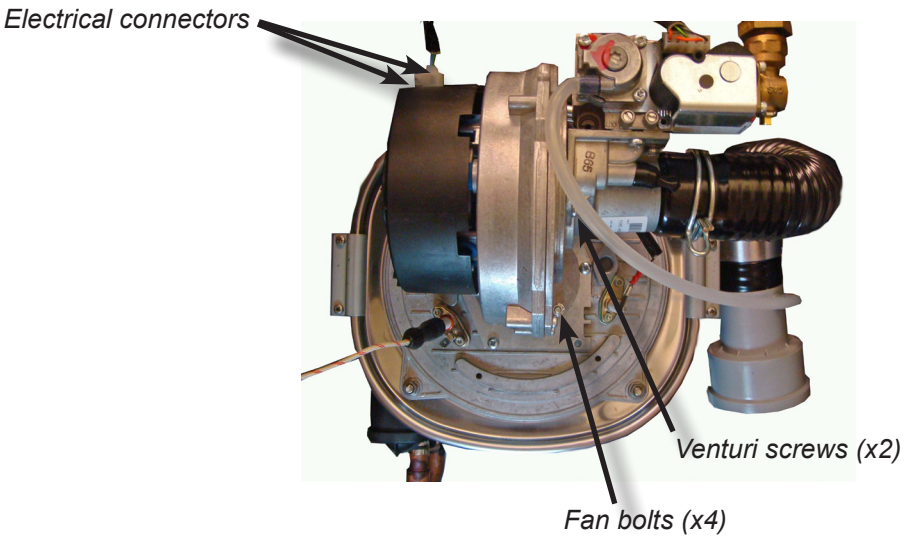
NB Valve Coil resistances are 2.8k and 1.6k ohms.

6.2.11 AIR INTAKE TUBE AND AIR CONTROL FLAP



- Remove the vacuum air tube from the gas valve.
- Using a pair of pliers, compress the Hose clip and pull hose off venturi.
- Pull other end slowly off the air intake manifold.
- Replacement is the reverse.

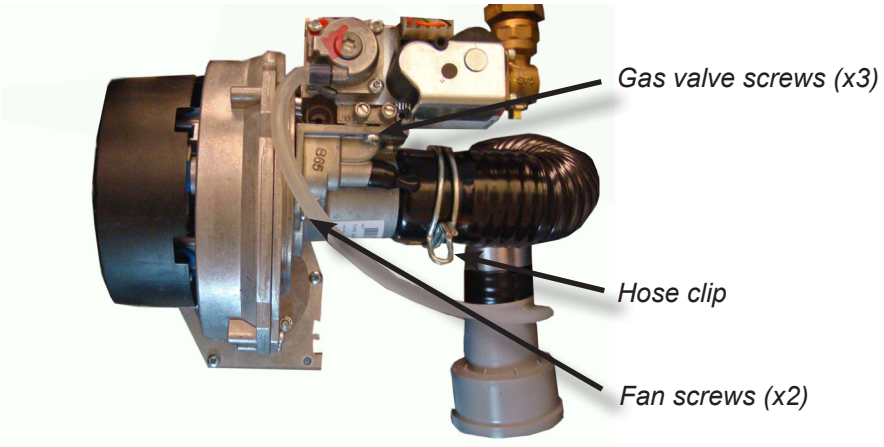
6.2.12 COMBUSTION FAN



- Carefully remove the two electrical connectors on the top of the fan.
- Remove the two screws holding the venturi to the fan. Check the condition of the gaskets for damage and replace as necessary.
- Undo the four nuts and washers holding the fan to the heat exchanger door and withdraw the fan.
- Ensure the venturi gasket is fitted to the new fan, before securing with screws.
- Replacement is the reverse

6.2.13 VENTURI

- Remove the gas valve (see 6.2.10 for details).
- Pull off the air hose tube (See 6.2.11 for details).

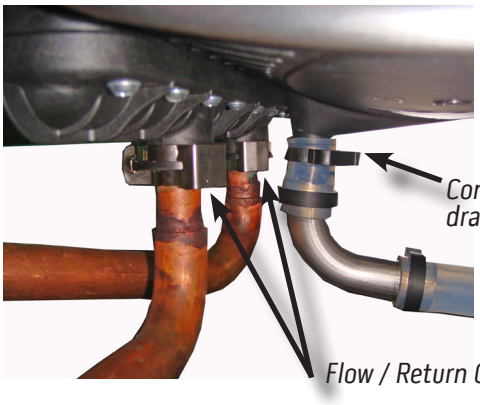


- Undo the two screws holding the venturi to the fan and remove.
- Undo the three screws holding the venturi to the gas valve and remove.
- Check the condition of the gaskets for damage and replace as necessary. Ensure that gaskets are fitted to the new venturi or positioned on the fan before positioning the venturi into place.
- Replacement is the reverse.
- Operate the heat engine and check for gas leaks.
- After five minutes check the rate and combustion is correct to the table on page 8. Adjust using the throttle screw on the gas valve clockwise to decrease CO_2, anti-clockwise to increase CO_2 if required. (*see 5.2.1 for details)*

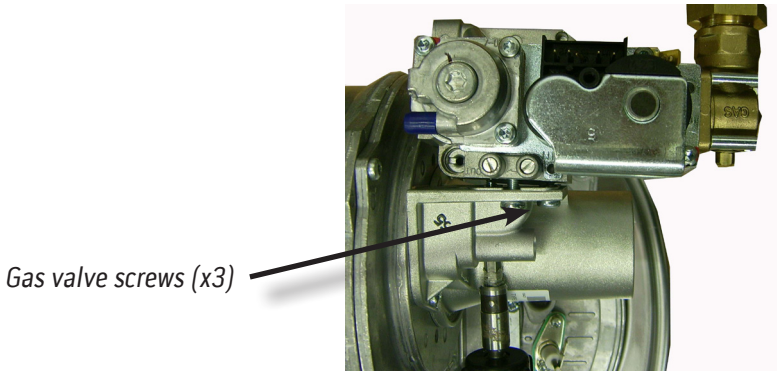
Changing the heat exchanger will require draining of the primary system. It is essential that all the air is removed from the heat exchanger before the appliance is operated. To not do so may damage the heat exchanger and invalidate the warranty.

6.2.14 HEAT EXCHANGER

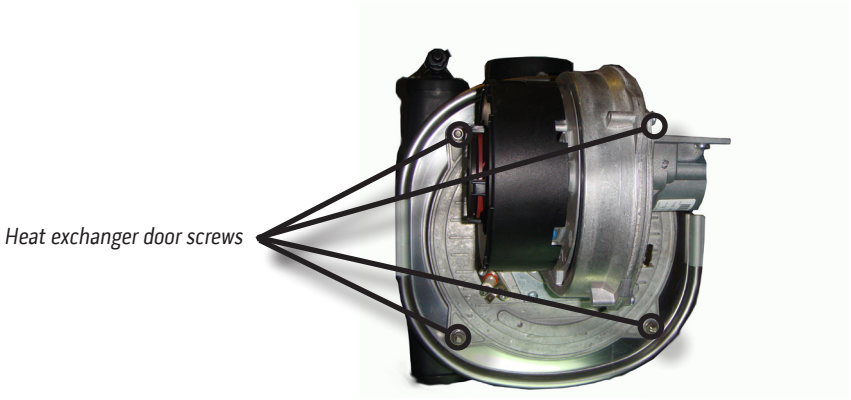
- Drain as much of the primary water as is necessary to ensure the heat exchanger is empty.
- Disconnect all electrical connections to the flue sensor, spark generator, fan and gas valve.
- Disconnect the air tube and air control flap (see 6.2.11 for details)



- Release both the heat exchanger demountable connections of the flow and return pipes, by removing the metal clips and pulling the pipes downwards.
- Disconnect the condense drain connection by releasing the plastic clip on the top connector.

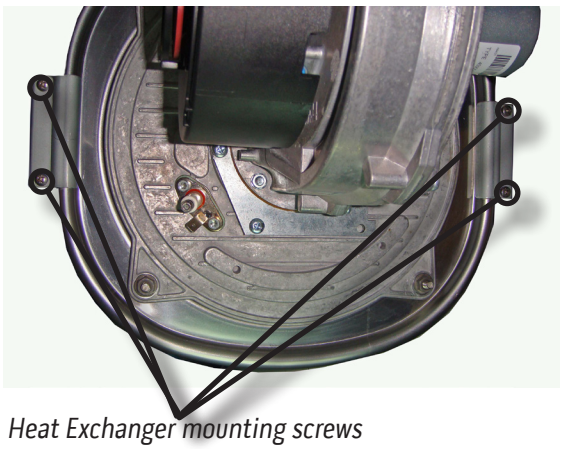


- Disconnect the gas valve from the venturi by removing the three securing screws



- Remove the whole burner system using the four retaining nuts holding the heat exchanger door to the body.

- Remove the flue elbow by twisting the flue elbow whilst lifting it up and away from the heat exchanger.



Heat Exchanger mounting screws

- The heat exchanger is now only retained by the two side brackets. Releasing the four front screws will enable it to be pulled forwards.

Warning this item is heavy - Before releasing the brackets ensure support is available

- Replacement is the reverse.

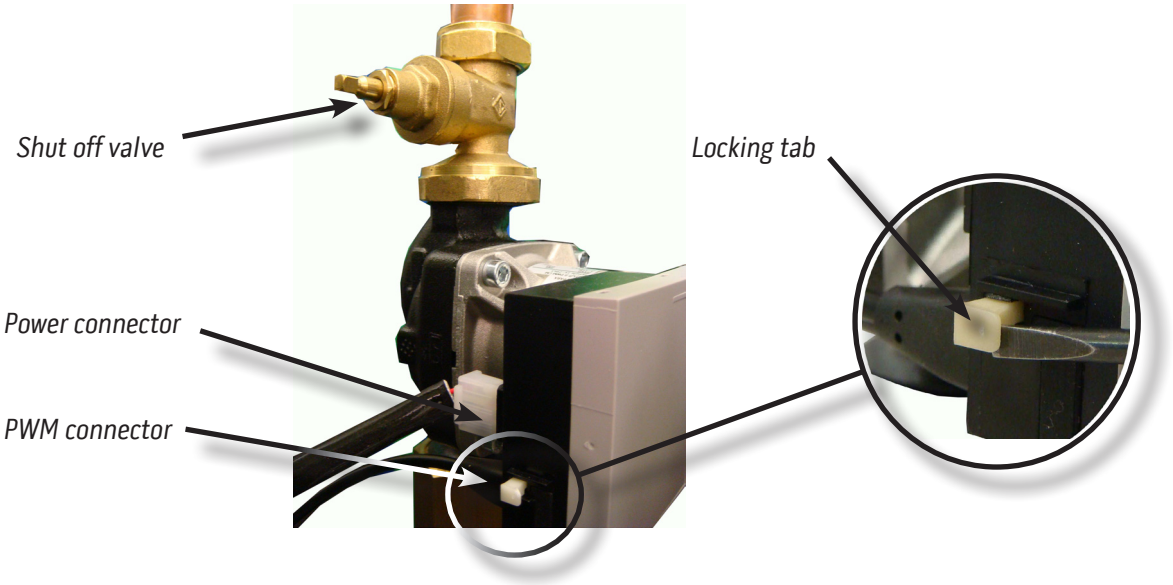
6.2.15 WATER PRESSURE SENSOR

- Screw down the isolator valves immediately above and below the sensor
- Carefully remove wiring connector - Take care not to pull on the wires

- Unscrew by hand the sensor
- Replacement is the reverse

6.2.16 HEAT ENGINE CIRCULATION PUMP Q1 (SEE 6.4, ITEM 24)

- Close the shut off valve immediately above the pump
- Remove the power connector cable by squeezing in the locking mechanism whilst disconnecting



- Remove the PWM connector, by first pulling out the locking tab using a small flat blade screwdriver
- Undo the unions at the top and bottom of the pump body and remove pump.
- Replacement is the reverse. Fit the new pump seals supplied with the replacement pump.
- Refill and check for leaks.

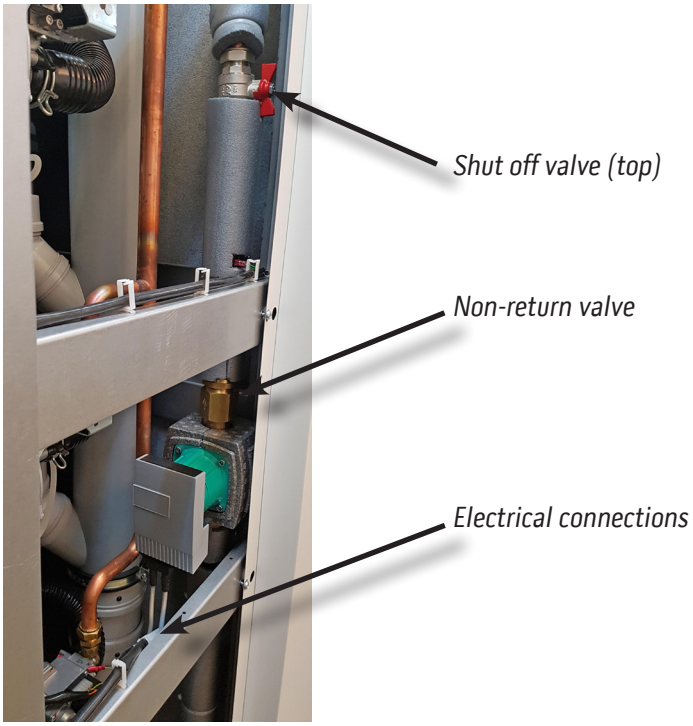
6.2.17 PRIMARY DHW PUMP Q3 (SEE 6.4 ITEM 25)

- Close the shut off valves immediately above and below the pump
- Remove the screw on the front face of the pump to free the electrical supply lead connector.

- Undo the unions at the top and bottom of the pump body and remove pump.
- Fit the new pump with the new seals provided.
- Transfer the supply lead to the new pump.
- When replacing the electrical connector, ensure the the screw lines up with the receiver and then apply gentle pressure to the connector whilst tightening the screw.
- Refill and check for leaks.

6.2.18 SECONDARY DHW PUMP Q33 (SEE 6.4 ITEM 26)

- Close the two shut off valves located on the top and bottom pipes connected to the DHW tank.
- Open the tank drain (very bottom, front, left hand corner of appliance) for 10s to remove pressure.



- Disconnect the two electrical connections
- Undo the unions at the top and bottom of the pump body and remove pump (have a receptacle ready to catch any escaping water).
- Replacement is the reverse. Fit the new pump seals suppied with the replacement pump.
- Refill and check for leaks.

6.3 COMPONENT PARTS LIST

Refer to section 6.4 for item location reference

Item number	Description	Part Number
1	Primary heat exchanger	5139773
2	Heat exchanger silicone door seal	5139774
2A	Heat exchanger door internal insulation	call for part no
3	Burner door nut set	5139783
4	Burner	5139781
5	Burner gasket	5139782
6	Fan	5139777
7	Fan gasket	5139778
8	Ionisation electrode c/w gasket & screws (LPG Compatible)	7669652
9	Spark electrode c/w gasket & screws	5139785
10	Spark generator	5139784
11	HT lead	5139786
12	Gas valve	5139779
13	Venturi	5139780
14	Air control tube and flap assembly	5142713
15	DHW tank 300 litre	call for part no
16	DHW tank inspection hatch c/w bridge, nut & o-ring	5139809
17	DHW tank temperature & pressure relief valve 3/4"	G068
18	DHW tank temperature & pressure relief valve 1"	5139805
19	Condensate pipe non-return valve	5142712
20	Condensate trap	E211
21	Pressure relief valve (4 bar)	5142698
22	Tundish 1 inch (4 bar)	5139811
23	Plate heat exchanger c/w fittings	5139775
24	Heat exchanger pump (Q1)	5142701
25	DHW primary pump (Q3)	5142699
26	DHW secondary pump (Q33)	5142700
27	Non-return valve assembly for heat engine & DHW charging	5142704
28	Heat exchanger pump isolation valve	5142702
29	Flow or return temperature sensor	5139794
30	Flue temperature sensor	5139798
31	Primary water pressure sensor	5142697
32	LLH/DHW tank temperature sensor	5139795
33	DHW tank charging temperature sensor	5139797
34	Air pressure switch (condense line)	5142695
35	OC1345 communication device (c/w cable)	5139792
36	AVS74 Graphical User Interface	5142711
37	On / Off power switch	5142705
38	Reset switch	5142706
39	LMS Interface PCB	5142707

6.3 COMPONENT PARTS LIST (CONT)

Item number	Description	Part Number
40	COMBIflo LMS14 PCB 1	5142708
41	COMBIflo LMS14 PCB 2	5142709
42	COMBIflo LMS14 PCB 3	5142710
43	AGU2.5 clip-in extension	5139793
44	QAC34 Out-side sensor	5104726
LPG	LPG 5.2mm Orifice	7669653
Optional	RGB Room sensor	5117803
Optional	QAD36 Flow temperature sensor	5103867
Optional	QAA55 Programmable room thermostat	5138511
Optional	QAA75 Programmable room controller	5117802
Optional	Commissioning controller	5141599

6.4 COMPONENT ILLUSTRATIONS

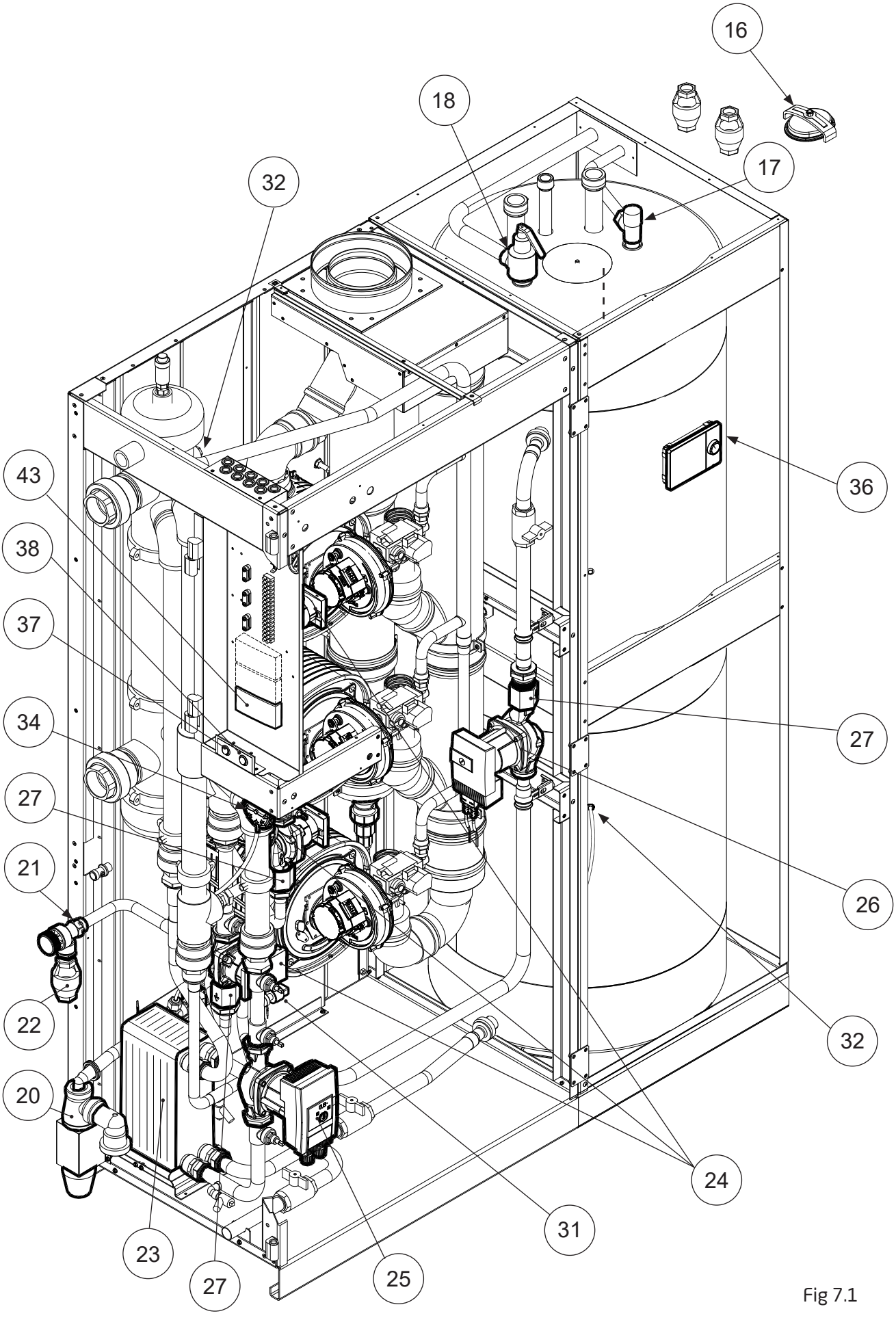
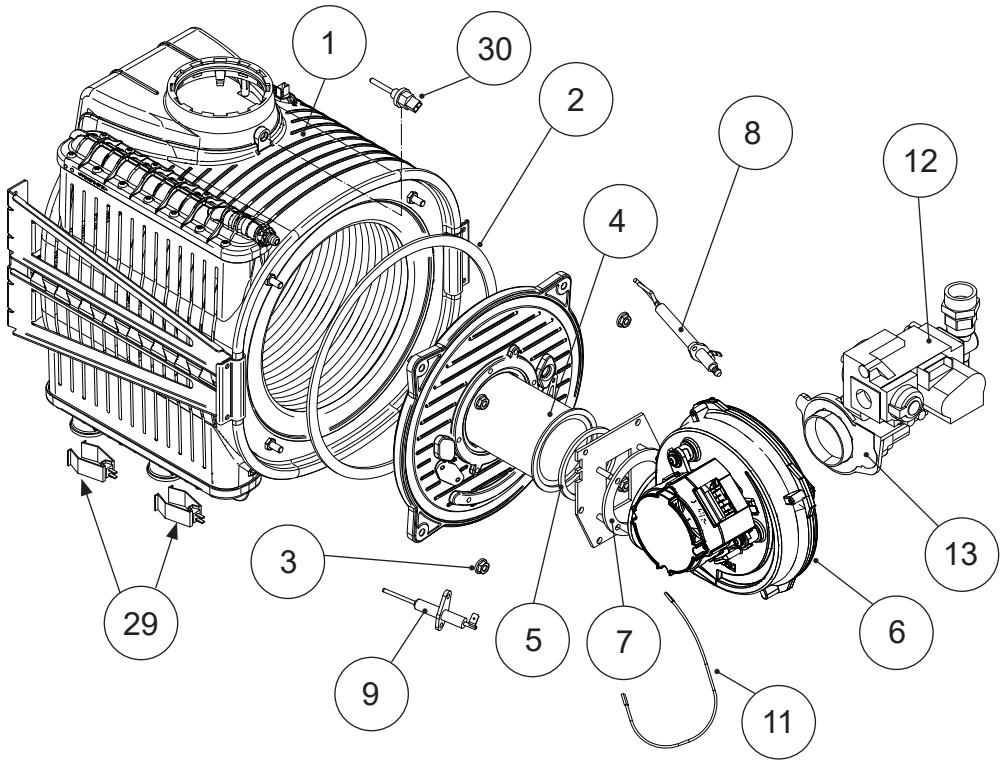
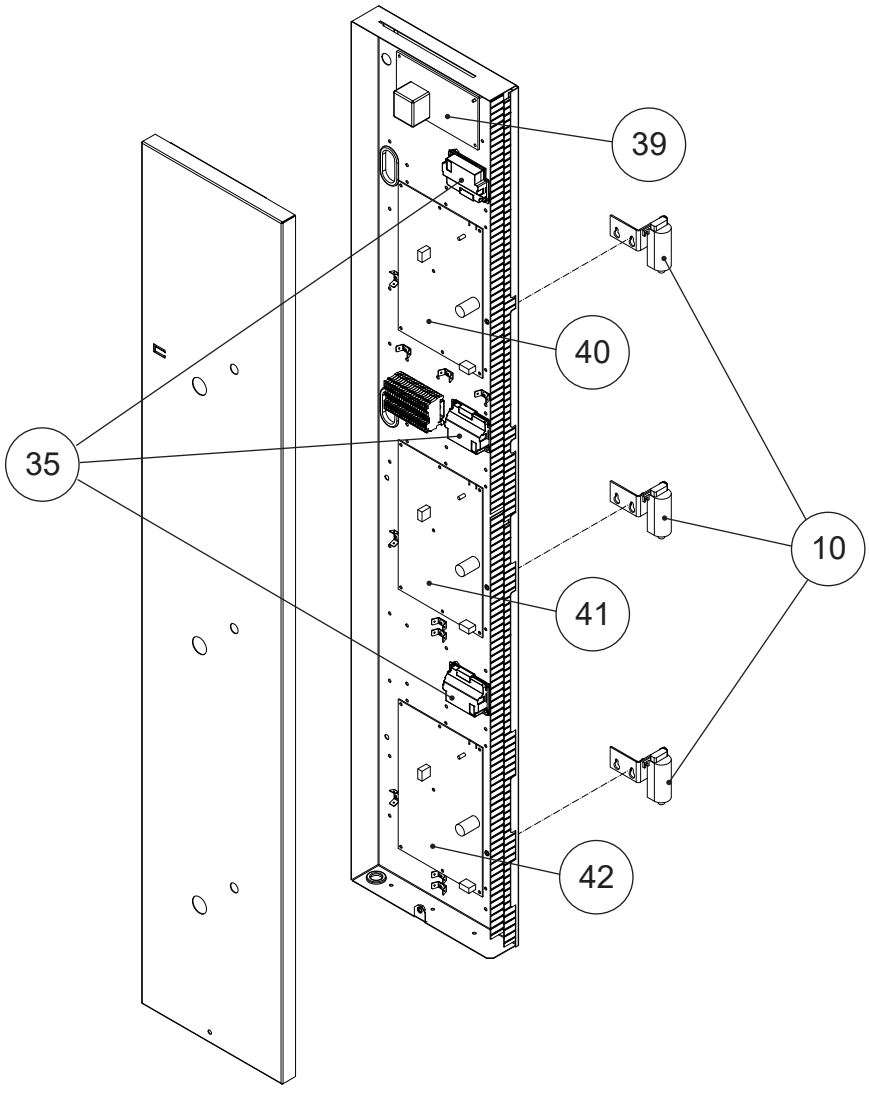


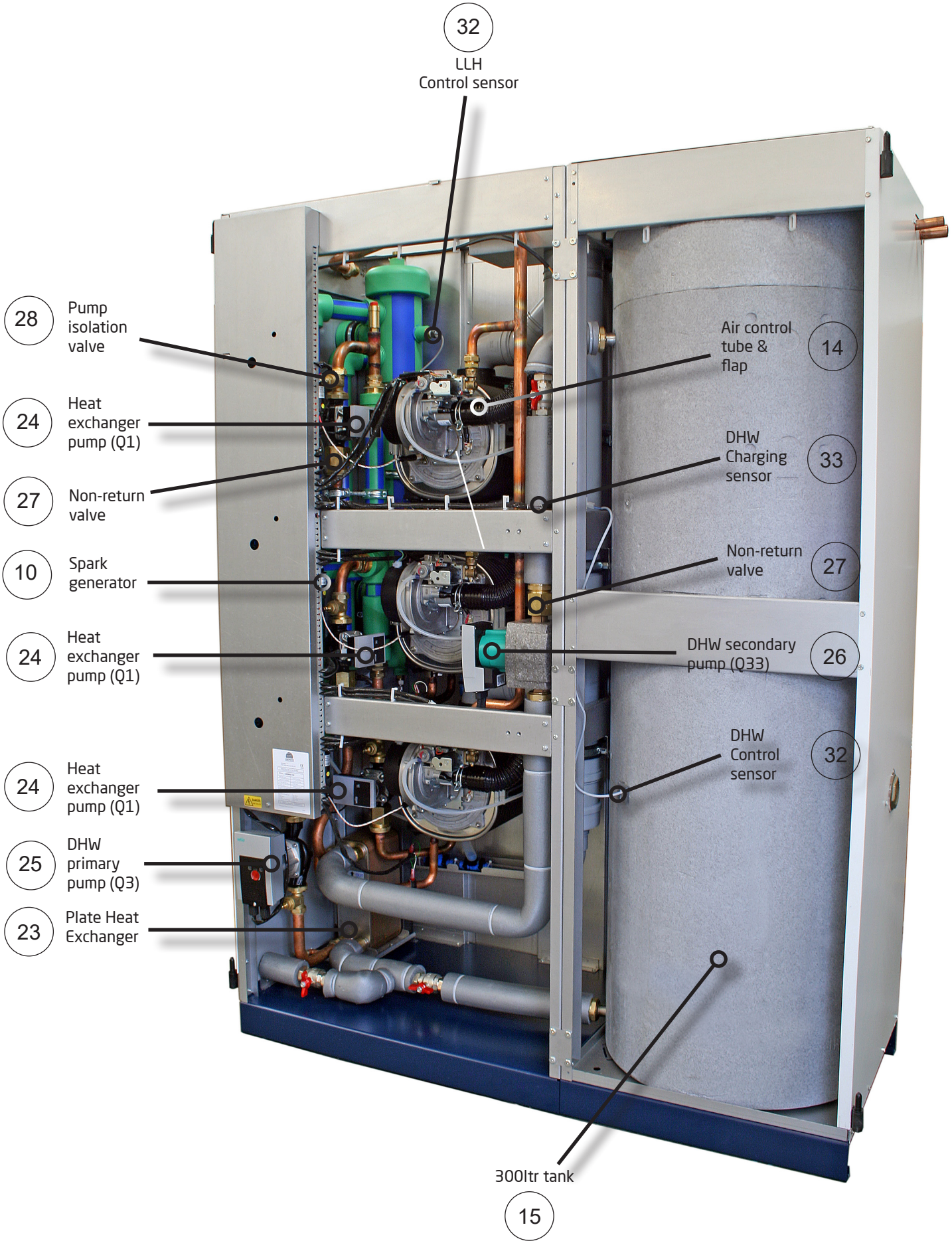
Fig 7.1

6.4 COMPONENT ILLUSTRATIONS (CONTINUED)





6.4 COMPONENTS ILLUSTRATIONS (CONTINUED)



6.5 RECOMMENDED SPARES REQUIREMENTS

As with all boilers, most wear occurs on the components containing moving parts that are in regular use. Because there are multiple heat engines in operation inside this appliance, the risk of complete appliance failure is much lower than an appliance containing a single source of heat.

However, there are a few components that if they failed, could result in a complete appliance shut down. In order to facilitate the fastest possible recovery time in the unlikely event of sudden appliance failure. It is recommended that spares are carried for the following essential components:-

- 5142708 - LMS14 control PCB1
- 5142697 - Primary water pressure sensor

} *Essential for DHW & Space heating*

- 5139793 - AGU2.5 extension module

Essential for Space heating

- 5139795 - DHW tank temperature sensor
- 5142699 - DHW Primary pump (Q3)
- 5142700 - DHW Secondary pump (Q33)

} *Essential for DHW generation*

In order to maintain and have operating all heat engines at all times, it would be useful to have the following spares available:-

- 5139785 - Spark electrode c/w gasket and screws
- 5139787 - Ionisation electrode c/w gasket and screws
- 5139794 - Flow & return temperature sensors
- 5139795 - Low loss header sensor
- 5139777 - Combustion fan
- 5139779 - Gas valve
- 5142701 - Heat engine pump (Q1)

6.6 FAULT CODE TABLE

Code	Fault Description	Notes
10	Outside sensor, error	Check connections and / or replace faulty sensor (B9)
20	Boiler temperature 1, sensor error	Check connections and / or replace faulty sensor (B2)
22	Water pressure 3 too low	Check water pressure in primary system
26	Common flow temperature, sensor error	Check connections and / or replace faulty sensor (B10)
28	Flue gas temperature, sensor error	Check connections and / or replace faulty sensor (B8)
30	Flow temperature 1, sensor error	Check connections and / or replace faulty sensor (B1)
32	Flow temperature 2, sensor error	Check connections and / or replace faulty sensor (B12)
40	Return temperature 1, sensor error	Check connections and / or replace faulty sensor (B7)
50	DHW temperature 1, sensor error	Check connections and / or replace faulty sensor (B3)
60	Room temperature 1, sensor error	Check connections and / or replace faulty sensor (R1)
65	Room temperature 2, sensor error	Check connections and / or replace faulty sensor (R2)
68	Room temperature 3, sensor error	Check connections and / or replace faulty sensor (R3)
70	Storage tank temperature 1, sensor error	Check connections and / or replace faulty sensor (R4)
81	LPB Short circuit	Check ribbon cable of OCI345 is not shorting on casing
83	LPB collision	Duplicate LPB address - Check all PCBs function 6600
84	BSB address collision	Room unit incorrectly configured - see function 40
98	Extension module 1, error	Module 1 configuration error - Check parameters
99	Extension module 2, error	Module 2 configuration error - Check parameters
100	2 Clock time masters	Only PCB no 1 is set as time master - see Function 6640
110	STB lockout	Check connector X18a and all flow & return sensors
111	Shutdown limit thermostat	Heat exchanger temperatures have been exceeded
119	Shutd water pressure switch	Check for condensate or flue blockage
121	Flow temperature heating circuit 1 not reached	Htg Circuit 1, time temp parameter not reached
122	Flow temperature heating circuit 2 not rached	Htg Circuit 2, time temp parameter not reached
126	DHW charging temperature not reached	Check operation and heat up times for DHW
127	DHW legionella temperature not reached	Check operation of appliance
128	Loss of flame during operation	Ionisation current lost after successful ignition
130	Flue gas temp too high	Heat Engine is overheating. Check causes of high temperatures
133	Safety time exceeded	Ignition unsuccessful after 5 attempts
151	BMU Internal error	Check polarity is not reversed to the appliance
152	Parameterization error	Incorrect / Conflicting parameters input.
153	Unit manually locked	Check condense line for blockage / Manual reset applied >10s
160	Fan speed threshold not reached	Required fan speed not reached
217	Sensor error	Ionisation current fault.
218	Pressure supervision	Water pressure near critical level -top up system
317	Mains frequency outside permissable range	Check electrical installaiton
320	DHW Charging temperature, sensor error	Check connections and / or replace faulty sensor (B36)
322	Water Pressure 3 too high	System water pressure too high - relieve water pressure
323	Water Pressure 3 too low	Safety shutdown - Water pressure too low - top up system
324	Input BX, same sensors	BX sensor duplicated - check parameters
325	Input BX/extension module, same sensors	BX extension module sensor duplicated - check parameters

Table 3.0

6.6 FAULT CODES LIST (CONTINUED)

Code	Fault Description	Notes
326	Input BX/mixing group, same sensors	BX Mixing Circuit sensor duplicated - check parameters
327	Extension module, same function	Extension Modules duplicated - check parameters
330	Sensor input BX1 without function	BX1 connected but not defined - check parameters
331	Sensor input BX2 without function	BX2 connected but not defined - check parameters
332	Sensor input BX3 without function	BX3 connected but not defined - check parameters
333	Sensor input BX4 without function	BX4 connected but not defined - check parameters
335	Sensor input BX21 without function	BX21 connected but not defined - check parameters
336	Sensor input BX22 without function	BX22 connected but not defined - check parameters
351	Primary controller/system pump, address error	Htg Pump (Q14) not configured on PCB1
353	Cascade flow sensor B10 missing	Check connections and configuration of sensor (B10)
384	Extraneous Light	Ionisation current detected before ignition
385	Mains under voltage	Mains voltage below 185v - check electrical installation
386	Fan speed tolerance	Fan outside allowed speed tolerance level
388	DHW sensor no function	Tank temperature sensor not configured (B3)
432	Function earth not connected	No Ignition earth, X1 / X17 not connected or earth fault
NA	Operating mode button locked - Cannot operate in DHW or Heating mode (No fault displayed)	Remote system enable operating. Check to see if link is still in place or controls wired to these terminals are closing this circuit.

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All the technical information you need is easy to find on our website, using your smart phone, tablet or PC:

-BIM files
-CAD files
-Brochures
-Technical specification sheets
-Case studies
-Installation manuals
-User guides
-Size-It Tool

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