SIMPLY BETTER

Installation and Operating Manual for the ProCon 16, 27, 47, 75 & 77 Wall Mounted Condensing Boiler Range.

MHG Heating Ltd Unit 4 Epsom Downs Metro Centre, Waterfield, Tadworth, Surrey KT20 5LR
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1.0 Appliance Type

There are four build types and four outputs within the ProCon range.

Please ensure you have the correct unit for the application and where required located correctly within the cascade prior to beginning the installation.

ProCon 16H & 16HS, ProCon 27H, 27S & 27HS, ProCon 47H & 47S, ProCon 75&77H & 75&77HM

1.1 The ProCon H range of appliances is designed to be applied to systems requiring direct on boiler weather compensated heating and priority hot water production via a separate high recovery calorifier/cylinder.

1.2 The ProCon S range of appliances is designed to be applied to systems requiring direct on boiler weather compensated heating and priority on demand hot water production via an internal late heat exchanger.

1.3 The ProCon HS range of appliances are designed to be applied to systems requiring direct on boiler weather compensated heating and priority hot water production via a separate high recovery Calorifier/Cylinder, where the diverter valve controlling the production of hot water is within the boiler case.

1.4 The ProCon HS+ can be supplied complete with an integrated high recovery calorifier for simplified and attractive installation housed within and extended case. The high recovery calorifer can be located beneath of adjacent to the boilers. (Further information available via the website www.mhgheating.co.uk)

1.5 The ProCon HM appliance is supplied complete with and integral RVA47 Cascade Manager capable of controlling an additional 11 ProCon boilers. Each subsequent boiler must be fitted with an OCI420 Communication Clip.

The product codes for the entire range are:

Product Name	Product Code
ProCon 16 H	96.30000-7192
ProCon 16 HS	96.30000-7193
ProCon 27 H	96.30000-7194
ProCon 27 S	96.30000-7195
ProCon 27 HS	96.30000-7196
ProCon 47 H	96.30000-7197
ProCon 47S	96.30000-7198
ProCon 75 H	96.30000-7188
ProCon 75 HM	96.30000-7189
ProCon 77 H	96.30000-7190
ProCon 77 HM	96.30000-7191

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2.0 Installation Regulations and Requirements

The installation of Procon HT boilers must be in accordance with the relevant requirements of Gas Safety (Installation & Use) Regulations 1994, Health & Safety at Work Act, Building Regulations, IEE Regulations, Construction (Design & Management) Regulations 1994, Local Authority Bye-Laws, National, Fire Regulations and Insurance Company requirements.

The following Codes of Practice are also applicable:-

BS 5440-1: 2000 Installation of flues and ventilation for gas appliances of rated input not exceeding 70 kW net (1st, 2nd and 3rd family gases).
Part 1: Specification for the installation of flues.

BS 5440-2: 2000 Installation of flues and ventilation for gas appliances of rated input not exceeding 70 kW net (1st, 2nd and 3rd family gases).
Part 2: Specification for installation and maintenance of ventilation for gas appliances.

BS 5449: 1990 Specification for forced circulation hot water central heating systems for domestic premises.

BS 6644: 2005 Specification for gas fired hot water boilers of rated inputs between 70kW (net) and 1.8MW(net) (2nd and 3rd family gases).

BS 6798: 1987 Specification for installation of gas fired hot water boilers of rated input not exceeding 60 kW.

BS 6880: 1988 Code of Practice for low temperature hot water heating systems of output greater than 45kW. Parts 1, 2 & 3.

BS 6891: 1988 Specification for installation of low pressure gas pipework of up to 28mm (R1) in domestic premises (2nd family gases)

BS 7593: 1992 Code of Practice for treatment of water in domestic hot water central heating systems.

BS 7671: 1992 Requirements for electrical installations. IEE Wiring Regulations. Sixteenth edition.

CISBE Guide reference sections B7, B11 and B13.

CP342 Part 2: 1974 Code of Practice for centralized hot water supply.

GE/UP/2 Gas installation pipework, boosters and compressors on industrial and commercial premises.

IGE/UP/4 Commissioning of gas fired plant on industrial and commercial premises

IGE/UP/10 Installation of gas appliances in industrial and commercial premises. Part 1: Flued appliances.

And any addition prevailing regulation and or code of practice not detailed above.

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2.1 Appliance Warranties

All MHG appliances enjoy a full 24 month warranty as detailed in our terms and conditions.

The guarantee period shall begin on the day of commissioning, or at latest 3 months after delivery has been made.

The customer shall only be able to claim against MHG under guarantee if the commissioning of the object of delivery has been carried out by MHG staff or the authorised supplier, if the customer has followed MHG's instructions relating to the treatment and maintenance of the object of delivery, and if no replacement parts of outside origin have been fitted.

Parts subject to wear such as ignition electrodes, seals etc. are strictly excluded from the guarantee."

In addition to the above warranties, the Primary Heat Exchangers carry a 60 month guarantee against manufacturing or material defect.

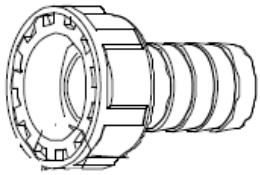
Supplied Components

All ProCons are supplied with the following components.

QAC 34 Outside Air Sensor. (To activate direct on boiler weather compensation.)

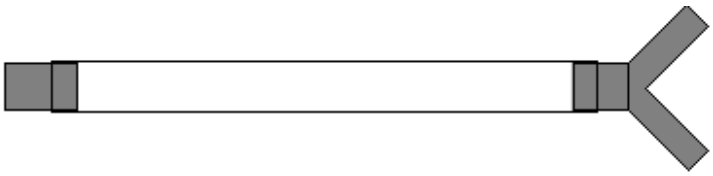
Wall Mounting bracket and fixing kit.

Condensate outlet adapter. (To convert ¾" BPS to 22mm plastic waste.)



Bleed key & heat exchanger venting hose.

Condensate syphon flushing hose. (To be attached to the heat exchanger and flue waste pipes and flushed with clean water.)



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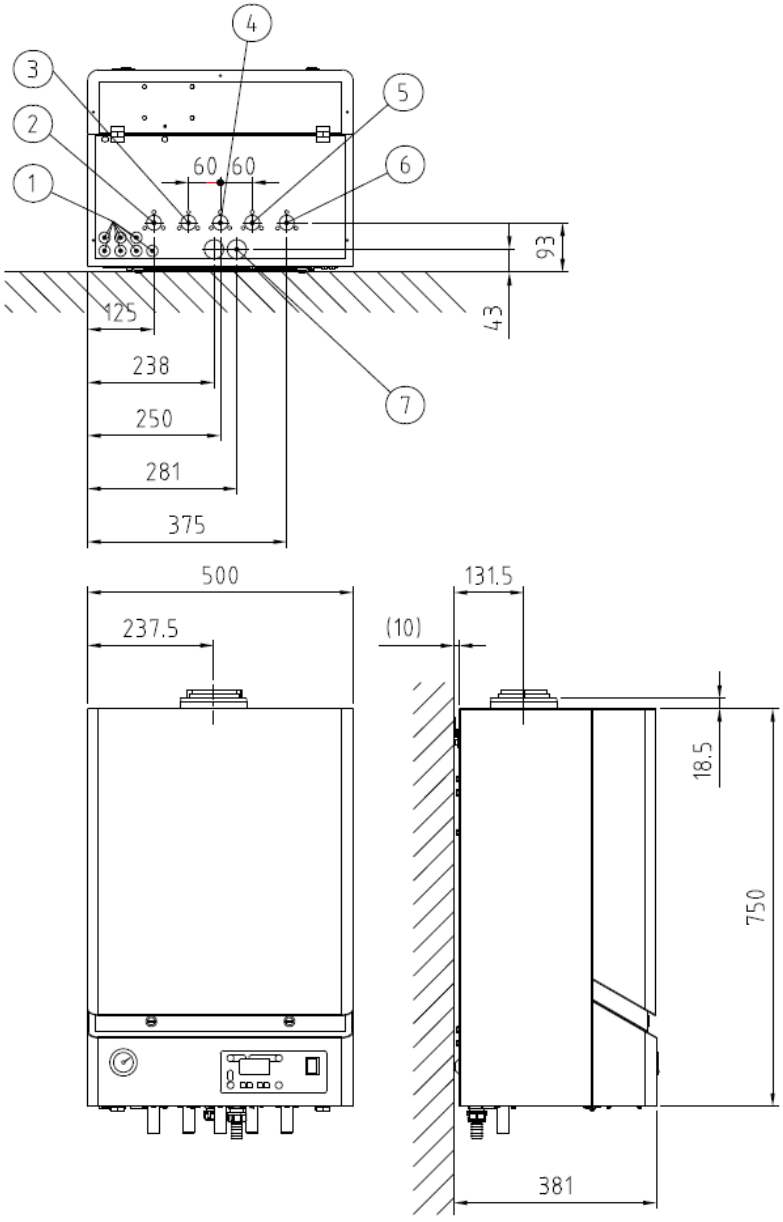
3.0 Dimensions. 16 – 47 Boilers



Legend

1	Cable Entry Grommets	**5**	Hot Water Primary Return 22mm (HS Models) Cold Water Inlet 22mm (S Models)
2	Heating Flow 22mm (All Models)	**6**	Heating Return 22mm (All Models)
3	Hot Water Primary Flow 22mm (HS Models) Hot Water Outlet 22mm (S Models)	**7**	Condensate Outlet ¾" BSP Plastic
4	Gas Inlet 22mm	**7.1**	Condensate Cleanout Connection ¾" Cap

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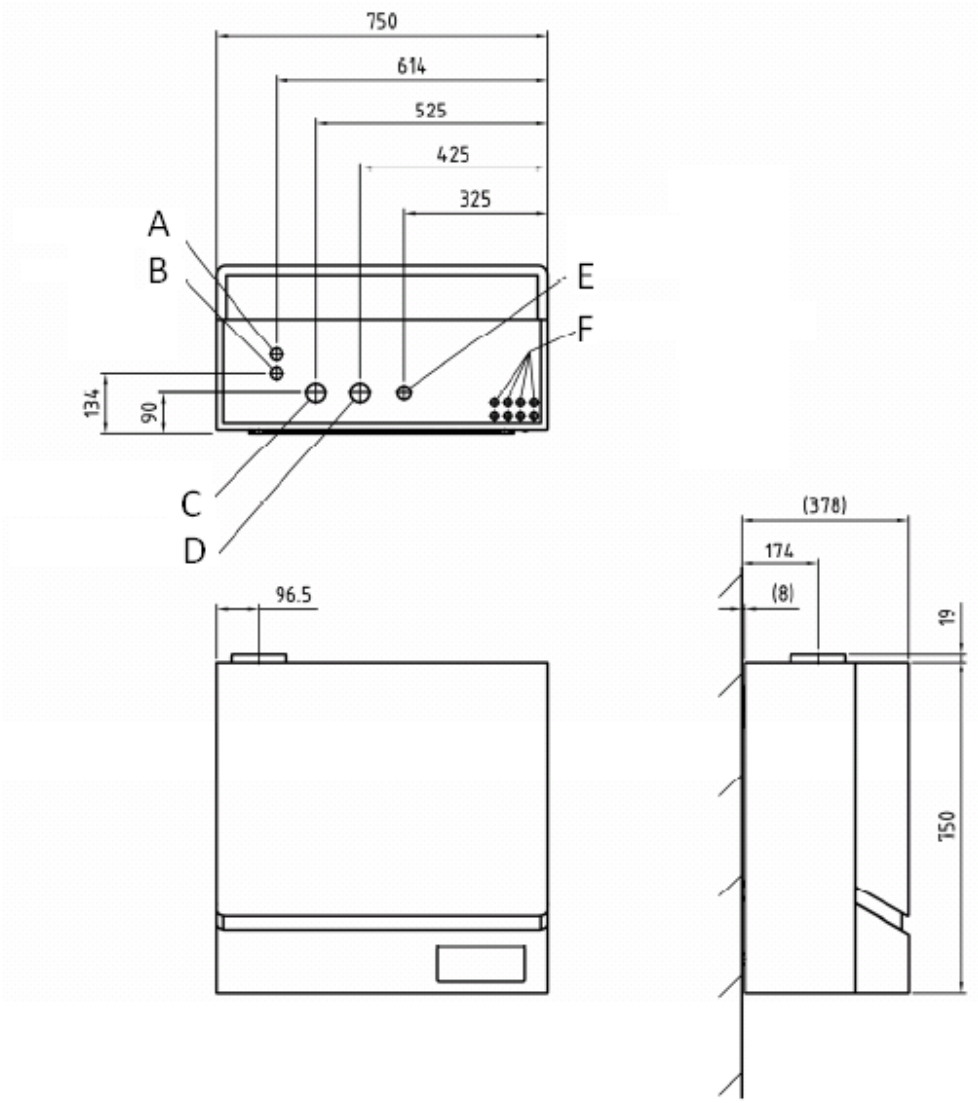
3.1 Dimensions. 75 Boiler



Legend

A	Condensate Cleanout Connection ¾" Cap	**D**	Heating Flow 1 ¼"
B	Condensate Outlet ¾" BSP Plastic	**E**	Gas Supply inlet ¾"
C	Heating Return 1 ¼"	**F**	Cable Entry Grommets

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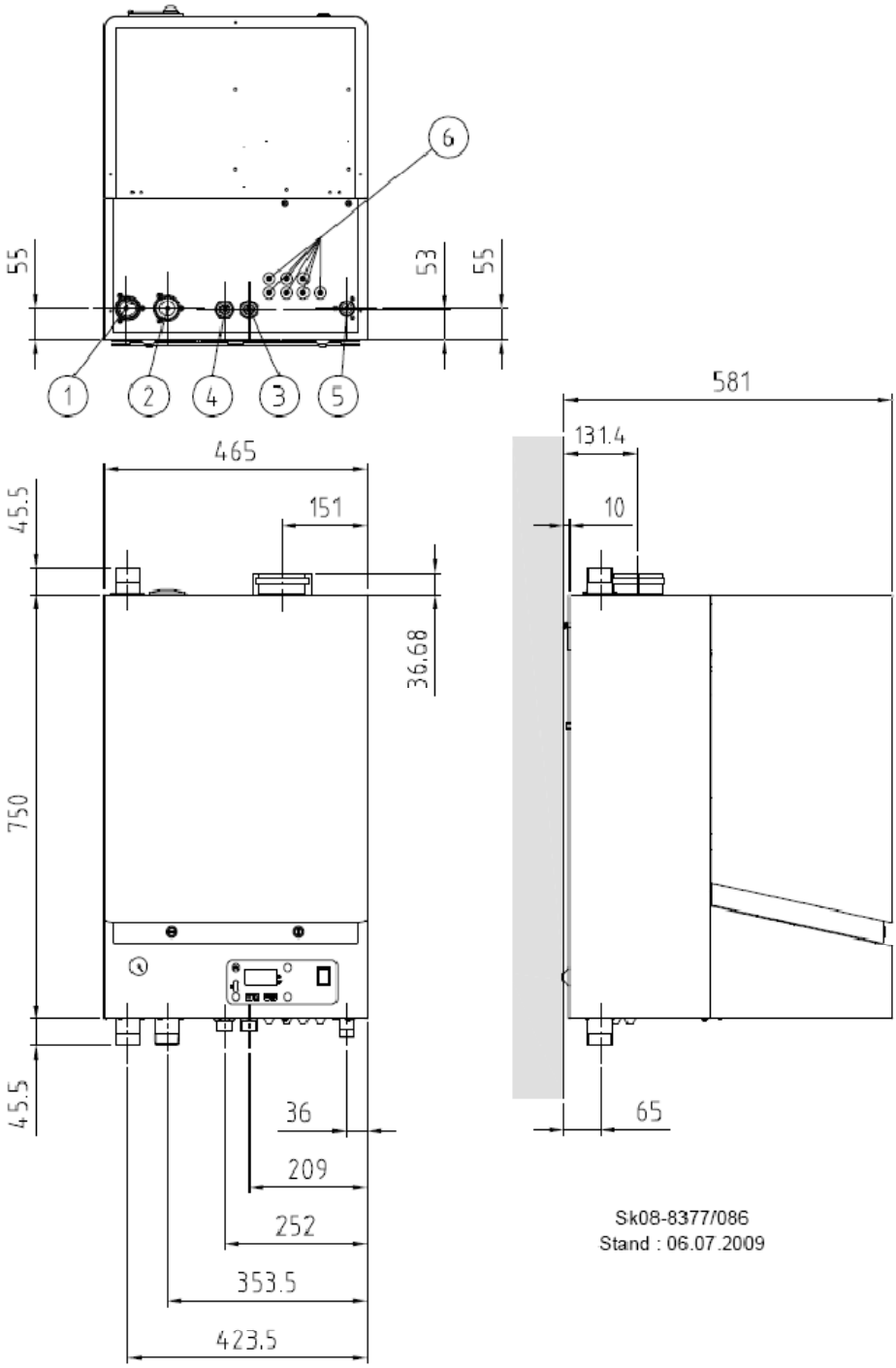
3.2 Dimensions. 77 Boiler



Legend

1	Heating Return Connection 1 ¼"	**4**	Condensate Cleanout Connection ¾" Cap
2	Heating Flow Connection Option 1 ¼"	**5**	Gas Inlet ¾"
3	Condensate Outlet ¾" BSP Plastic	**6**	Cable Entry Grommets

Please note that the flexible flow connection can be rerouted to the top of the boiler if required.

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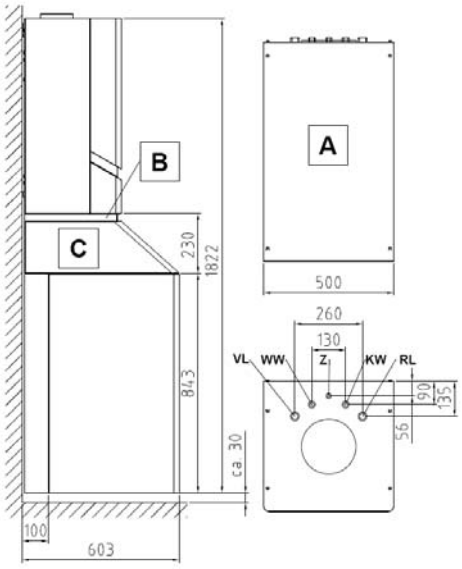
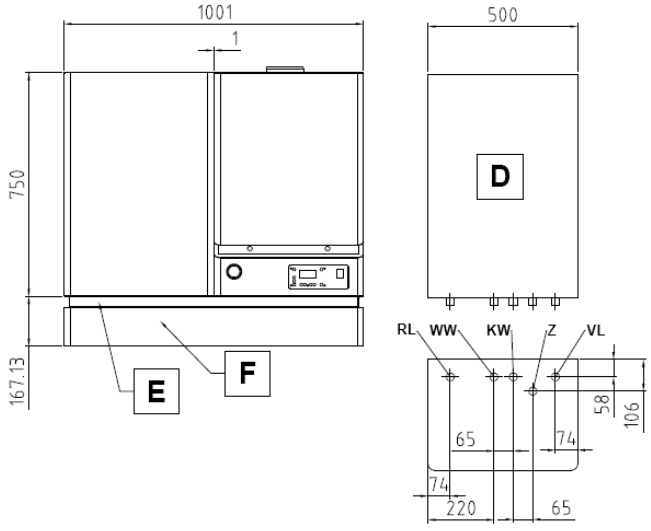
3.3 Dimensions HS + Calorifier Below (Additional information available from the website www.mhgheating.co.uk)



Legend

VL	Hot water Primary Flow 1"	**RL**	Hot Water Primary Return 1"
WW	Hot Water Secondary Outlet ¾"	**A**	120 Litre Calorifier
Z	Hot Water Secondary Return ½"	**B**	Pipework Cover
KW	Cold Water Secondary Inlet ¾"	**C**	Calorifier Cover

3.3 Dimensions HS + Calorifier Adjacent (Additional information available from the website www.mhgheating.co.uk)



Legend

RL	Hot Water Primary Return ¾"	**VL**	Hot water Primary Flow ¾"
WW	Hot Water Secondary Outlet ¾"	**D**	60 Litre Calorifier
KW	Cold Water Secondary Inlet ¾"	**E**	Calorifier Cover
Z	Hot Water Secondary Return ½"	**F**	Pipework Cover

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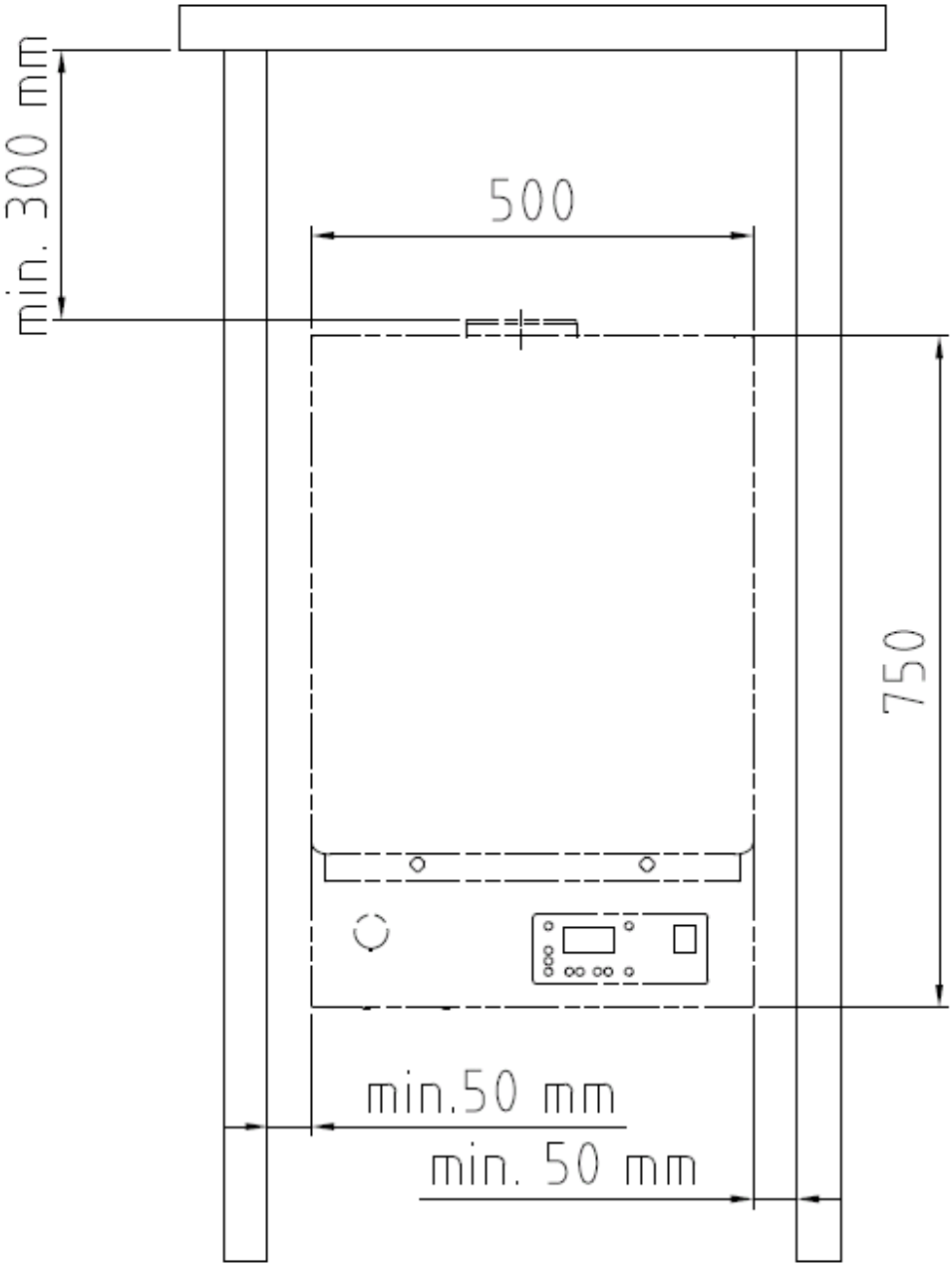
3.4 Installation and Service Clearances 16-47 Boilers



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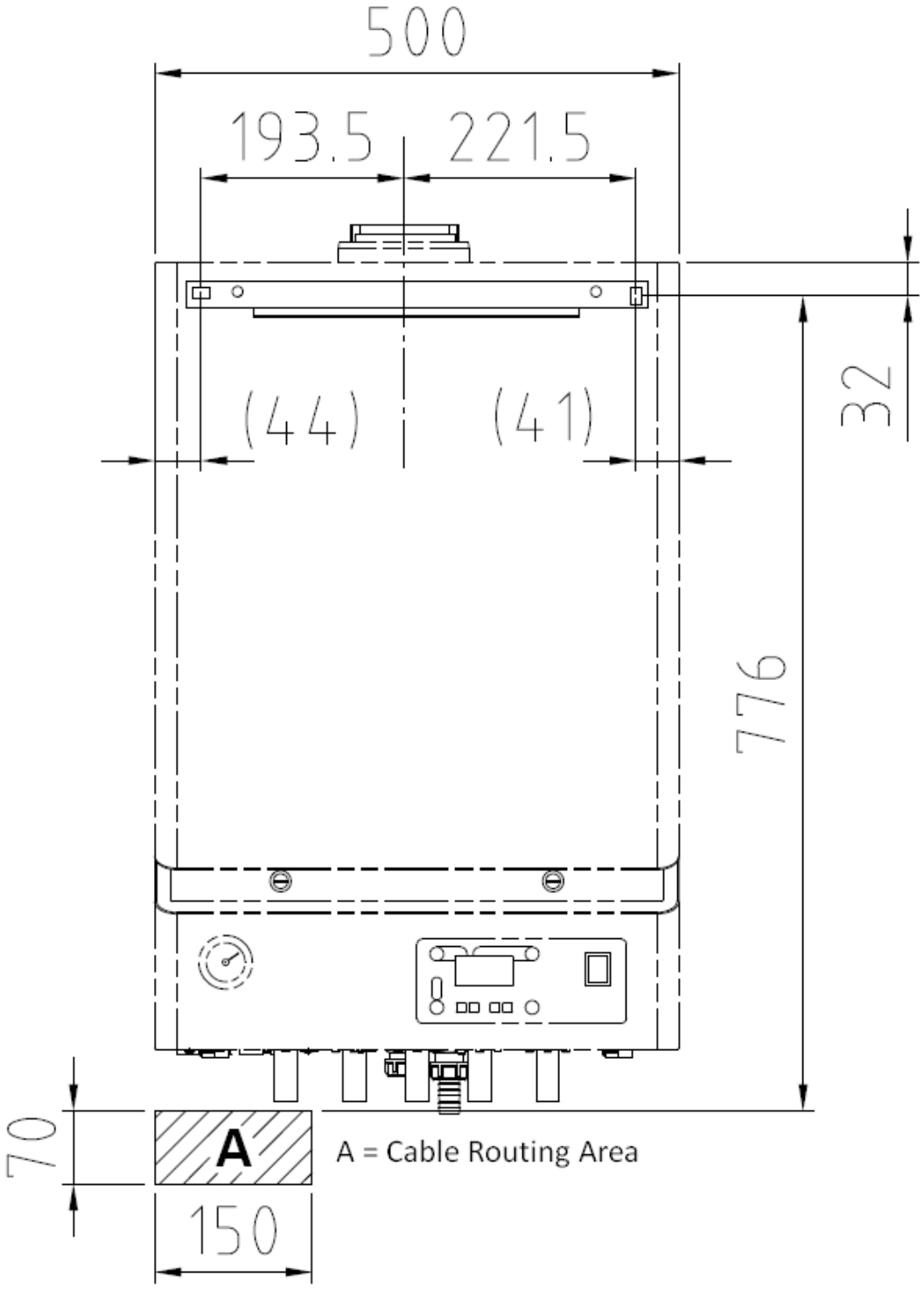
3.4 Mounting Information 16 – 47 Boilers



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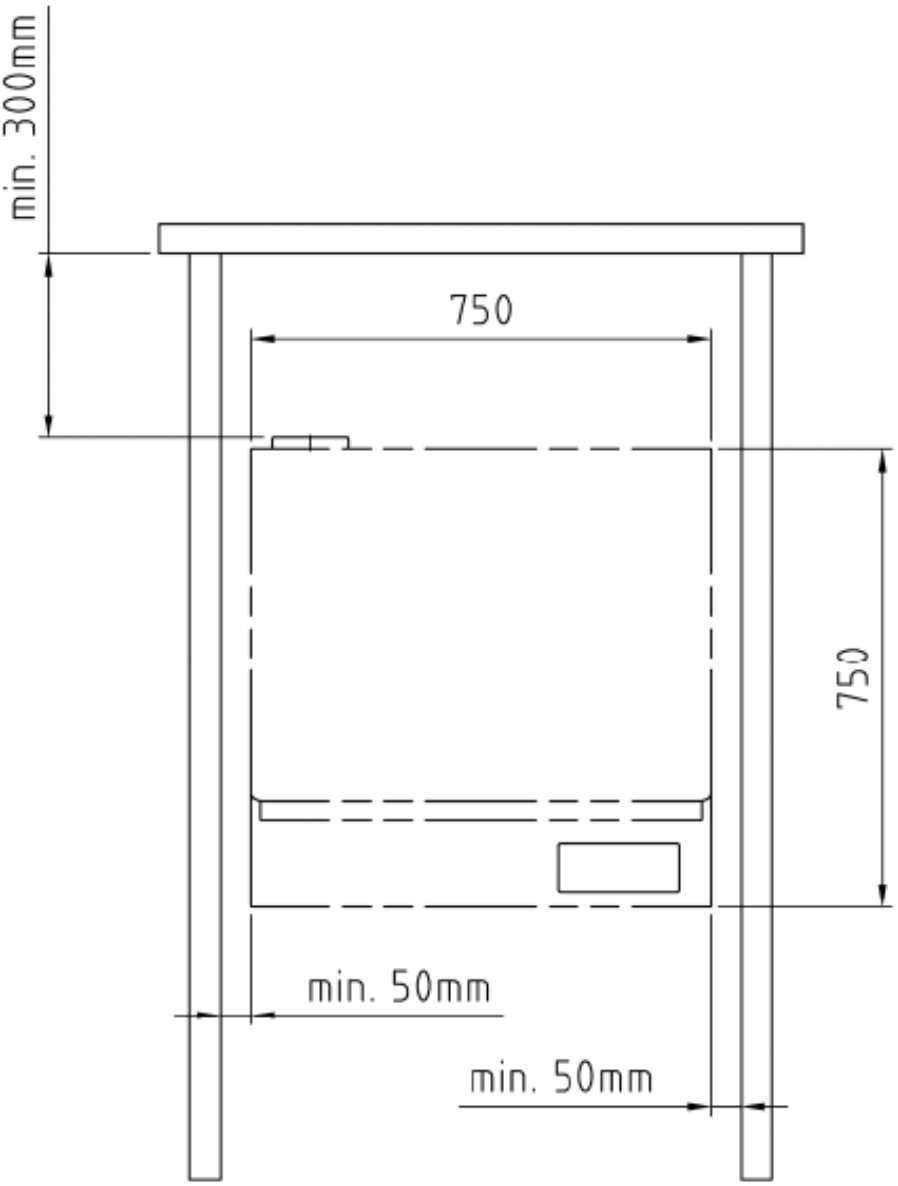
3.5 Installation and Service Clearances 75 Boiler



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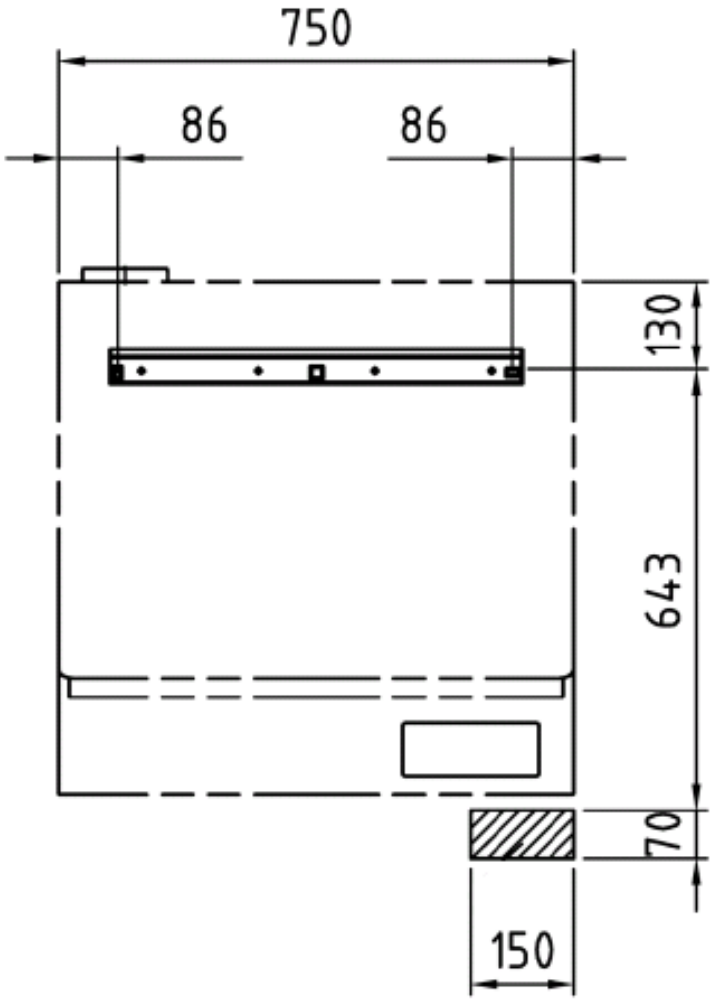
3.5 Mounting Clearances 75 Boiler



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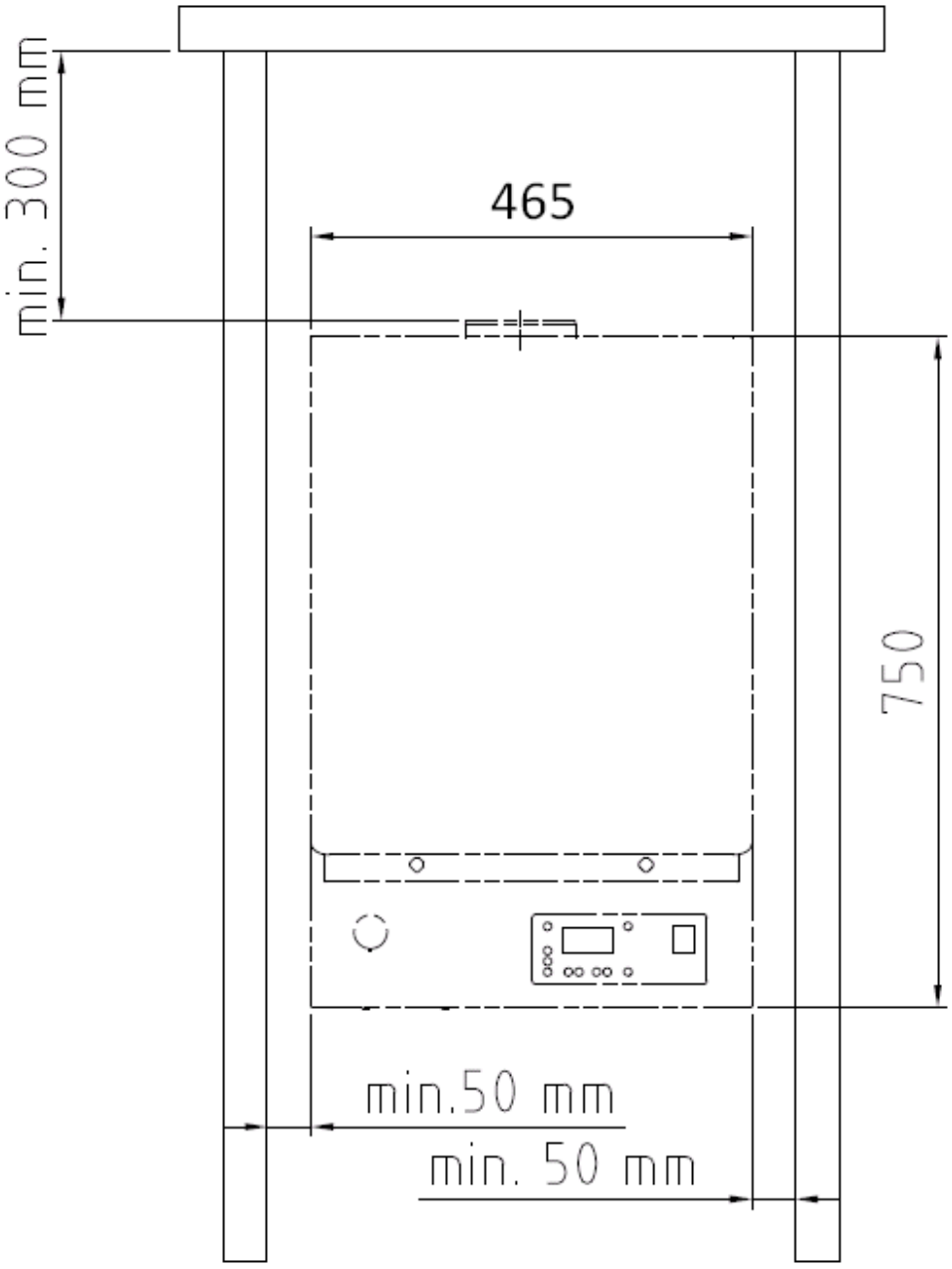
3.6 Installation and Service Clearances 77 Boiler



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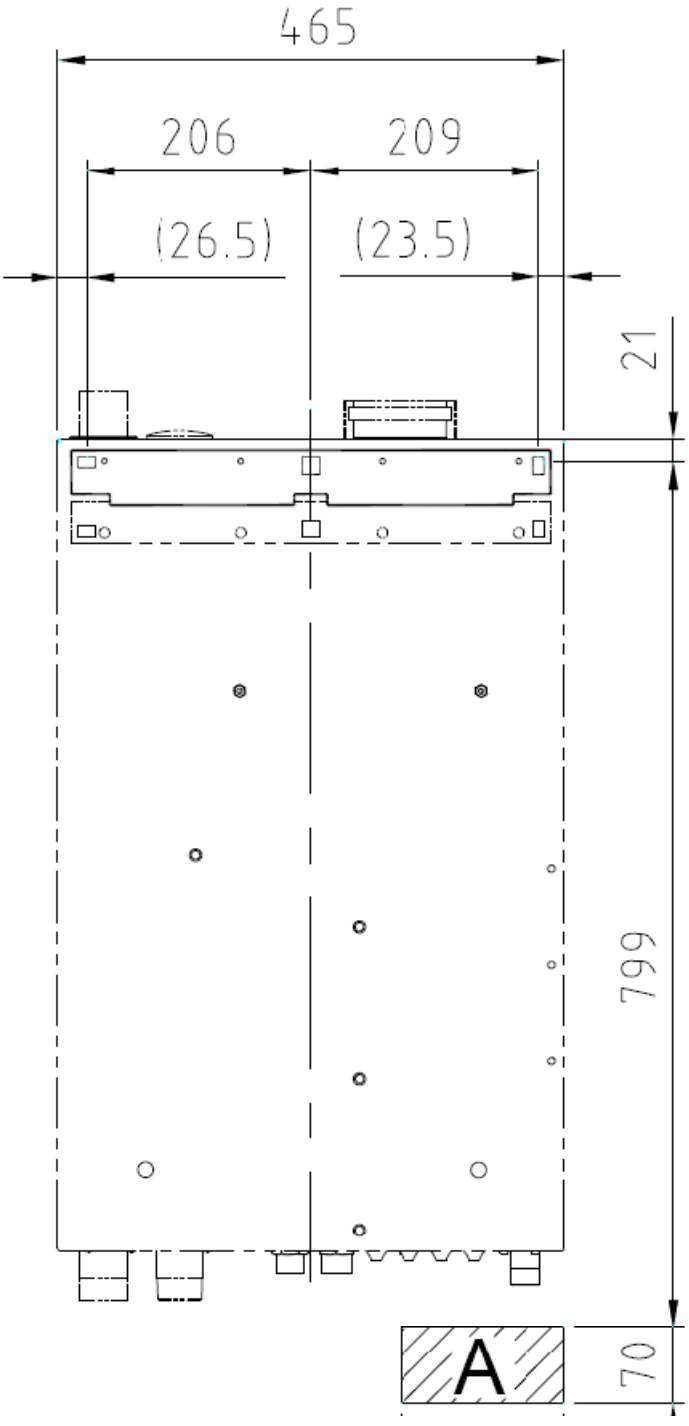
3.6 Mounting Clearances 77 Boiler



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4.0 Delivery and Mobility

All ProCons are supplied fully tested and therefore may contain residual test water.
The test water utilised contains additives that will help prevent the pump from sticking and other metals from oxidising.

To maintain the structural integrity of the appliance the internal components should not be used during the lifting and positioning of the unit onto the wall bracket.

All packaging materials should be disposed of in an environmentally way.

4.1 Case Removal

To remove the case insert a flat blade screwdriver or similar into the black latch slots and turn through 90^0.

Pull the base of the cover forward and up to release the hooks at the top. Ensure that the earth cable is removed prior to lifting the cover clear.

The lower case housing the display panel can be hinged down to all greater access to all internal components.

The lower case is secured on either side by thumb nuts located on the return edge on the side case.

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5.0 Technical Data

Technical Data		Units	16 H & HS	27 H & HS & (S)	47 H & (S)	75 & 77 H & HM
Nominal Heat Input Net	Min/Max	kW	4.0/15.0	6.5/25.0	12.0/45.0	15.0/70.0
Nominal Heat Input Gross	Min/Max	kW	4.4/16.5	7.2/27.5	13.2/49.5	16.5/77.0
Carbon Emissions 100% Of max Output	G20 G31	kgC/kWhr kgC/kWhr	0.061 0.078	0.061 0.078	0.061 0.078	0.060 0.077
Carbon Emissions 30% Of max Output	G20 G31	kgC/kWhr kgC/kWhr	0.055 0.070	0.055 0.070	0.055 0.070	0.055 0.070
SEDBUK Rating			B	B	B	B
Operating Efficiency (40°C/30°C)		%	108.8	108.7	108.5	108.5
Nominal Heat Output (50°C/30°C)	Min/Max	kW	4.3/15.8	7.0/26.2	12.9/47.0	16.0/74.6
Design Flow Rate (50°C/30°C)		Ltr/sec	0.188	0.312	0.560	0.880
Nominal Heat Output (80°C/60°C)	Min/Max	kW	3.7/14.5	6.3/24.2	11.7/43.5	14.5/67.8
Design Flow Rate (80°C/60°C)		Ltr/sec	0.172	0.288	0.519	0.807
Hot Water Generation Output		kW		(31.3)	(45)	
Hot water flow rate @ DT 30C		Ltr/min		(15)	(20)	
Min Flow Rate For H/W Activation		Ltr/min		(3)	(3)	
Minimum Flow Rate		**Ltr/sec**	**0.125**	**0.246**	**0.373**	**0.592**
Residual Head from In-built Pump		m/W.C	3.7	1.3	0.5	0.75
Maximum Input Gas Rate	G20 G31	m³/hr m³/hr	1.55 0.57	2.55 1.00	4.65 1.72	6.91 2.60
Gas Inlet Pressure	Min/Max	Mbar	18.0/50.0	18.0/50.0	18.0/50.0	18.0/50.0
Maximum Flue Gas Volume	(Hot)	m³/hr	21.36	40.81	64.08	96.84
Available Fan Pressure		Pa	400	400	400	400
Maximum Water Pressure	(Hot)	bar	3.0	3.0	3.0	3.0
Minimum Water Pressure	(Cold)	bar	0.8	0.8	0.8	0.8
Maximum Flow Temperature		°C	90	90	90	90
Power Supply (230 V / 50 Hz)		Amps	5	5	5	5
Max Power Consumption		Watts	122	129	145	250
Water Content		Ltrs	4	5.2	5.2	8.2
Lift Weight (Dry)		kg	43.0	43.0	43.0	70.0

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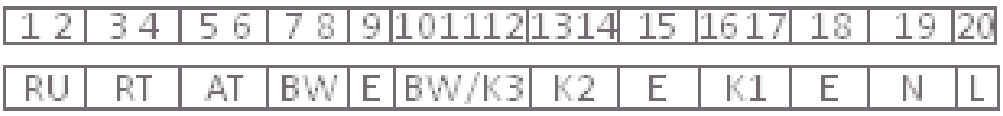
6.0 Pressure (Safety) Relief Valve

In accordance with the prevailing British Standard 5440/6644, the installer shall install as suitably sized Pressure (Safety) Relief Valve.
The location of this valve is important with respect to the applied pressure of the boiler circulation pump, it is therefore recommended to locate the Pressure (Safety) Relief Valve on the flow pipe immediately adjacent to the boiler; furthermore, there must not be any means of isolation between the boiler and the Pressure (Safety) Relief Valve.

7.0 Electrical Connections

Basic electrical connection for all types of ProCon



Legend

Low Voltage Control terminals < 25 Volts		
RU	1	QAA73 Room Unit Not Polarity Sensitive < 24Volts
	2	(Link terminals to activate second heating zone control.)
RT	3	Heating Circuit 1 Volt Free Enable Not Polarity Sensitive (Room stat/BMS) < 24 Volts
	4	
AT	5	Outside Air Sensor (QAC34) Not Polarity Sensitive < 24Volts
	6	(Required to Activate Direct on Boiler Weather Compensation)
BW	7	Hot Water Sensor (QAZ36) or Hot Water Volt Free Enable (Thermostat/BMS).
	8	Not Polarity Sensitive < 24Volts
High Voltage Output and Input Terminals 230 Volts		
E	9	Common Earth Terminal
BW/K3	10	Permanent 230 Volt Output for Motor Open Motor Close Hot Water Diverter Valve
	11	Neutral Terminal for Hot Water Diverter Valve or Charging Pump
	12	230 Volt Output For Hot Water Diverter Valve or Charging Pump (Max 1Amp)
K2	13	230 Volt Output For Heating Circuit Pump (ProCon 16-27)/Boiler Pump ProCon 47, 75&77) (Max 1Amp)
	14	Neutral Terminal for heating/Boiler Pump
E	15	Common Earth Terminal
K1	16	Neutral Terminal for heating/Boiler Pump
	17	230 Volt Output For Boiler Pump (ProCon 16-27)/Heating Circuit Pump ProCon 47,75&77) (Max 1Amp)
E	18	Permanent Earth Terminal
N	19	Switched Fused Permanent Neutral
L	20	Switched Fused Permanent 230 Volt Live (Max 5Amp)

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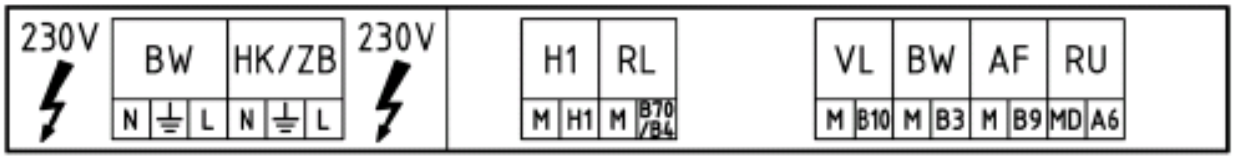
Enhanced electrical connection for ProCon HM (Units supplied with an integral Cascade manager)



Legend

High Voltage Output Terminals 230 Volts		
BW	N	Neutral Terminal for Hot Water Charging Pump
	E	Earth Terminal for Hot Water Charging Pump
	L	230 Volt Output For Hot Water Charging Pump (Max 1Amp)
HK/ZB	N	Neutral Terminal for Heating Circuit Pump
	E	Earth Terminal for heating Circuit Pump
	L	230 Volt Output For Heating Circuit Pump (Max 1Amp)
Low Voltage Control terminals < 25 Volts		
H1	M	H1 Ground Terminal
	H1	Controller Operating Input (Volt free Enable/0-10 Volt Control/Mode Alteration)
RL	M	System Return Sensor (QAD 21) Terminal Not Polarity Sensitive < 25 Volts
	B70/B4	
VL	M	System Flow Sensor (QAD 21) Terminal Not Polarity Sensitive < 25 Volts
	B10	
BW	M	Hot Water Sensor (QAZ21) or Hot Water Volt Free Enable (Thermostat/BMS). Not Polarity Sensitive < 24Volts
	B3	
AF	M	Outside Air Sensor (QAC32) or (620Ω Substitute Resistor = -1◦C) Not Polarity Sensitive < 24Volts (Required to Activate Direct On Boiler Weather Compensation)
	B9	
RU	MD	Cascade Controller Output to Slave Boilers. Polarity Sensitive (Screened Cable Required) (X41 Terminal 2 (Right) OCI420 Communication Clip)
	A6	Cascade Controller Output to Slave Boilers. Polarity Sensitive (Screened Cable Required) (X41 Terminal 1 (Left) OCI420 Communication Clip)

Please note that two outside air sensors are available. Please ensure that the units are wired as follows.

QAC31/32	QAC34
Wired to the AT terminal of the RVA 47 Cascade Controller.	Wired to the AT terminal of the boiler.

In either case the outside air temperature will be communicated to all controllers.

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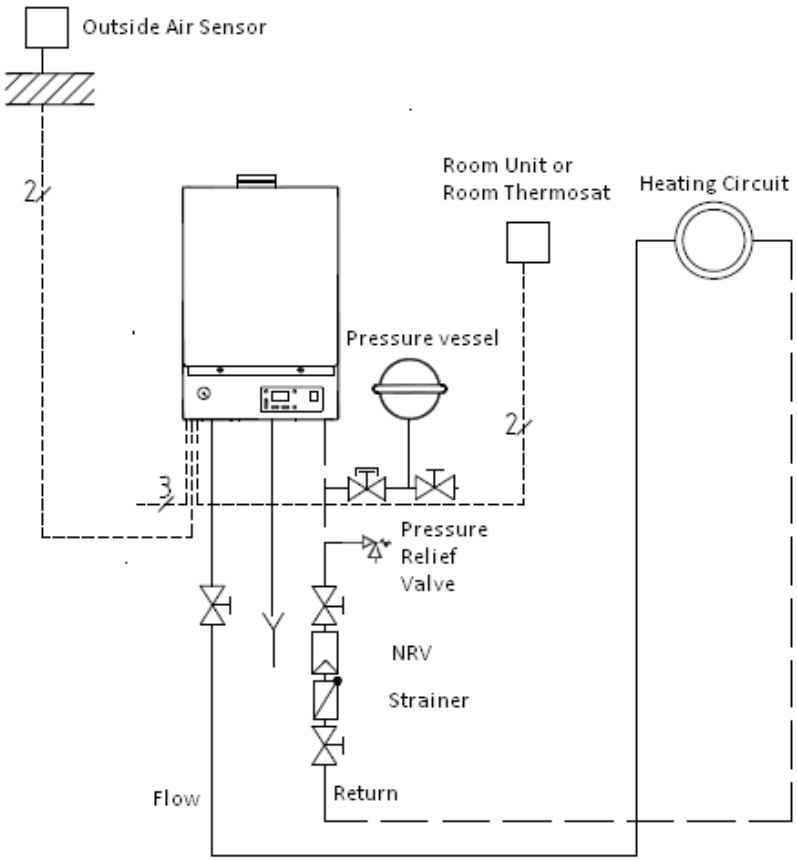
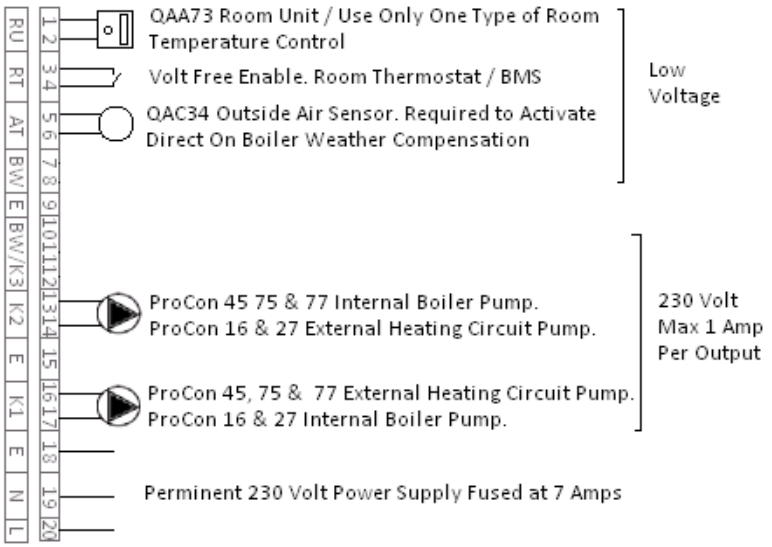
8.0 Hydraulic Design Single Unit (Option 1)



Electrical Connections Single Unit (Option 1)



Parameter #	Parameters Description	Default	Proposed Change
H554 b3	Weather Compensation (1) / Constant Flow Temperature Operation (0) (E10 Error signal when outside air sensor is not installed.)	1	0

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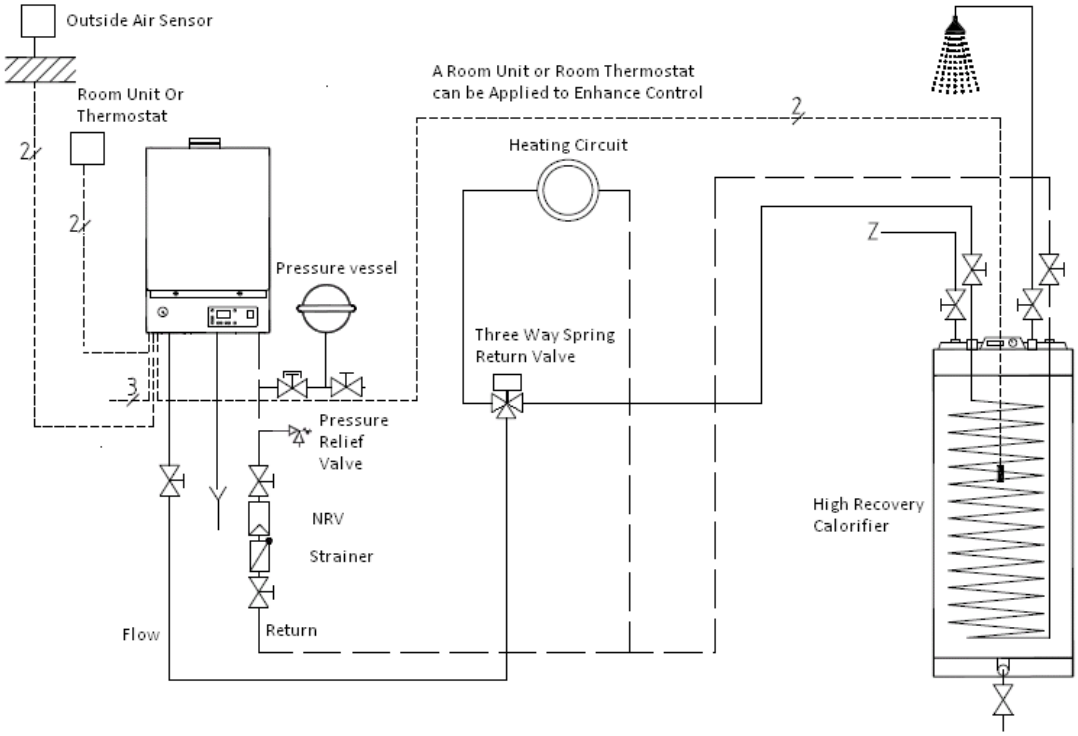
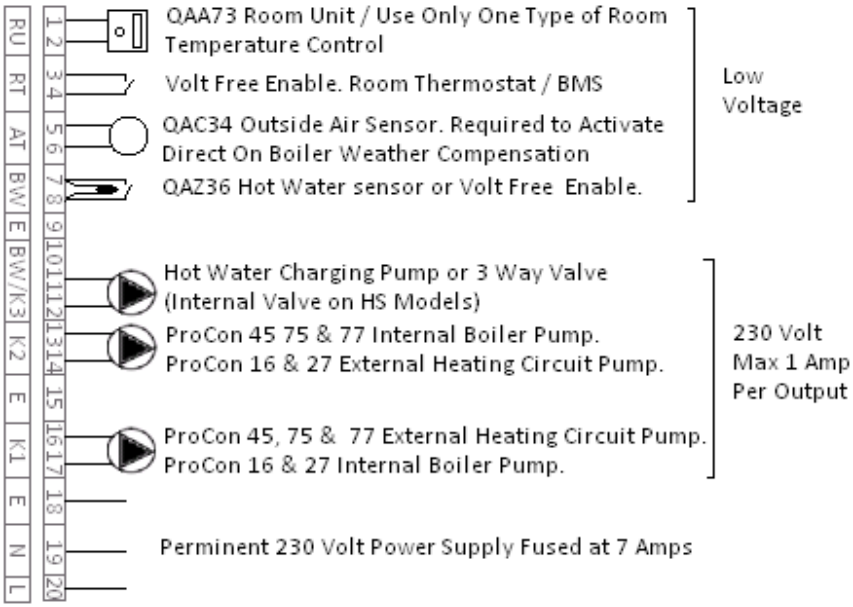
8.1 Hydraulic Design Single Unit (Option 2)



Electrical Connections Single Unit (Option 2)



Parameter #	Parameters Description	Default	Proposed Change
H554 b3	Weather Compensation (1) / Constant Flow Temperature Operation (0) (E10 Error signal when outside air sensor is not installed.)	1	0
H558 b2	Hot Water Storage Sensor (0) / Hot Water Thermostat (1) (E50 Error signal when sensor is not used.)	0	1

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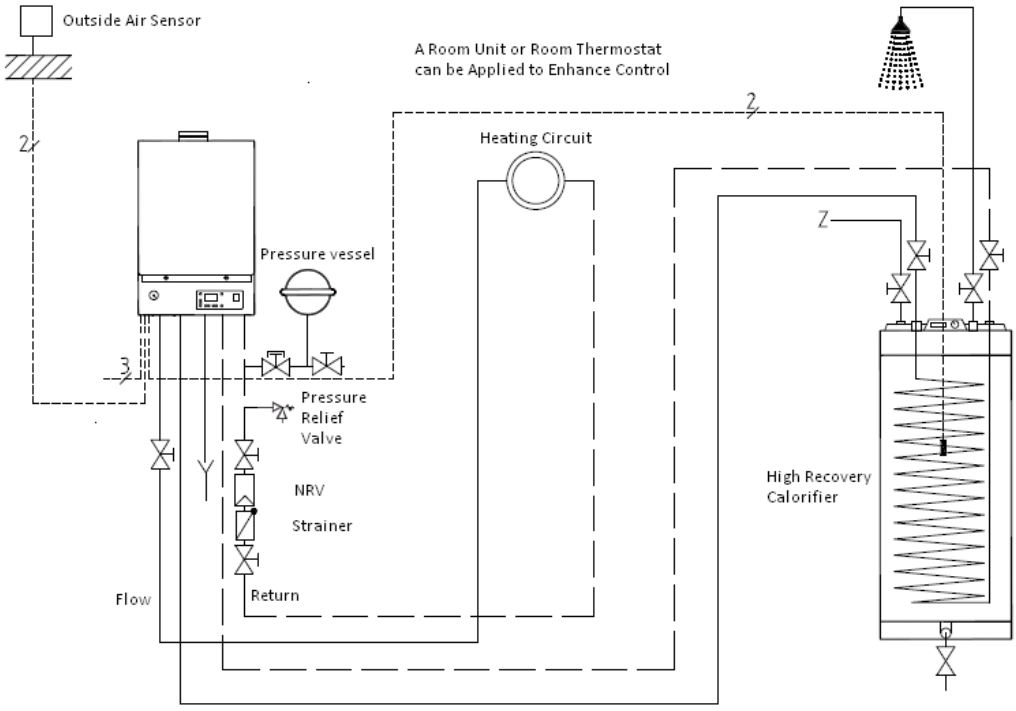
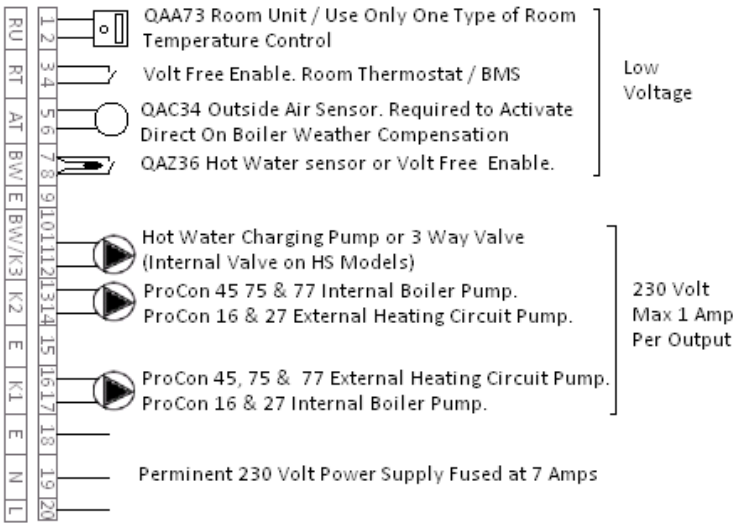
8.2 Hydraulic Design Single Unit (Option 3),



Electrical Connections Single Unit (Option 2)



Parameter #	Parameters Description	Default	Proposed Change
H554 b3	Weather Compensation (1) / Constant Flow Temperature Operation (0) (E10 Error signal when outside air sensor is not installed.)	1	0
H558 b2	Hot Water Storage Sensor (0) / Hot Water Thermostat (1) (E50 Error signal when sensor is not used.)	0	1

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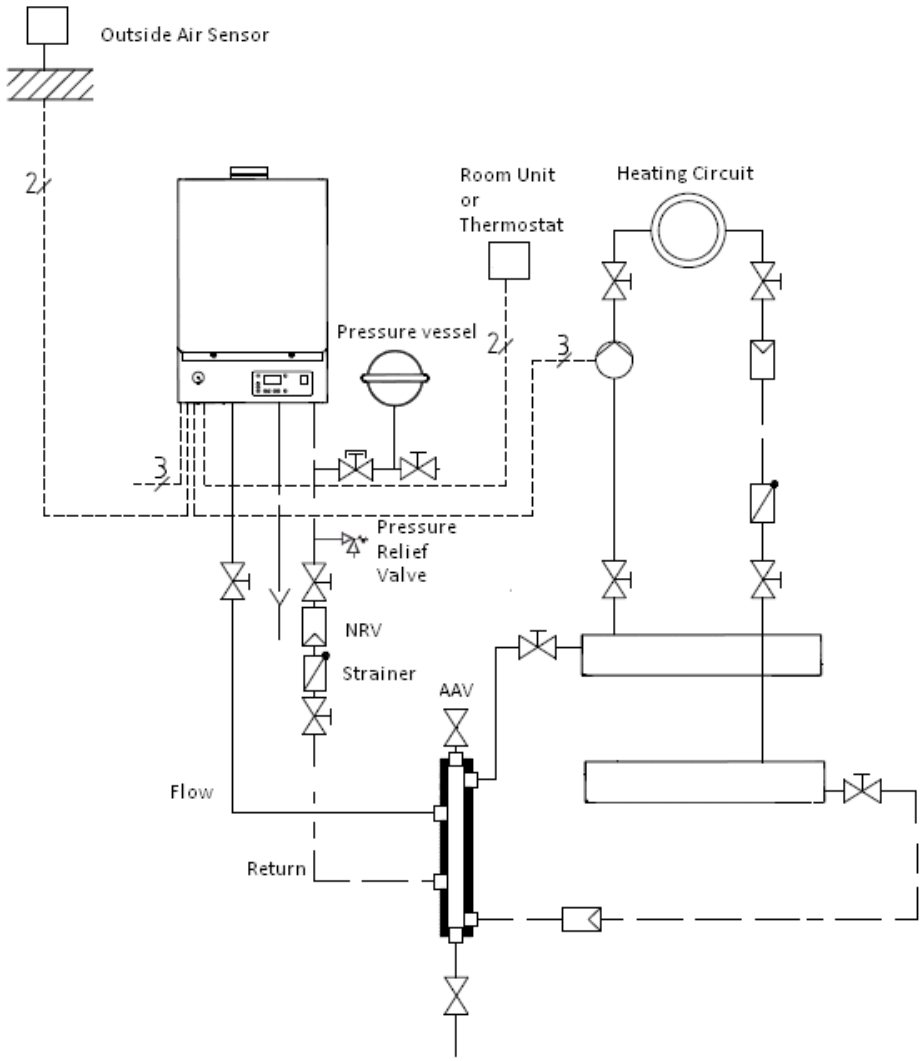
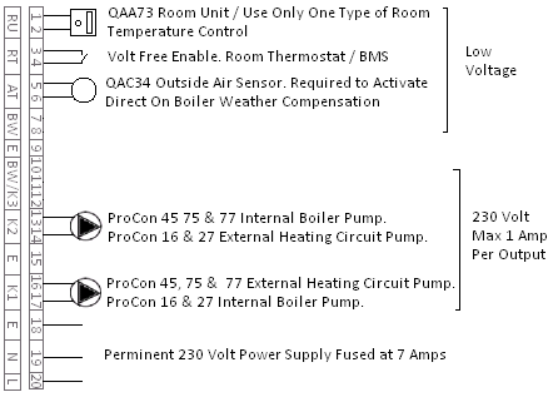
8.3 Hydraulic Design Single Unit (Option 4)



Electrical Connections Single Unit (Option 4)



Parameter #	Parameters Description	Default	Proposed Change
H554 b3	Weather Compensation (1) / Constant Flow Temperature Operation (0) (E10 Error signal when outside air sensor is not installed.)	1	0

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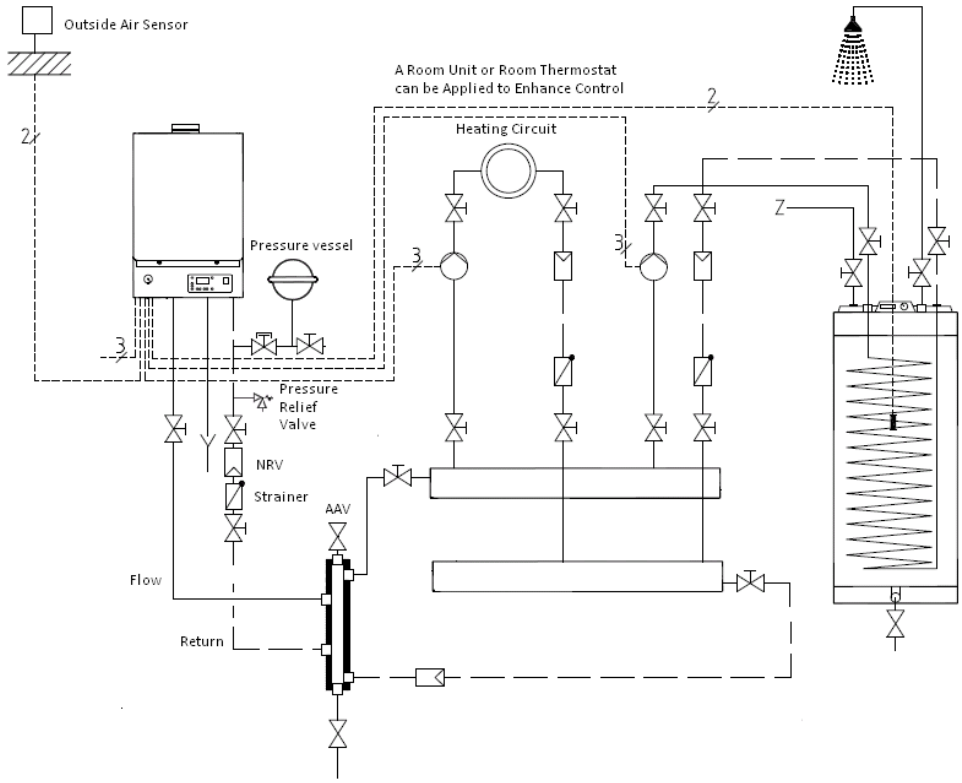
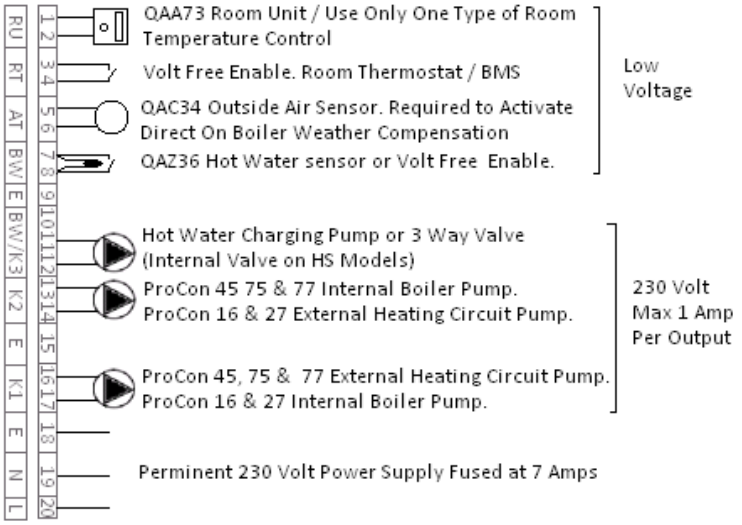
8.4 Hydraulic Design Single Unit (Option 5)



Electrical Connections Single Unit (Option 5)



Parameter #	Parameters Description	Default	Proposed Change
H554 b3	Weather Compensation (1) / Constant Flow Temperature Operation (0) (E10 Error signal when outside air sensor is not installed.)	1	0
H558 b2	Hot Water Storage Sensor (0) / Hot Water Thermostat (1) (E50 Error signal when sensor is not used.)	0	1

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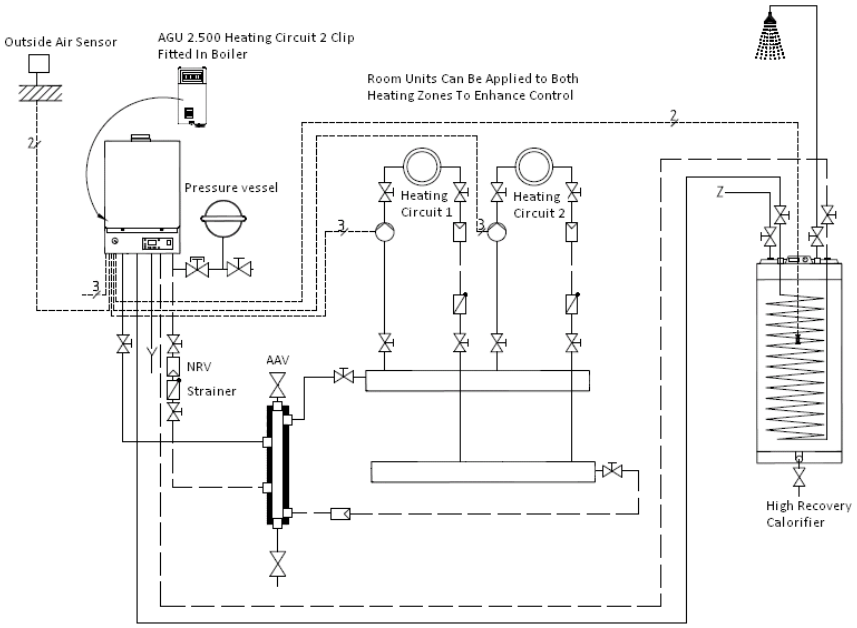
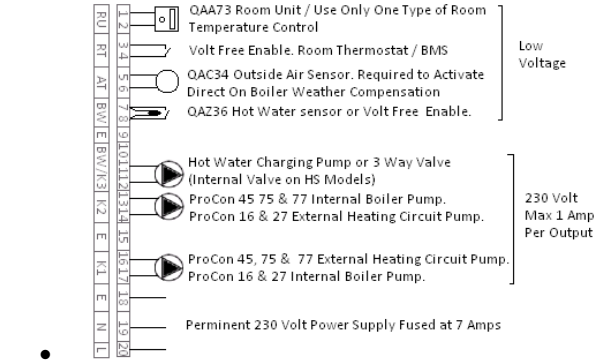
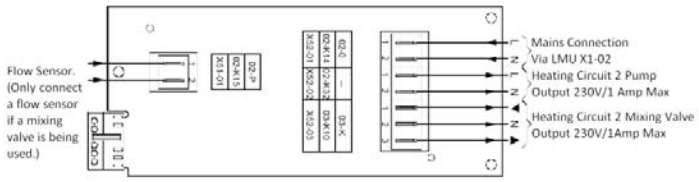
8.5 Hydraulic Design Single Unit (Option 6)



Electrical Connections Single Unit (Option 6)





AGU 2.500 Heating Circuit/Mixing Valve Clip Mounted onto LMU64 Controller.

Parameter #	Parameters Description	Default	Proposed Change
H554 b3	Weather Compensation (1) / Constant Flow Temperature Operation (0) (E10 Error signal when outside air sensor is not installed.)	1	0
H558 b2	Hot Water Storage Sensor (0) / Hot Water Thermostat (1) (E50 Error signal when sensor is not used.)	0	1
	Second Heating Circuit Installed without 3 Way Valve and Sensor		
H554 b5	Mixed Flow Sensor Present (1) / No Mixed Flow sensor Present (0) (E26 Error signal when sensor is not used.)	1	0
	Second Heating Circuit Installed with 3 Way Valve and Sensor		
	No Alterations Required		

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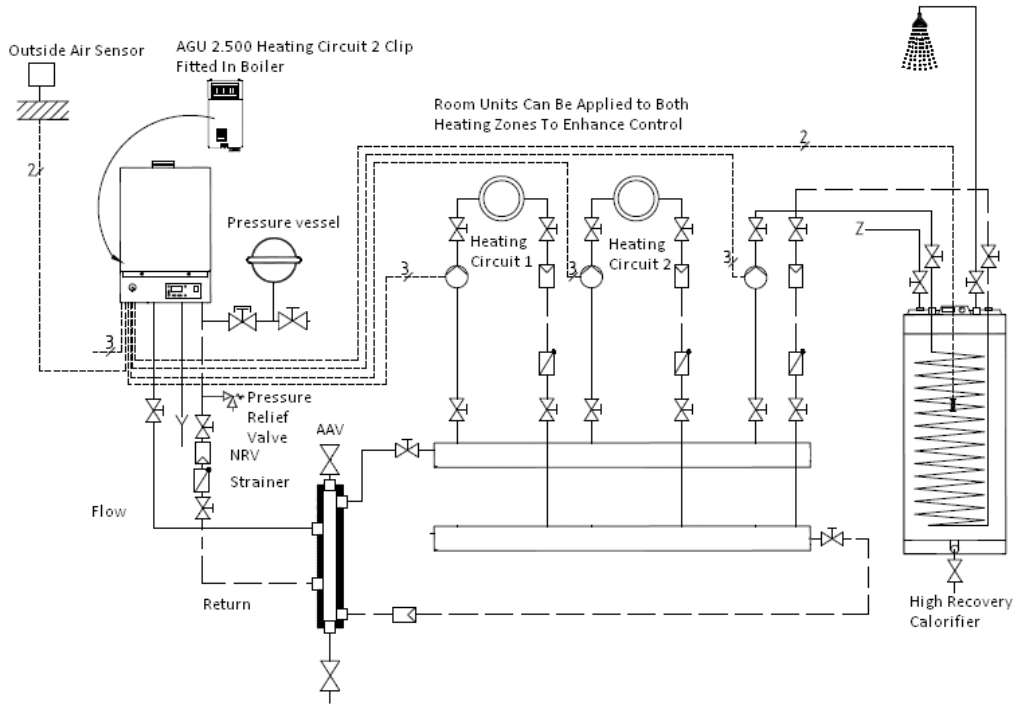
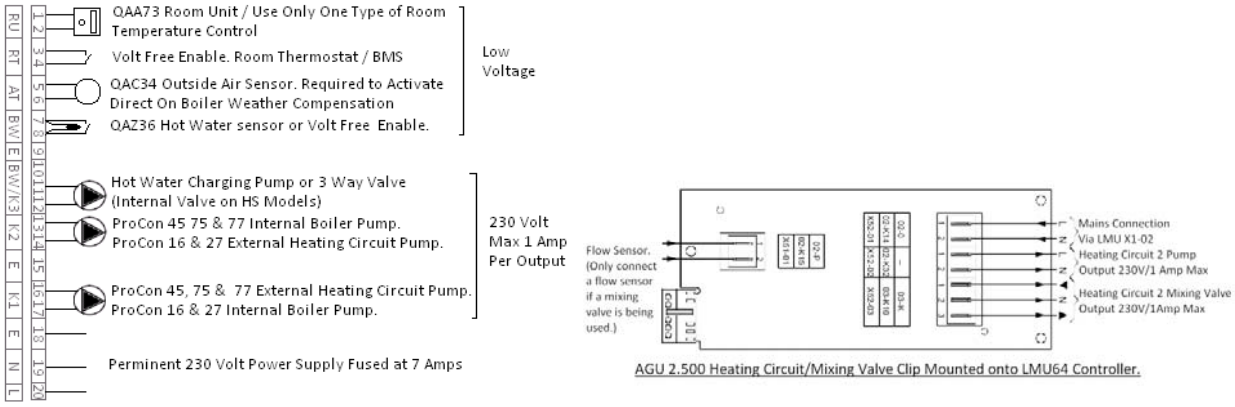
8.6 Hydraulic Design Single Unit (Option 7)



Electrical Connections Single Unit (Option 7)



AGU 2.500 Heating Circuit/Mixing Valve Clip Mounted onto LMU64 Controller.

Parameter #	Parameters Description	Default	Proposed Change
H554 b3	Weather Compensation (1) / Constant Flow Temperature Operation (0) (E10 Error signal when outside air sensor is not installed.)	1	0
H558 b2	Hot Water Storage Sensor (0) / Hot Water Thermostat (1) (E50 Error signal when sensor is not used.)	0	1
	Second Heating Circuit Installed without 3 Way Valve and Sensor		
H554 b5	Mixed Flow Sensor Present (1) / No Mixed Flow sensor Present (0) (E26 Error signal when sensor is not used.)	1	0
	Second Heating Circuit Installed with 3 Way Valve and Sensor		
	No Alterations Required		

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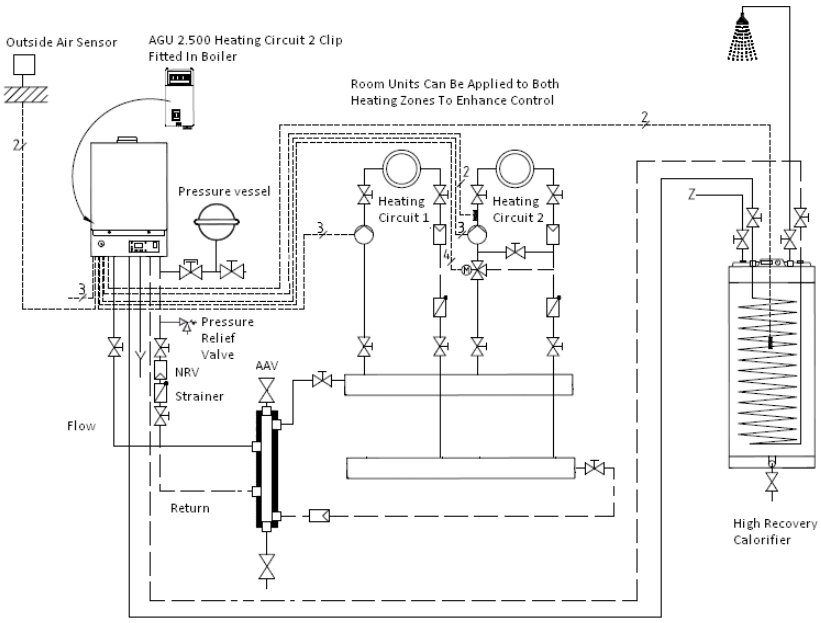
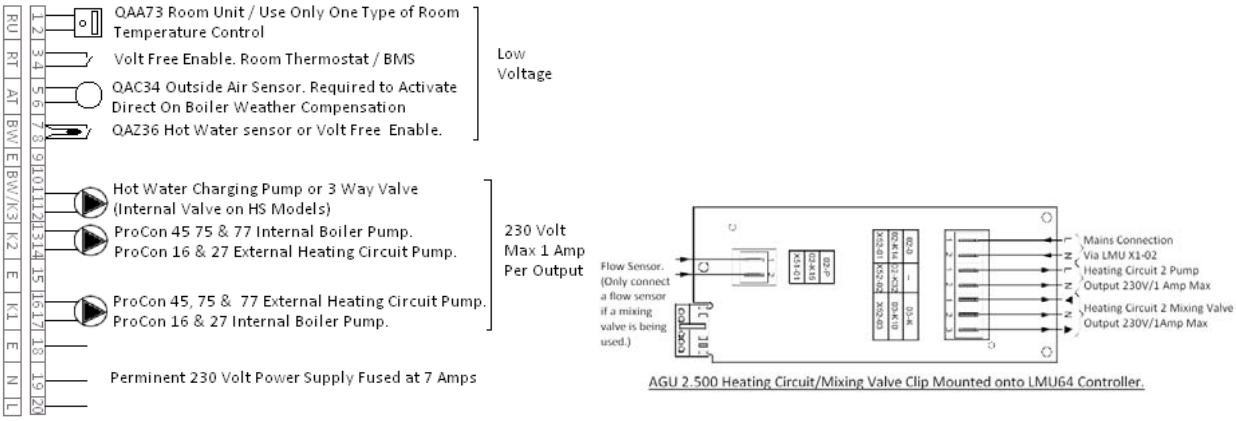
8.7 Hydraulic Design Single Unit (Option 8)



Electrical Connections Single Unit (Option 8)



AGU 2.500 Heating Circuit/Mixing Valve Clip Mounted onto LMU64 Controller.

Parameter #	Parameters Description	Default	Proposed Change
H554 b3	Weather Compensation (1) / Constant Flow Temperature Operation (0) (E10 Error signal when outside air sensor is not installed.)	1	0
H558 b2	Hot Water Storage Sensor (0) / Hot Water Thermostat (1) (E50 Error signal when sensor is not used.)	0	1
	Second Heating Circuit Installed without 3 Way Valve and Sensor		
H554 b5	Mixed Flow Sensor Present (1) / No Mixed Flow sensor Present (0) (E26 Error signal when sensor is not used.)	1	0
	Second Heating Circuit Installed with 3 Way Valve and Sensor		
	No Alterations Required		

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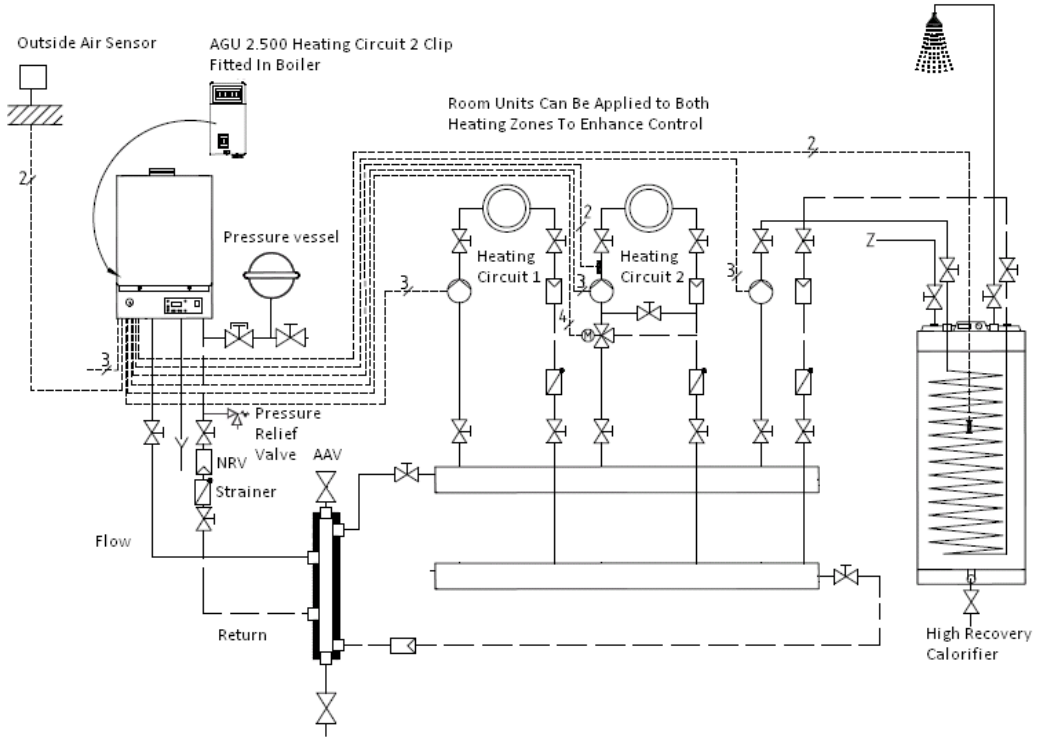
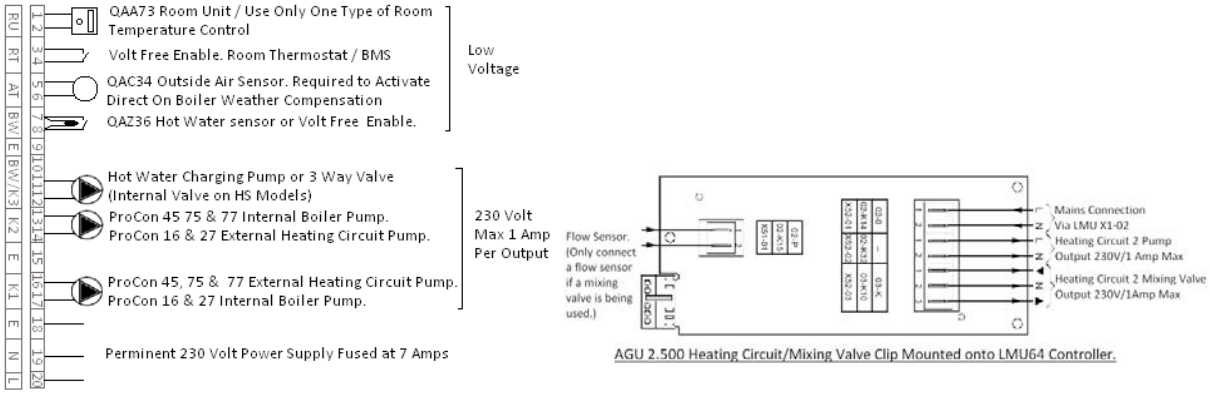
8.8 Hydraulic Design Single Unit (Option 9)



Electrical Connections Single Unit (Option 9)



AGU 2.500 Heating Circuit/Mixing Valve Clip Mounted onto LMU64 Controller.

Parameter #	Parameters Description	Default	Proposed Change
H554 b3	Weather Compensation (1) / Constant Flow Temperature Operation (0) (E10 Error signal when outside air sensor is not installed.)	1	0
H558 b2	Hot Water Storage Sensor (0) / Hot Water Thermostat (1) (E50 Error signal when sensor is not used.)	0	1
	Second Heating Circuit Installed without 3 Way Valve and Sensor		
H554 b5	Mixed Flow Sensor Present (1) / No Mixed Flow sensor Present (0) (E26 Error signal when sensor is not used.)	1	0
	Second Heating Circuit Installed with 3 Way Valve and Sensor		
	No Alterations Required		

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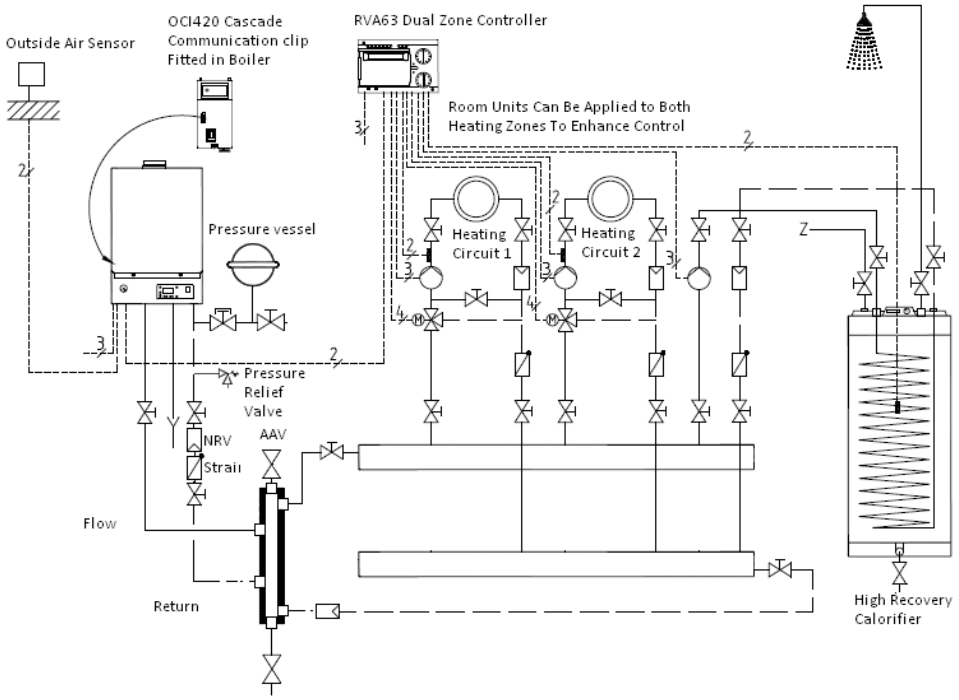
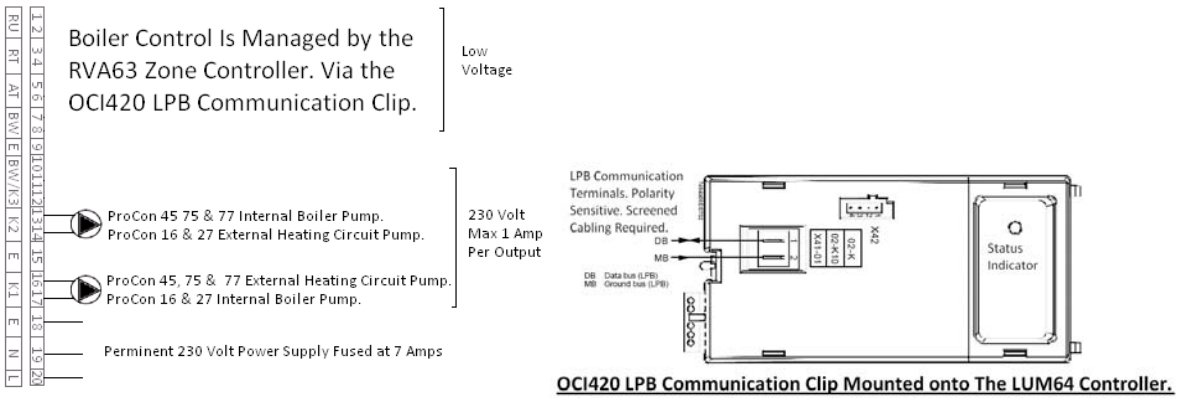
8.9 Hydraulic Design Single Unit (Option 10)



Electrical Connections Single Unit (Option 10)



OCI420 LPB Communication Clip Mounted onto The LUM64 Controller.

Boiler Parameter Alterations

Parameter #	Parameters Description	Default	Proposed Change
H516	Summer / Winter Automatic Changeover Temperature	18	30

RVA63 Controller Alterations

Parameter #	Parameters Description	Default	Proposed Change
29	Summer / Winter Automatic Changeover Temperature	18	30
80	Boiler Control Type LPB/On-Off/Hi-Low	2	0
140	LPB Controller / Appliance Communication (Device)	0	1
141	LPB Controller / Appliance Communication (Segment)	0	1

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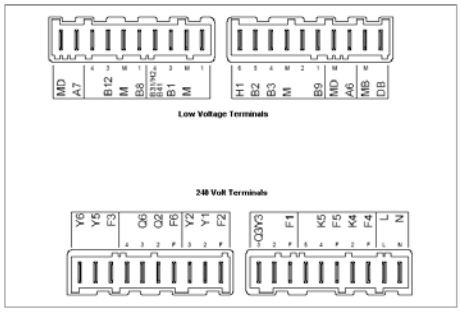
8.10 RVA63 Zone Controller Wiring Terminals



Terminal Designation (Low Voltage Terminals)

Tag	Description/Operation/Function
MD	Zone 2 QAA70/50/10 Room Unit (PPS Ground)
A7	Zone 2 QAA70/50/10 Room Unit (PPS Data)
B12	Zone 2 Flow Sensor (QAD21/26) (To be positioned on Zone side of 3 way mixing valve)
M	Ground Connection for all Sensors/Inputs
B8	Flue Gas Sensor (Not Used)
B31/H2/B41	Volt Free Enable via Room Thermostat/BMS
B1	Zone 1 Flow Sensor (QAD21/26) (To be positioned on Zone side of 3 way mixing valve)
H1	0-10 Volt Input via BMS/Volt Free Enable via Room Thermostat/BMS
B2	Boiler Sensor (Not Used)
B3	Hot Water Sensor (QAZ21)/Volt Free Enable via Calorifier Thermostat/BMS (Parameter alteration required if Volt Free Enable Used)
B9	Outside Air Sensor (QAC31/32) or (620Ω Substitute Resistor = -1°C) (Mounted on North Facing Wall)
MD	Zone 1 QAA70/50/10 Room Unit (PPS Ground)
A6	Zone 1 QAA70/50/10 Room Unit (PPS Data)
MB	Boiler Communication (LPB Ground connected in parallel to boiler mounted OCI420 Clip or RVA47 Manager)
DB	Boiler Communication (LPB Data connected in parallel to boiler mounted OCI420 Clip or RVA47 Manager)

Terminal Designation (230 Volt Terminals)

Tag	Description/Operation/Function
Y6	Zone 2 Mixing Valve Closing Output (Max 2 Amp)
Y5	Zone 2 Mixing Valve Opening Output (Max 2 Amp)
F3	Power Input for Zone 2 Valve Outputs (To be linked to Live Input)
Q6	Zone 2 Pump Output (Max 2 Amp)
Q2	Zone 1 Pump Output (Max 2 Amp)
F6	Power Input for Zone Pumps Output (To be linked to Live Input)
Y2	Zone 1 Mixing Valve Closing Output (Max 2 Amp)
Y1	Zone 1 Mixing Valve Opening Output (Max 2 Amp)
F2	Power Input for Zone 1 Valve Outputs (To be linked to Live Input)
Q3/Y3	Hot Water Charging Pump/3 Way Valve Output (Max 2 Amp)
F1	Power Input for Hot Water Pump/Valve Output (To be linked to Live Input)
K5	Burner Enable Output Stage 2 (Not Used)
F5	Power Input Burner Enable Stage 2 (Not Used)
K4	Burner Enable Stage 1 (Not Used)
F4	Power Input Burner Enable Stage 1 (Not Used)
L	Permanent Live (Max 6 Amp)
N	Permanent Neutral

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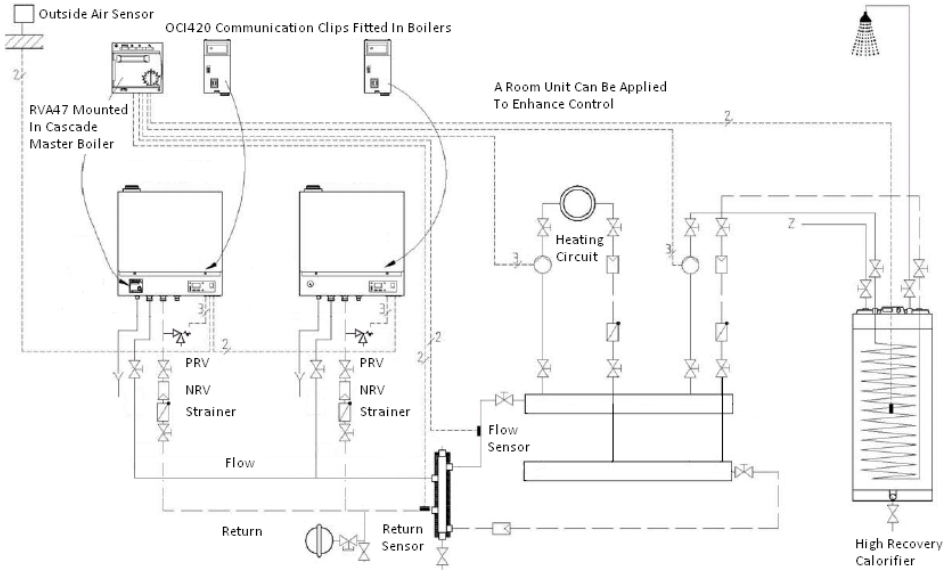
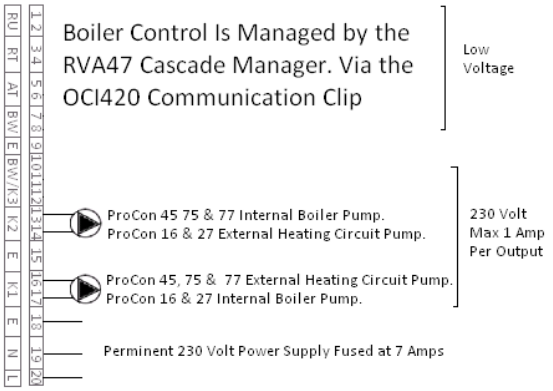
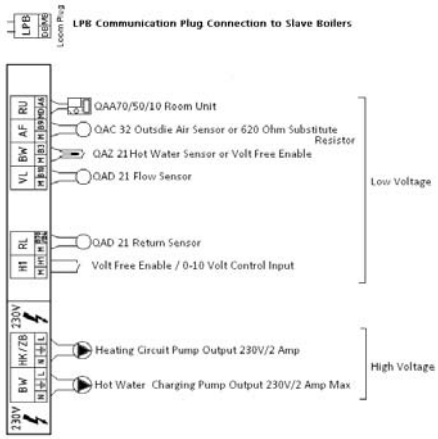
8.11 Hydraulic Design Single Unit (Option 11)

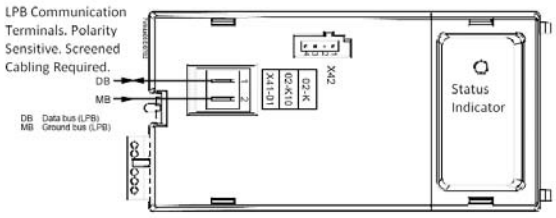


Electrical Connections Single Unit (Option 11)



Boiler Mounted Cascade Manager





OCI420 LPB Communication Clip Mounted onto The LUM64 Controller.

Boiler Parameter Alterations

Parameter #	Parameters Description	Default	Proposed Change
H516	Summer / Winter Automatic Changeover Temperature	18	30
H552	Appliance Hydraulic Configuration	66/67/70	80/80/81
H605	LPB Communication Appliances Address (Maximum 12 Boilers)	1	Boiler1=2, Boiler2=3…etc

RVA47 Manager Alterations

Parameter #	Parameters Description	Default	Proposed Change
16	Summer / Winter Automatic Changeover Temperature	18	30

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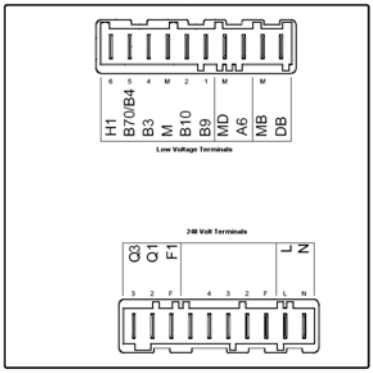
8.12 Separately Housed RVA47 Cascade Manager



Terminal Designation

Tag	Voltage	Description/Operation/Function
H1	<25V	0-10 Volt Input via BMS/Volt Free Enable via Room Thermostat/BMS (M terminal used to create circuit)
B70/B4	<25V	System Return Sensor (QAD21) (To be positioned on boiler side of system Low Loss Header)
B3	<25V	Hot Water Sensor (QAZ21)/Volt Free Enable via Calorifier Thermostat/BMS (Parameter alteration required if Volt Free Enable Used)
M	<25V	Ground Connection for all Sensors/Inputs
B10	<25V	System Flow Sensor (QAD21)(To be positioned on system side of system Low Loss Header)
B9	<25V	Outside Air Sensor (QAC31/32) or (620Ω Substitute Resistor = -1◦C)(Mounted on North Facing Wall)
MD	<25V	QAA70/50/10 Room Unit (PPS Ground)
A6	<25V	QAA70/50/10 Room Unit (PPS Data)
MB	<25V	Boiler Communication (LPB Ground connected in parallel to boiler mounted OCI420 Clips)
DB	<25V	Boiler Communication (LPB Data connected in parallel to boiler mounted OCI420 Clips))
Q3	230V	Hot Water Charging Pump/3 Way Valve Output (Max 2 Amp)
Q1	230V	Heating Pump Output (Max 2 Amp)
F1	230V	Power Input for Heating and Hot Water Pump Outputs (To be linked to Live Input)
L	230V	Permanent Live (Max 6 Amp)
N	230V	Permanent Neutral

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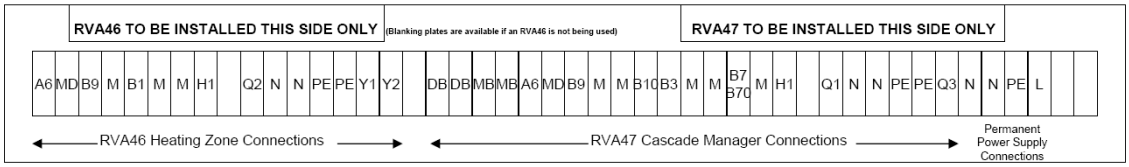
RVA47 Cascade Manager Wiring Terminals.(Housing)(Housing designed for use with additional RVA46 Zone controller)



Terminal Designation

Tag	Voltage	Description/Operation/Function
DB	<25V	Boiler Communication (LPB Data connected in parallel to boiler mounted OCI420 Clips))
MB	<25V	Boiler Communication (LPB Ground connected in parallel to boiler mounted OCI420 Clips)
A6	<25V	QAA70/50/10 Room Unit (PPS Data)
MD	<25V	QAA70/50/10 Room Unit (PPS Ground)
B9	<25V	Outside Air Sensor (QAC31/32) or (620Ω Substitute Resistor = -1·C) (Mounted on North Facing Wall)
M	<25V	Ground Connection for all Sensors/Inputs
B10	<25V	System Flow Sensor (QAD21) (To be positioned on system side of system Low Loss Header)
B3	<25V	Hot Water Sensor (QAZ21)/Volt Free Enable via Calorifier Thermostat/BMS (Parameter alteration required if Volt Free Enable Used)
B70/ B4	<25V	System Return Sensor (QAD21) (To be positioned on boiler side of system Low Loss Header)
H1	<25V	0-10 Volt Input via BMS/Volt Free Enable via Room Thermostat/BMS
Q1	230V	Heating Pump Output (Max 2 Amp)
Q3	230V	Hot Water Charging Pump/3 Way Valve Output (Max 2 Amp)
N	230V	Permanent Neutral
PE	-	Permanent Earth
L	230V	Permanent Live (Max 6 Amp)

(All 'M' Terminals are Internally Linked)

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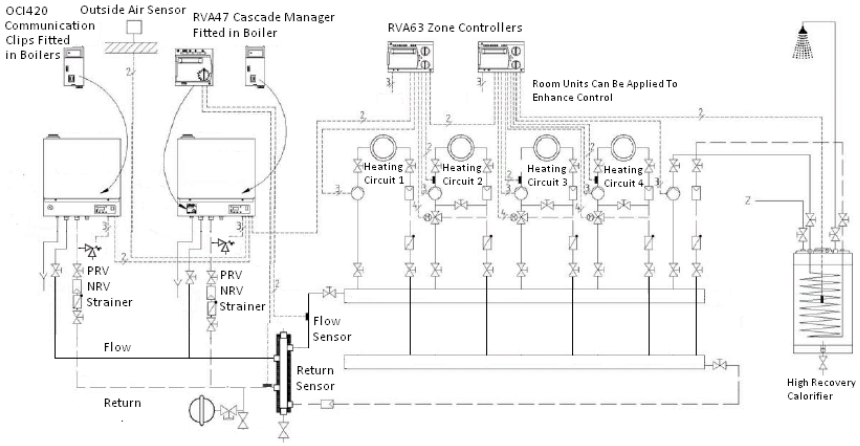
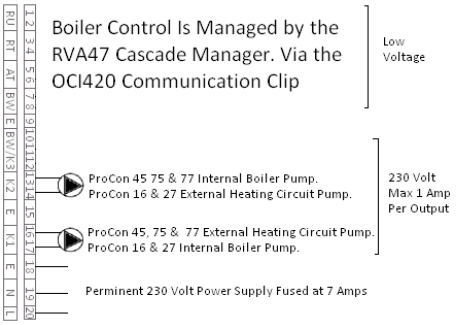
010711

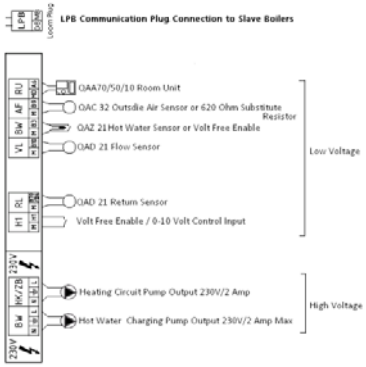
8.14 Hydraulic Design Single Unit (Option 12)

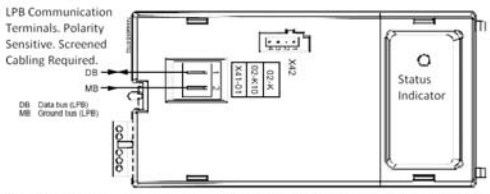


Electrical Connections Single Unit (Option 12)



Boiler Mounted Cascade Manager





OCI420 LPB Communication Clip Mounted onto The LUM64 Controller.

Please refer to System Options 10 and 11 for RVA47 and RVA63 controller wiring information.

Boiler Parameter Alterations

Parameter #	Parameters Description	Default	Proposed Change
H516	Summer / Winter Automatic Changeover Temperature	18	30
H552	Appliance Hydraulic Configuration	66/67/70	80/80/81
H605	LPB Communication Appliances Address (Maximum 12 Boilers)	1	Boiler1=2, Boiler2=3…etc

RVA47 Manager Alterations

Parameter #	Parameters Description	Default	Proposed Change
16	Summer / Winter Automatic Changeover Temperature	18	30

RVA63 Controller Alterations

Parameter #	Parameters Description	Default	Proposed Change
29	Summer / Winter Automatic Changeover Temperature	18	30
80	Boiler Control Type LPB/On-Off/Hi-Low	2	0
140	LPB Controller / Appliance Communication (Device)	0	1 For First RVA63, 2 For Second RVA63, 3 For Third RVA63…etc
141	LPB Controller / Appliance Communication (Segment)	0	1

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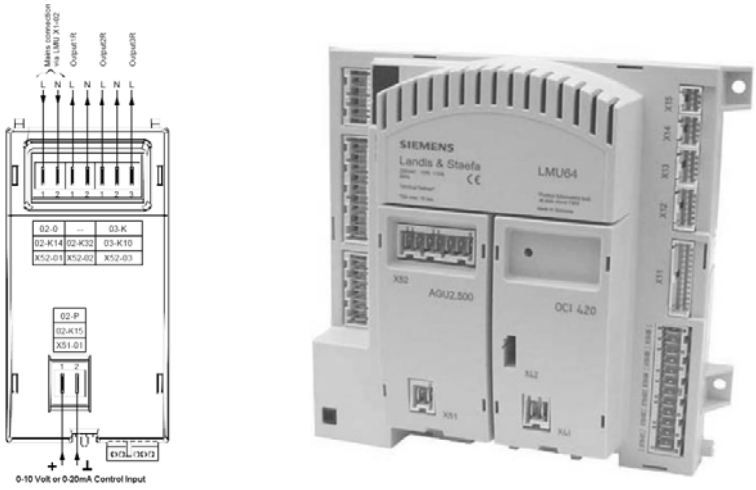
9.0 BMS Interface Clip Installation and Parameter Alteration

Following the installation of the AGU2.511 communication clip (complete with base mounted wiring connection) onto the front of the LMU64 controller a number of operational parameters within the unit must be altered to ensure the clips operates as required.



LMU64 Pictured above with AGU2.511 and OCI420 communication clips.

A number of parameters will require altering within the LMU64 controller from their standard default setting to allow the AGU2.511 communication clip to operate correctly.

Access is gained to the H parameters by pressing the PROG ▽△ buttons simultaneously for 3 seconds unit H 90 appears on the screen. The required H parameters can then be reached by using the PROG ▽ or △ buttons. Once at the required H parameter the required setting is achieved by using the - + buttons. To save the alteration in the controller the INFO button must be pressed.

Parameter #	Description	Default	New Setting
	Programmable Inputs		
H618	Input control configuration Input value interpretation affected by H622 or H623 Dependant upon control requirement. (4 is recommended.)	0	4. Predefined Temperature set point 5. Predefined Boiler Output 6. Low Loss Header Sensor
H622	Maximum Temperature Via X51 input 0-10 Volt When H618 is set to 4	85	85
H623	Percentage level reached by input prior to boiler activation. When H618 is set to 5	5	5
	Programmable Outputs		
H619	Relay designation for Output from Orange Plug Left Terminal Live. Right Terminal Neutral. Output rated at 240 Volts 0.5 Amp	0	0. Hydraulic Diagram Derived. 1. LPG SSOV Output. 2. Boiler Fault Output. 3. Boiler Operating Output. 4 -12 Non Supported Output.
H620	Relay designation for Output from Clear Plug Left Terminal Live. Middle Terminal Neutral. Output rated at 240 Volts 0.5 Amp	0	0. Hydraulic Diagram Derived. 1. LPG SSOV Output. 2. Boiler Fault Output. 3. Boiler Operating Output. 4 -12 Non Supported Output.
H621	Relay designation for Output from Clear Plug Right Terminal Live. Output rated at 240 Volts 0.5 Amp	0	0. Hydraulic Diagram Derived. 1. LPG SSOV Output. 2. Boiler Fault Output. 3. Boiler Operating Output. 4 -12 Non Supported Output.

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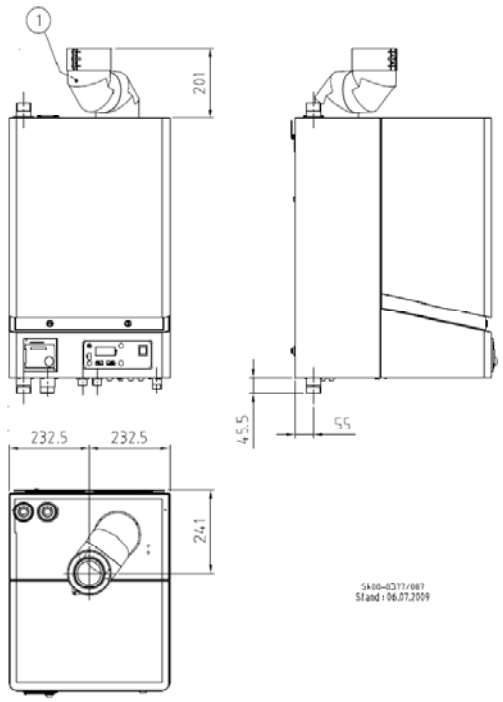
10.0 Fluing Options

Please note that excessive resistance within the flue and combustion air supply systems will lead to a reduction in the output of the appliance and induce operational faults.

	16	27	47	75 & 77
Concentric Flue Components (Pa Resistances)				
Wall Terminal	4.0	5.0	8.0	16.0
Vertical Terminal	4.0	5.0	8.0	16.0
955mm Flue Extension	2.5	4.0	6.0	12.0
500mm Flue Extension	1.25	2.0	3.0	6.0
255mm Flue Extension	1.0	1.5	2.0	4.0
87° Bend	2.5	4.0	6.0	12.0
45° Bend	1.25	2.0	3.0	6.0
30° Bend	1.00	1.5	2.0	4.5
80mmØ PPS Flue Components (Pa Resistances)				
Exhaust Pipe Terminal	1.0	2.5	4.0	8.0
Air Pipe Terminal	2.0	4.0	7.0	15.0
955mm Flue Extension	1.5	3.0	5.0	9.0
500mm Flue Extension	0.75	1.5	2.25	4.5
255mm Flue Extension	0.5	1.0	2.0	3.75
87° Bend	1.5	3.0	5.0	9.0
45° Bend	0.75	1.5	2.25	4.5
30° Bend	0.5	1.0	1.75	3.5

When flues are installed with horizontal sections/portions a 3^0 fall back to the boiler must be maintained. This will not only ensure condensate removal preventing premature seal failure, but also prevent nuisances dripping from the wall terminal.

10.01 Replacing a MicroMat EC 60-75 with a ProCon 77 complete with Flue Adapter.



MicroMat EC Flue adapter part number 96.36400-7020

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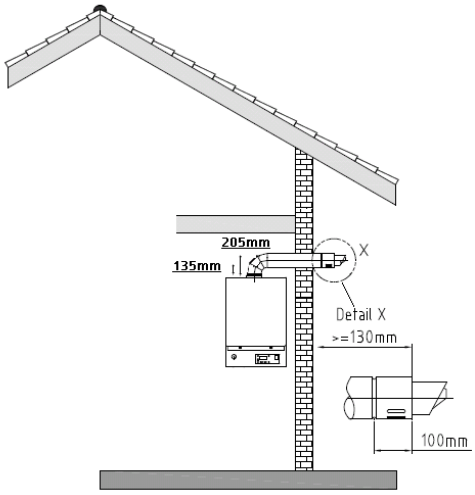
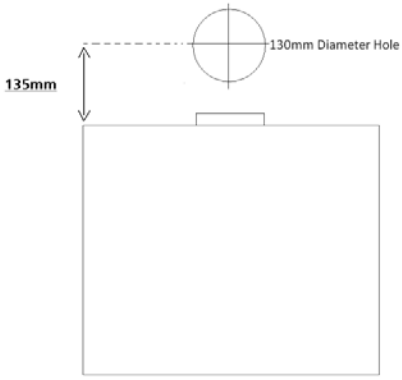
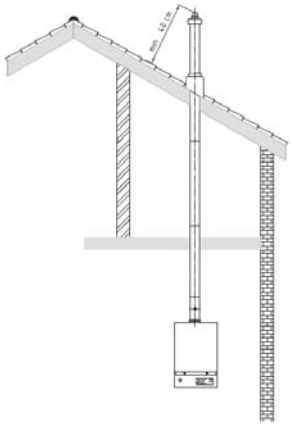
10.1 Single ProCon Balanced Flued. Through The Wall Termination.

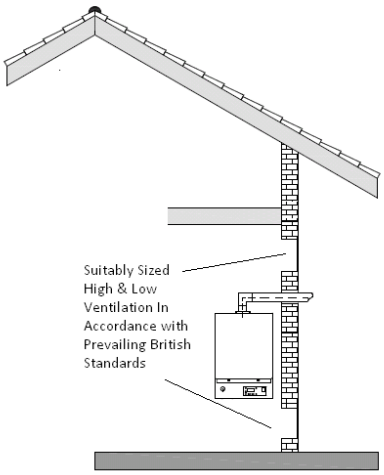




10.2 Single ProCon Balanced Flued. Vertical Termination.



10.3 Single ProCon Open Flued. Through The Wall Termination.



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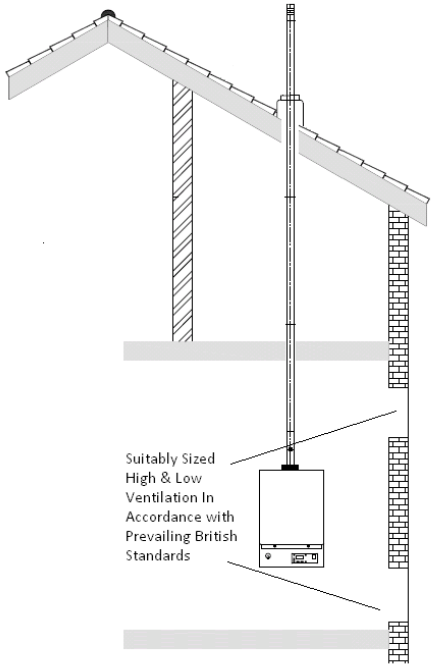
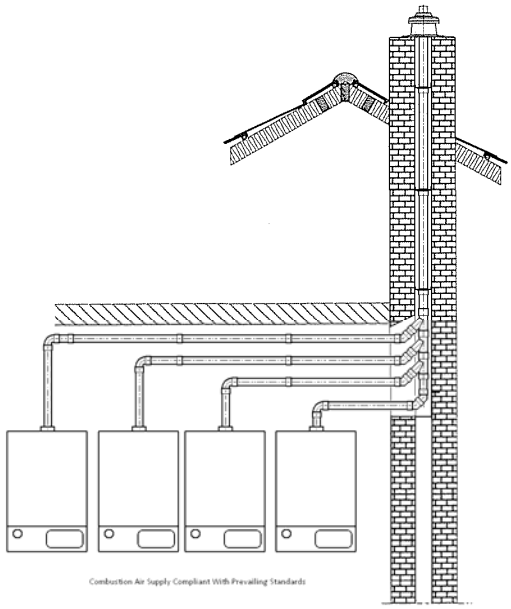
10.4 Single ProCon Open Flued. Vertical Termination



10.5 Cascaded Appliance Fluing Installation Open Flued



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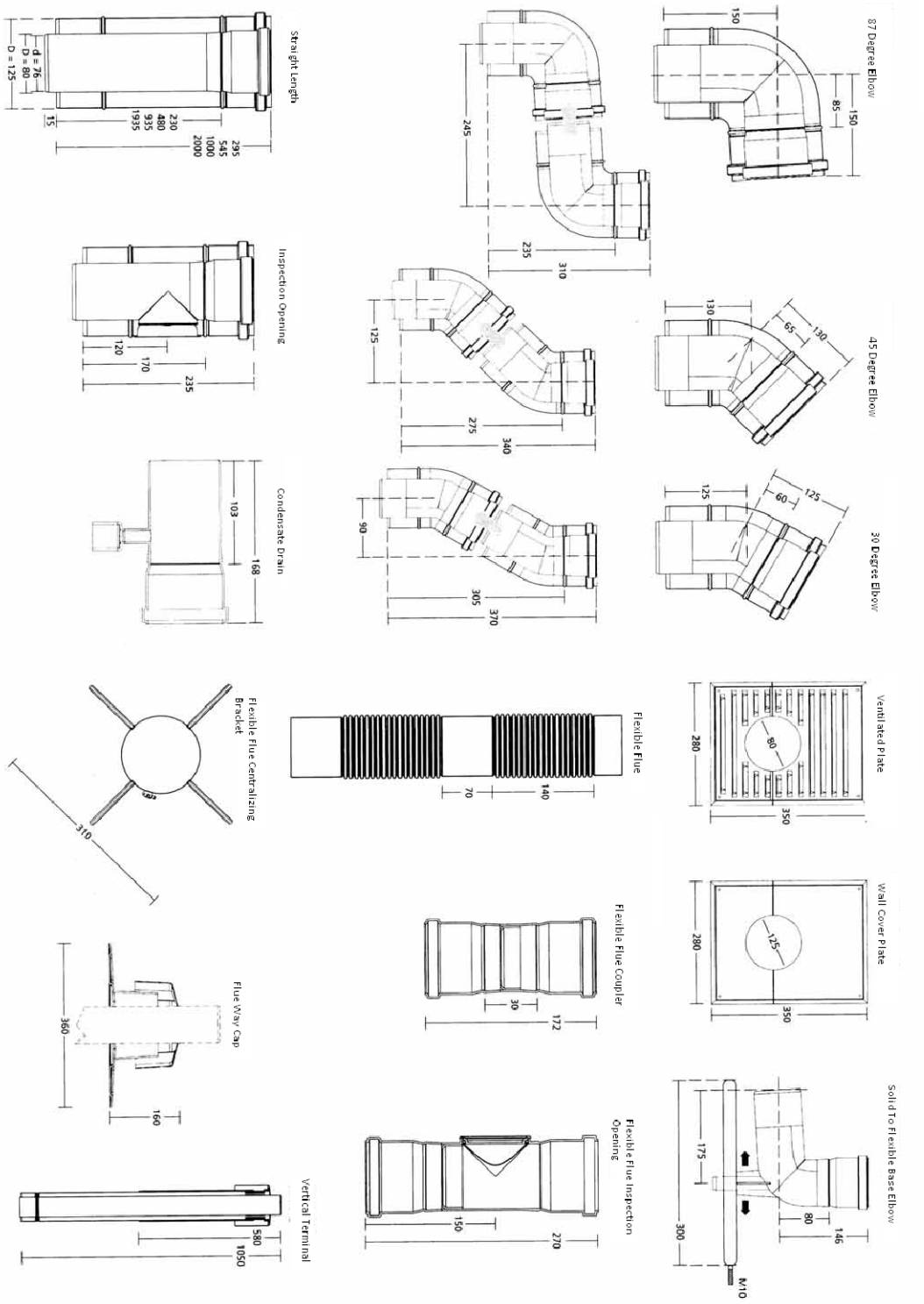
10.6 Dimensions of Available Flue Components



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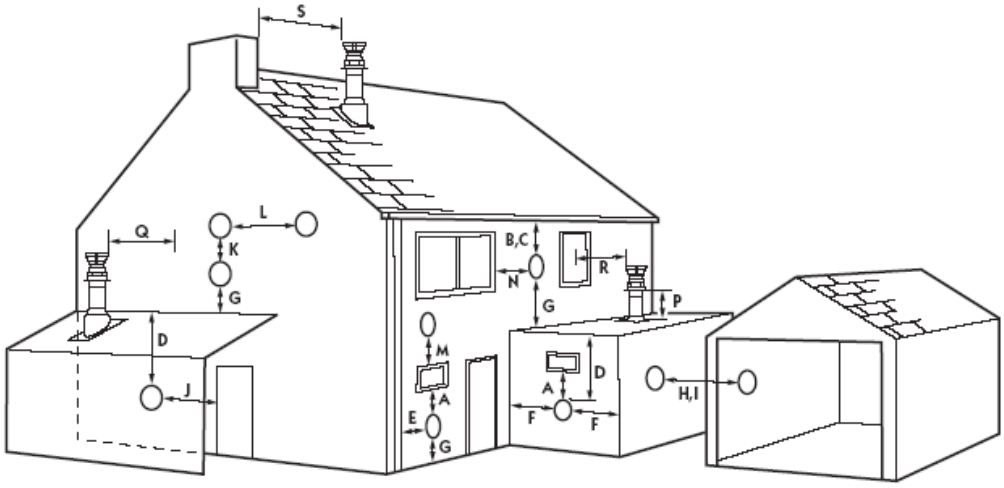
10.7 Balanced Flue Terminal Positions For Boilers Below and Above 70kW Net Input.

(All measurements are in mm and are minimum clearances.)

	Terminal Location	Boilers with a rated Input < 70kW Net	Boilers with a rated Input > 70kW Net
A	*Below and opening window etc.	300	600
B	Below gutter soil pipes etc.	75	700
C	Below Eaves.	200	200
D	*Below balconies or car port roof.	200	N/A
E	From vertical drain or soil pipe etc.	150	150
F	From internal or external corners.	300	300
G	Above ground or balcony level.	300	300 (2000 where people have general access)
H	From a surface facing the terminal.	2000	2000
I	From a terminal facing the terminal.	2000	2000
J	*From opening in a carport into a dwelling.	1200	N/A
K	Vertically from a terminal on the same wall.	1500	1500
L	Horizontally from a terminal on the same wall.	300	600
M	Above an opening, window etc.	500	600
N	*Horizontally to an opening, window etc.	300	600
P	Above a level roof (base of terminal.)	500	500
Q	From an adjacent wall (edge of terminal.)	500	500
R	From adjacent opening, window etc.	1000	1000
S	From any other flue terminal.	600	600

* Positions not recommended.



Groups of appliances of 150kW gross input (136kW net input) and above must comply with the Clean Air Act with respect to the chimney discharge height.

The terminal/s shall be guarded if it is less than 2000mm above the ground or in any position where it may cause injury to persons resulting from touching a hot surface. Absolute guidance must be sought from the respective regulation.

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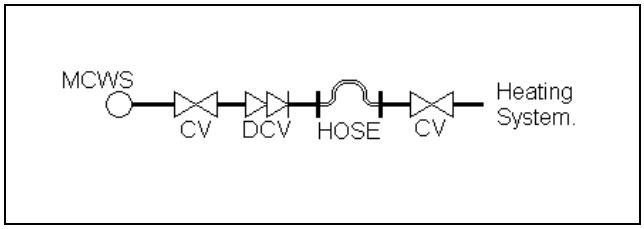
11.0 Filling The System

The Initial filling of a sealed heating system, and subsequent refilling, must be by a method that has been approved by the Water Regulation Advisory Scheme (WRAS) for that type of heating system.

i.e.	Domestic (*In-House*)	Fluid Category 3 (*C-3*)
	Non Domestic (Other than *In-House*)	Fluid Category 4 (*C-4*)

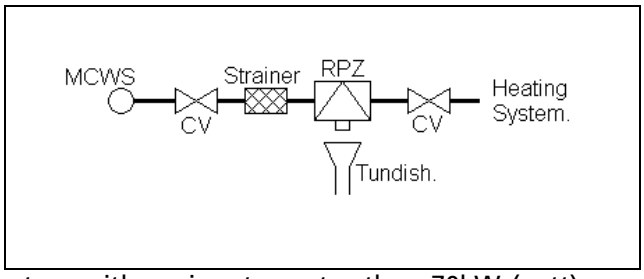
For Category 3 systems, the approved method of filling must comprise of the following components in the arrangement shown;

- Control Valve incorporating a Double Check Valve on the Mains Cold Water pipework.
- Temporary Connecting Hose, which must be disconnected after use.
- Control Valve, on the heating system.



For Category 4 systems, the approved method of filling must comprise of the following components in the arrangement shown;

- Control Valve.
- Strainer.
- Verifiable Backflow Device with Reduced Pressure Zone (RPZ Valve)
- Incorporating a 'Type BA' Air Gap.
- Tundish.
- Control Valve.



Further more, in accordance with BS 6644: 2005 system with an input greater than 70kW (nett), an automatic water replenishment unit shall be installed to automatically replenish any lost or evaporated water.

Please refer to BS 6644: 2005 for allowable water replenishment methods for use with sealed/pressurized heating systems.

For information on a comprehensive range of pressurization units that comply with current British Standards and WRAS Regulations, please contact MHG Heating Ltd Sales.

11.1 Expansion Vessel

In accordance with BS 6644: 2005, WRAS Regulations, and Local Authority Water Regulations, as applicable, the installer shall install a suitably sized, and approved, Expansion Vessel to ensure that the water capacity of the system has ample expansion capacity.

The location of the expansion vessel shall only be isolatable from the system via a Lockable Type Service Valve, which shall be locked in the *OPEN* position, to prevent accidental isolation.
Furthermore, a drain facility should be provided adjacent to the expansion vessel to aide the routine maintenance, overhaul, of the vessels Air Pressure setting.

For information on a comprehensive range of expansion vessels that comply with current British Standards and WRAS Regulations, please contact MHG Heating Ltd Sales.

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12.0 System Water Quality

Water Treatment, System Cleaning (BS 7592: 2006)

The entire primary system MUST be thoroughly cleaned and flushed to remove debris, flux residues, etc. before opening the boiler isolation valves & flooding the boiler. Particular care must be taken where the ProCon boiler is being retro-fitted into an old/existing system, as system silt or magnetite can be very damaging to the new boiler.
Following cleaning and flushing the system MUST be dosed with a good quality water treatment to prevent corrosion and the formation of scale. FAILURE TO OBSERVE THESE REQUIREMENTS WILL RENDER THE WARRANTEE ON THE APPLIANCE VOID.
Cleaning, flushing and water treatment must be carried out in accordance with the requirements of BS 7593:1992, prior to commissioning the boiler.
Repeated draining and refilling of the system, without replenishment of water treatment, must be avoided, as this is very damaging to the boiler. The boiler must not operate without the system water being correctly and adequately treated, and maintained, with an appropriate level of corrosion inhibitor.

For specific guidance on water treatment, direct contact is advisable with:-

Betz Dearborn Limited
(Sentiel)
Foundry Lane
Widnes
Cheshire
WA8 8UD
Tel: 0151 424 5351
Fax: 0151 420 5447

Alpha-Fry Technologies (Fernox)
Cookson Electronics
Forsyth Road
Sheerwater
Woking
Surrey
GU21 5RZ
Tel: 0208 665 6666
Fax: 0208 665 4695

12.1 Care With The Use of Solder Flux

The ProCon HT range has heat exchangers fabricated from 316L Stainless Steel. It is most important that the compatibility of any flux is checked with the supplier before use, and that any flux manufactures recommendations are strictly followed with regards to use in conjunction with Stainless Steel.

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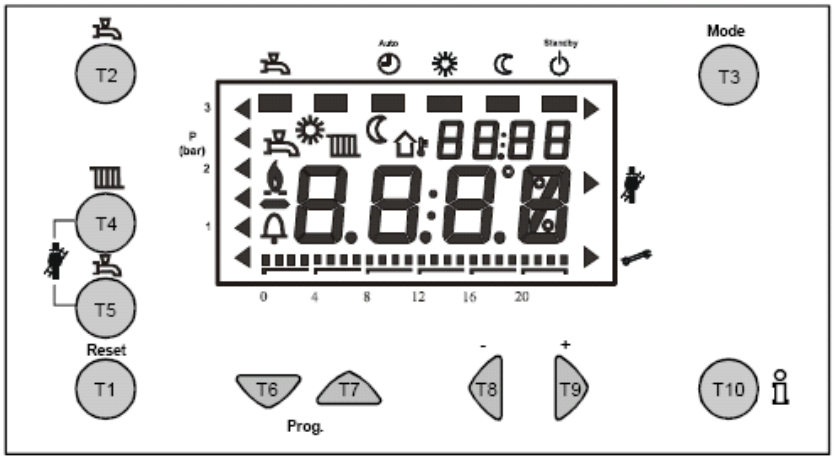
13.0 Appliance Controls

All appliance operational mode adjustments and settings are undertaken via the unit control fascia



Legend

Button	Label	Function	Units	Defaults
T1	RESET	Resets indicated large flashing fault codes. Places the boiler into fault is no fault is present (E153)	0-200	N/A
T2	HOT WATER (HWS)	Activates HWS generation capability. Indicated on the screen by a dash beneath the icon.	-	
T3	MODE	Adjusts the operating mode for the heating circuit.		
T4	HWS SETPOINT	Hot water storage temperature adjustment. Only possible is a HWS sensor is used.	20-60	55°C
T5	HEATING CIRCUIT FLOW TEMPERATURE SETPOINT	Heating flow temperature adjustment. Or Assumed room temperature adjustment. (If outside air sensor installed)	20 – 90 10 - 35	80°C 21°C
T6	PROGRAM DOWN	Access to program settings accessing in reverse order.	Time of day/ time switches/ operational settings.	-
T7	PROGRAM UP	Access to program settings accessing in sequential order.	-	-
T8	PROGRAM + PLUS	Alteration of program settings positively.	-	-
T9	PROGRAM – MINUS	Alteration of program settings negatively.	-	-
T10	INFORMATION	Access to operational information and saving altered program settings.	Fault Indication/ Boiler Flow Temperature/ Stored HWS/ Operation Mode/ Outside Air Temperature.	-

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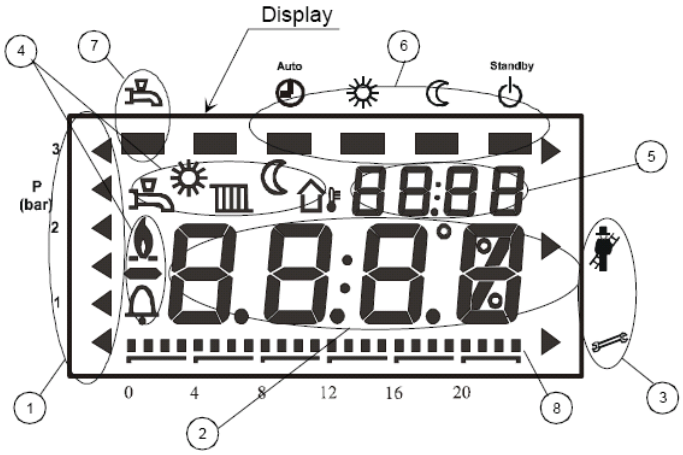

Legend

Button	Label	Function
1	WATER PRESSURE INDICATOR	Not used In ProCon Ranges
2	MAIN DISPLAY	Flow Temperature or Selected Parameter Setting
3	COMMISSIONING MODE	Commissioning Mode Indicator Full Power (no adjustment.)/Engineers Mode (full adjustment via Program Up & Down Buttons.)
4	SPECIFIC OPERATIONAL MODE INDICATOR	The Display Reflects the Operational Mode Dependent Upon Inputs.
5	TIME OF DAY / AUTO RESETTING ERROR	Time of Day Alternating with Automatic Resetting Error Codes.
6	HEATING CIRCUIT MODE INDICATOR	Indicator of Selected Heating Circuit Operating Mode.
7	HOT WATER ACTIVATION INDICATOR	Indication of Activation of Hot Water Production Mode.

If required an enhanced operational review level can be accessed.

The table on the following page indicates the level of information that is available.

To access these parameters the following sequence must be undertaken.

Press and release the INFO.

Press & Hold the ▽△ Program Buttons simultaneously for at least 3 second.

The display will indicate b0

Use the -/+ Button to access the various b level parameters.

Use the ▽ or △ to access the other parameter levels C & d

Use the -/+ Button to access the required levels within the desired parameter level.

To leave the enhanced operational review level press INFO or wait 8 minutes for automatic refresh.

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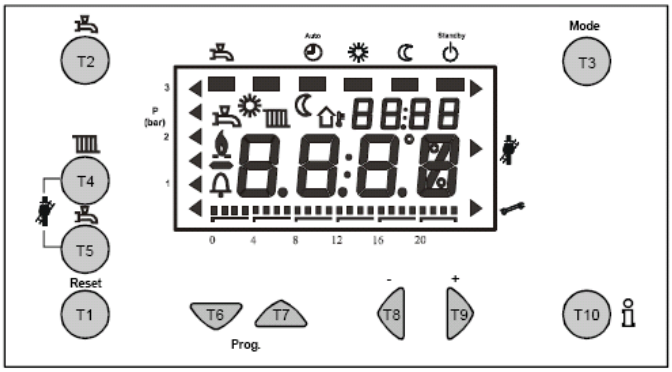
13.1 Module Operating Codes

Display level	Name of LMU... variable	Description
Temperatures (service level)		
b 0	DiagnoseCode	LMU...-internal software diagnostic code
b 1	TkRuec	Boiler return temperature
b 2	Tbwlst2	D.h.w. temperature sensor 2
b 3	Tabgas	Flue gas temperature
b 4	TiAussen	Outside temperature
b 5	TaGem	Composite outside temperature
b 6	TaGed	Attenuated outside temperature
b 7	Tvlst	Flow temperature AGU2.500...
Process values (service level)		
C 1	IonStrom	Ionization current
C 2	Gebl_Drehz	Fan speed
C 3	Gebl_PWM_AusAkt	Current fan control (PWM)
C 4	RelModLevel	Relative output
C 5	Pumpe_PWM	Pump setpoint (PWM)
C 6	ek0	Control differential
Setpoints (service level)		
d 1	Tsoll	Setpoint of 2-position or modulating controller (PID)
d 2	TkSoll	Current boiler temperature setpoint
d 3	TsRaum	Room temperature setpoint
d 4	TbwSoll	D.h.w. temperature setpoint
d 5	PhzMax	Maximum degree of modulation in heating mode
d 6	NhzMax	Maximum speed at maximum output in heating mode



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14.0 Appliance Fault Codes

The ProCon range has two levels of fault code indication.

Automatic Resetting Fault Code.

A small fault code alternating with the time of day.
The appliance will stop operating for a limited period/until the error has been corrected.
Repeated occurrences of an Automatic Resetting Fault Codes will result in a Manual Reset Fault Code.

Manual Reset Fault Code.

A large fault code is displayed on the screen along with the symbol.
The appliance will stop operating until the error has been corrected and the RESET button has been pressed.

PLEASE NOTE.
If the RESET button is pressed when a small fault code is displayed or no fault code is displayed the unit will display a Manual Reset Fault Code of E153 will be displayed. The RESET button must be pressed again to clear this code.

If a fault is encountered within the appliance or Cascade LPB network, a fault code will be generated and displayed by the failing appliance and all LPB networked RVA and Opentherm units .

If a fault is encountered by a RVA controller or is communicated to a RVA controller via the LPB network ER will be generated on the display.
Opening the controllers flap and pressing the Down PROG button twice will gain access to parameter line 50 where the generated fault code can be reviewed.

In either case the fault code should be noted for future reference.

If the fault is related to a specific appliance the unit can be reset by pressing the Lockout Reset Button.

If the fault is related to a RVA controller or the LPB communication network the fault code will clear automatically following the rectification of the fault.

This is also applicable following the rectification of any appliance fault. This can take up to 10 minutes.

Fault Code	Description
E-0	No Error Detected
E-10	Outside Air Sensor Fault / Not Detected
E-20	Flow Water Sensor Fault / Not Detected
E-26	System Flow Sensor Faulty / Not Detected
E-28	Flue Gas Sensor Fault / Not Detected
E-40	Return Water Sensor Fault / Not Detected
E-46	System Return Water Sensor Fault / Not Detected
E-50	HWS Sensor Short Circuit 1
E-52	HWS Sensor Short Circuit 2 (Not Used)
E-58	HWS Volt Free Switch Fault / Not Detected

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E-60	Faulty Room Sensor
E-61	Faulty Room Sensor
E-62	Incorrect Room Unit Connected
E-77	Air Pressure Sensor Not Detected (Not Used)
E-78	Water Pressure Sensor Defective (Not Used)
E-81	LPB Short Circuit (Boiler Cascade Wiring)
E-82	LPB Address Conflict (Boiler Cascade Settings)
E-86	Short Circuit on PPS Connection (Not Used in ProCon Configuration)
E-91	EEPROM
E-92	Hardware Malfunction
E-100	Conflict Between Time of Day Master Control (Boiler / QAA70 / RVA47)
E-105	Annual Service of Unit is Due. (QAA73 Service Tool Required to reset timer See Section 16.0)
E-110	Module Water Temperature Overheat
E-111	Module Temperature Too High (Auto Resetting)
E-113	Flue Gas Temperature overheat (Not Used)
E-117	High System Water Pressure Sensor (Not Used)
E-118	Low System Water Pressure Sensor (Not Used)
E-119	System Water Pressure Switch Activated (Below 0.8 bar)
E-124	Module Temperature Too High (Auto Resetting)
E-128	Flame Extinguished During Operation (LMU Version D)
E-129	Air Supply Error. Fan not operating at correct speed (LMU Version D)
E-130	Flue Temperature Too High (Auto Resetting)
E-131	Fault With Burner
E-132	External Safety Interlock Activated (Open Circuit)
E-133	No Flame Detected After Final Ignition Attempt
E-134	Flame Extinguished During Operation (LMU Version C)
E-135	Air Supply Error Fan not operating at correct speed (LMU Version C)
E-140	LPB Segment / Address Not Recognized (Boiler Cascade Settings)
E-142	LPB Missing Partner (Boiler Cascade Settings)
E-145	Wrong Device Connected to PPS Circuit (Not Used in ProCon Configuration)
E-146	Unrecognized Plant Configuration
E-147	Burner Modules Not Connected (PPS Circuit Not Used in ProCon Configuration)
E-148	LPB Interface Not Configured (Boiler Cascade Settings)
E-150	General Boiler Fault
E-151	Module LMU64 Controller Malfunction
E-152	Module LMU64 Controller Parameter Programming Error
E-153	Module Control Interlocked
E-154	Module Operating Outside of Predefined Parameters. (System Hydraulic Error.)
E-160	Fan Not Reaching Set Point
E-161	Module Combustion Fan Speed Too High
E-162	Air Pressure Switch Fault (Not Used)
E-164	Flow Switch / Pressure Switch Open (Not Used)
E-166	Air Pressure Switch Fault (Not Used)
E-180	Module Operating in Chimney Mode 100% Output
E-181	Module Operating in Commissioning Mode
E-183	Module Controller / QAA73 Room Unit in Parameter Setting Mode

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14.1 Enhanced Fault Diagnosis Codes (LMU Internal Software Diagnostic Codes)

If required a more detailed fault diagnosis code can be viewed. This will assist where a definitive cause for a repeated operational error cannot be found.

The enhanced fault diagnosis code is displayed at b0 within the second INFO level. Access to this level is detailed on page 49.

The table below indicates a limited number of enhanced fault codes. If the exact number indicated by the appliance is not detailed below please call our Technical Department or guidance.

Fault Code	Fault Description
83	Combustion Fan Not Reaching Ignition Speed
87	Combustion Fan Operating Beneath Minimum Setting
90	Combustion Fan Not Reaching Pre Purge Speed
96	Flame Rectification Signal Detected When Burner Off
97	Flame Rectification Signal Detected When Burner Off
98	Flame Signal Lost During Operation
99	Flame Signal Lost During Operation
100	Flame Signal Lost During Operation
101	Flame Signal Not Detected Following Last Ignition Attempt
102	Flame Signal Not Detected Following Last Ignition Attempt
170	The Reset Button is being Continually Depressed. (Possible Display Module Mounting Error.)
259	The Reset Button Has Been Pressed When No Error Has Been Displayed (E153 Generator.)
282	Combustion Fan Not Reaching Correct Speed
400	System Hydraulic Error. Return Temperature > Flow Temperature. (Repeatedly.)
401	System Hydraulic Error. Return Temperature > Flow Temperature. (Repeatedly.)
402	System Hydraulic Error. Return Temperature > Flow Temperature. (Repeatedly.)
403	System Hydraulic Error. Return Temperature > Flow Temperature. (Repeatedly.)
404	System Hydraulic Error. Return Temperature > Flow Temperature. (Repeatedly.)
406	Boiler Flow Temperature Rising to Above Maximum Limit Temperature When Burner Is On.
422	Boiler Flow Temperature Rising to Above Maximum Limit Temperature When Burner Is Off.
433	System Hydraulic Error. ΔT between Flow and Return Too High. (Repeatedly.)
434	System Hydraulic Error. ΔT between Flow and Return Too High. (Repeatedly.)
435	System Hydraulic Error. ΔT between Flow and Return Too High. (Repeatedly.)

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15.0 Accessing Boiler Parameters

Control Parameter Default Settings.

All Units are preset for correct operation.
However if alterations are required to enhance the operation of the unit following the application of optional control the procedure is detailed below.

The following Pages detail the parameters of the LMU64 controllers, For your assistance the Standard Factory settings are indicated.
(Please note, the installer/commissioning engineer may have changed some of these settings to suit the system installed.)

To access the parameters detailed below the boiler's control panel must be used. (Only boilers supplied prior to 2003 will require a QAA73 Room Unit to access the control parameters. The unit must be connected to the RU terminals or directly to the LMU64 controller via the X10:01 terminal.)

There are three levels of access available, as follows. If you cannot access a particular parameter line, please consult with MHG Heating Ltd Technical Department for further assistance.

Level One (User) - Press and release one of the ▽ or △ Program Buttons.
The display will now indicate
Use the Program Buttons to access the desired parameter line. Use the -/+ Button to alter the displayed parameter to the required setting.
To save the adjusted parameter move to the adjacent parameter or press and release the INFO Button if you wish to exit this level.
To exit without saving any adjustment press and release the MODE Button.

Level Two (Installer) - Press & Hold the ▽△ Program Buttons simultaneously for at least 3 seconds.
The display will indicate H90
Use the Program Buttons to access the desired parameter line.
Use the -/+ Button to alter the displayed parameter to the required setting.
To save the adjusted parameter move to the adjacent parameter or press and release the INFO Button if you wish to exit this level.
To exit without saving any adjustment press and release the MODE Button.

Level Three (OEM) - Press & Hold the ▽△ Program Buttons simultaneously for at least 9 seconds.
The display will indicate - - - - -
A password is required to access this level. (Please contact MHG prior to accessing this as parameter level)
Use the ▽△ Program Buttons to access the desired parameter line. Use the -/+ Button to alter the displayed parameter to the required setting.
To save the adjusted parameter move to the adjacent parameter or press and release the INFO Button if you wish to exit this level.
To exit without saving any adjustment press and release the MODE Button.

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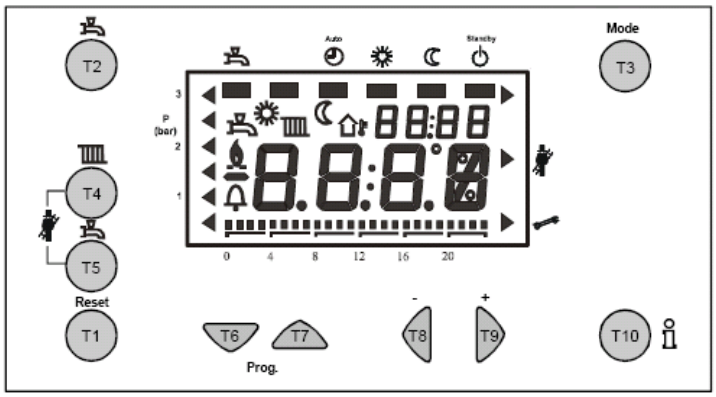
Level One end User Parameters

Line #	Description	Range	Defaults
P1	Time of Day	0…23.59	---
P2	Day Of Week	1 = Monday	---
P5	Reduced Room Temperature Set Point (If outside air sensor installed) Minimum Boiler Flow Temperature	5 - 34 20 - 80	16 20
	Time Switch 1 Heating Zone 1 Set Points		
P10	Heating Circuit 1 Time Switch 1 Day Selection	1..2, 1-5, 1-7	1-7
P11	Heating Circuit 1 Time Switch 1 First On	00:00 - 24:00	---
P12	Heating Circuit 1 Time Switch 1 First Off	00:00 - 24:00	---
P13	Heating Circuit 1 Time Switch 1 Second On	00:00 - 24:00	---
P14	Heating Circuit 1 Time Switch 1 Second Off	00:00 - 24:00	---
P15	Heating Circuit 1 Time Switch 1 Third On	00:00 - 24:00	---
P16	Heating Circuit 1 Time Switch 1 Third Off	00:00 - 24:00	---
	Time Switch 2 Heating Zone 2 Set Points (*AGU2.500 Clip and QAD36 sensors required)		
P20*	Heating Circuit 2 Time Switch 2 Day Selection	1..2, 1-5, 1-7	1-7
P21*	Heating Circuit 2 Time Switch 2 First On	00:00 - 24:00	---
P22*	Heating Circuit 2 Time Switch 2 First Off	00:00 - 24:00	---
P23*	Heating Circuit 2 Time Switch 2 Second On	00:00 - 24:00	---
P24*	Heating Circuit 2 Time Switch 2 Second Off	00:00 - 24:00	---
P25*	Heating Circuit 2 Time Switch 2 Third On	00:00 - 24:00	---
P26*	Heating Circuit 2 Time Switch 2 Third Off	00:00 - 24:00	---
	Time Switch 3 HWS Set Points (**QAZ36 HWS Sensor Required)		
P30**	Time Switch 3 Day Selection	1..2, 1-5, 1-7	1-7
P31**	Time Switch 3 First On	00:00 - 24:00	---
P32**	Time Switch 3 First Off	00:00 - 24:00	---
P33**	Time Switch 3 Second On	00:00 - 24:00	---
P34**	Time Switch 3 Second Off	00:00 - 24:00	---
P35**	Time Switch 3 Third On	00:00 - 24:00	---
P36**	Time Switch 3 Third Off	00:00 - 24:00	---
	General Functions		
P45	Default Reset of Time Switch Setting	0 / 1	0
P516	Summer / Winter Changeover Temperatures	8….30	20
P727	Detailed Diagnostic Code	English …….	English



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Level Two Engineer Parameters

#	Description	Range	16 & 27 H (16 & 27 HS)	27 S [47 S]	45,75,77 H	75 & 77 HM {Cascade Slave Boilers}
H90	Reduced Temperature for DHW	8….60	10	10	10	10
H91	DHW Production Control *(0=Time control 1=Constant)*	0…1	0	1	0	0
H93	DHW Production Control 0=Non Eco 1=Eco	0…1	0	0	0	0
H94	DHW Secondary Pump Control *(0= As H91. 1= As HWS Time Switch) (K2, X2:03, H615:6)*	0…1	0	0	0	0
H503	Minimum boiler setpoint temperature *(20 °C<=TkSmin<=TkSmax)*	20 ... 90 °C	20	20	20	20
H504	Maximum boiler setpoint temperature *(TkSmin<=TkSmax<=90 °C)*	20 ... 90 °C	90	90	90	90
H505	Boiler setpoint at design outside temperature	20 ... 90 °C	85	85	85	85
H506	Minimum flow setpoint temperature *(20 °C<=TvSmin<=TvSmax)*	20 ... 90 °C	25	25	25	25
H507	Maximum flow setpoint temperature *(TvSmin<=TvSmax<=90 °C)*	20 ... 90 °C	90	90	90	90
H516	Summer / winter changeover temperature *(30 °C: S / W changeover deactivated)*	8 ... 30 °C	18	18	18	18
H532	Heating curve slope heating circuit 1	1 ... 40	32	32	32	32
H533	Heating curve slope heating circuit 2	1 ... 40	1	1	1	1
H536	Maximum speed at maximum output in heating mode *(maximum speed limitation)*	0 ... 9950 rpm	5000	5000 [7000]	7000	7000
H541	Maximum degree of modulation in heating mode *(LmodTL <= PhzMax <= LmodVL)*	0 ... 100 %	65	65 [100]	100	100
H542	Minimum boiler output in kW *(lower calorific value)*	0 ... 9999 kW	6	6 [15]	15	15
H543	Maximum boiler output in kW *(lower calorific value)*	0 ... 9999 kW	25	25 [75]	75	75
H544	Overrun time of pumps, max. 210 min *(setting 255: continuous operation of Q1)*	0 ... 255 min	10	10	10	10
H545	Minimum burner pause time *(heat demand-dependent switching hysteresis)*	0 ... 3600 s	300	300	300	300
H551	Constant for quick setback without room influence	0 ... 20	2	2	2	2
H552	Hydraulic system adjustment	0 ... 255	67	70	66	80
554	Setting flags: status code open-circuit sensor for ANx channel suppressed / not suppressed	0 ... 255	b0=1 b1=0 b2=1 b3=1 b4=0 b5=1 b6=0 b7=0	b0=1 b1=0 b2=1 b3=1 b4=0 b5=1 b6=0 b7=0	b0=1 b1=0 b2=1 b3=1 b4=0 b5=1 b6=0 b7=0	b0=1 b1=0 b2=1 b3=1 b4=0 b5=1 b6=0 b7=0

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#	Description	Range	16 & 27 H (16 & 27 HS)	27 S [47 S]	45,75,77 H	75 & 77 HM {Cascade Slave Boilers}
H555	Setting flags	0 ... 255	b0=0 b1=0 b2=0 b3=0 b4=1 b5=0 b6=0 b7=0	b0=0 b1=0 b2=0 b3=0 b4=1 b5=0 b6=0 b7=0	b0=0 b1=0 b2=0 b3=0 b4=1 b5=0 b6=0 b7=0	b0=0 b1=0 b2=0 b3=0 b4=1 b5=0 b6=0 b7=0
H558	Setting flags	0 ... 255	b0=1 b1=0 b2=0 b3=0 b4=0 b5=0 b6=1 b7=0	b0=1 b1=0 b2=0 b3=0 b4=0 b5=0 b6=1 b7=0	b0=1 b1=0 b2=0 b3=0 b4=0 b5=0 b6=1 b7=0	b0=1 b1=0 b2=0 b3=0 b4=0 b5=0 b6=1 b7=0
H596	Running time of actuator in heating circuit 2 *(TimeOpening / TimeClosing)*	30 ... 873 s	150	150	150	150
H605	LPB device number of LMU (HM or Master Boiler 2 then Slave units 3...12)	0 ... 16*	1	1	1	2 {3…12}
H606	LPB segment number of LMU	0 ... 14	0	0	0	0
H614	Program input LMU basis	0 ... 255	3	3	3	3
H615	Function programmable output K2 LMU	0 ... 255	0	0	0	0
H618	Progr input on clip-in function module	0 ... 255	0	0	0	0
H619	Function output1 clip-in function module	0 ... 255	0	0	0	0
H620	Function output2 clip-in function module	0 ... 255	0	0	0	0
H621	Function output3 clip-in function module	0 ... 255	0	0	0	0
H622	Maximum value of heat demand with external predefined temperature setpoint *(5 °C< = TAnfoExtMax< = 130 °C)*	5 ... 130 °C	85	85	85	85
H630	Setting flags of maintenance alarms	0 ... 255	b0=1 b1=0 b2=0 b3=0 b4=0 b5=0 b6=0 b7=0	b0=1 b1=0 b2=0 b3=0 b4=0 b5=0 b6=0 b7=0	b0=1 b1=0 b2=0 b3=0 b4=0 b5=0 b6=0 b7=0	b0=1 b1=0 b2=0 b3=0 b4=0 b5=0 b6=0 b7=0
H636	Months (interval) since last service visit	0 ... 255 months	0	0	0	0
H700	1st Historical Fault – Number of Occurrences.					
H701	1st Historical Fault – Operating Phase.					
H702	1st Historical Fault – Operating Error Code					
H703	2nd Historical Fault – Number of Occurrences.					

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#	Description	Range	16 & 27 H (16 & 27 HS)	27 S [47 S]	45,75,77 H	75 & 77 HM {Cascade Slave Boilers}
H704	2nd Historical Fault – Operating Phase.					
H705	2nd Historical Fault – Operating Error Code					
H706	3rd Historical Fault – Number of Occurrences.					
H707	3rd Historical Fault – Operating Phase.					
H708	3rd Historical Fault – Operating Error Code					
H709	4th Historical Fault – Number of Occurrences.					
H710	4th Historical Fault – Operating Phase.					
H711	4th Historical Fault – Operating Error Code					
H712	5th Historical Fault – Number of Occurrences.					
H713	5th Historical Fault – Operating Phase.					
H714	5th Historical Fault – Operating Error Code					
H715	Current Historical Fault – Number of Occurrences					
H716	Current Historical Fault – Operating Phase.					
H717	Current Historical Fault – Operating Error Code					
H718	Hours run burner	0 ... 131070 hrs	0	0	0	0
H719	Hours run heating mode	0 ... 131070 hrs	0	0	0	0
H720	Hours run DHW heating	0 ... 131070 hrs	0	0	0	0
H721	Hours run zone	0 ... 131070 hrs	0	0	0	0
H722	Start counter	0 ... 327675	0	0	0	0
H727	Current Fault Code – ALBATROS Error Code	0 ... 583				
H728	1st Historical Fault – ALBATROS Error Code					
H729	2nd Historical Fault – ALBATROS Error Code					
H730	3rd Historical Fault – ALBATROS Error Code					
H731	4th Historical Fault – ALBATROS Error Code					
H732	5th Historical Fault – ALBATROS Error Code					
H732	Current Historical Fault – ALBATROS Error Code					
H755	Measured value of ionization current	-				

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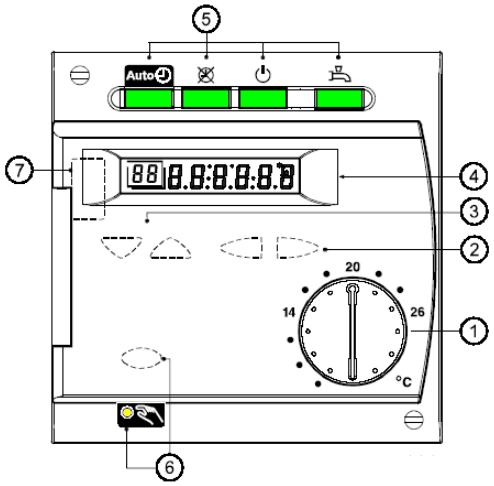
16.0 RVA47 Cascade Manager (ProCon 75 HM & 77 HM)



Legend

Button	LABEL	Function
1	ROOM TEMPERATURE SET POINT ADJUSTER.	Assumed Room Temperature if no Room Unit Fitted
2	PROGRAM DOWN & UP BUTTONS	Access to Program Settings
3	PROGRAM + PLUS & - MINUS BUTTONS	Access to program settings In Sequential Order.
4	DISPLAY SCREEN	Operational Status Indicator
5	MODE SELECTION BUTTONS. OPERATING MODE INDICATION	Auto Automatic Operation Continuous Operation On / Off Standby HWS On / Off
6	MANUAL OVERRIDE BUTTON AND INDICATOR	Manual Operation On / Off
7	COMPUTER ACCESS PORT	Specialist Equipment Required

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16.1 RVA47 Cascade Manager Settings.

The Single and Cascade Master units are preset for correct operation.

The following Pages detail the parameters of the RVA47 Cascade Manager and the Standard Factory settings, please note, the installer/commissioning engineer may have changed some of these settings to suit the system installed.

There are two levels of access available, as follows. If you cannot access a particular parameter line, please consult with MHG's Technical Department for further assistance.

Level One (End User)	-	Open The Hinged Flap. Use either of the ▽△ Program Buttons to access the desired parameter line. (Parameter Line range 0-50) Use the -/+ Buttons to alter the required parameter. Once all alterations have been completed press the AUTO button to exist this level.
Level Two (Installer)	-	Open The Hinged Flap. Press & Hold the ▽△ Program Buttons simultaneously for more than 3 seconds until Parameter # 51 appears. Use either of the ▽△ Program Buttons to access the desired parameter line. (Parameter Line range 51-173) Use the -/+ Buttons to alter the required parameter. Once all alterations have been completed press the AUTO button to exist this level.
Level Three (OEM)	-	Open The Hinged Flap. Press & Hold the ▽△ Program Buttons simultaneously for up to 9 seconds until - - - - - appears. A password will be required to access this level. (Down Down Plus Minus Plus) Use either of the ▽△ Program Buttons to access the desired parameter line. (Parameter Line range 2-92) Use the -/+ Buttons to alter the required parameter. Once all alterations have been completed press the AUTO button to exist this level.

Complete RVA47 Cascade Controller Parameter Settings.

The defaults indicated on the following pages are for standard systems.
If additional control features are required alteration will have to be made.
Please refer to the RVA47 manual for additional details.

#, -, ---	Indicates where an input can be made if required.
--	Indicates where an input can not be made and a sensed / attenuated figure is displayed. 'OFF' will be displayed if the +/- buttons are used.

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[#]	Description	Range	Defaults
	End User Level		
1	Time of Day	00:00-24:00	As Required
2	Weekday	1-7	As Required
3	Date	00:00	As Required
4	Year	1900-3000	As Required
5	Day of Week	1.7 1.5 6.7 1-7	As Required
6	Heating Time Switch 1st On Time	00:00-24:00	06:00
7	Heating Time Switch 1st Off Time	00:00-24:00	22:00
8	Heating Time Switch 2nd On Time	00:00-24:00	-
9	Heating Time Switch 2nd Off Time	00:00-24:00	-
10	Heating Time Switch 3rd On Time	00:00-24:00	-
11	Heating Time Switch 3rd Off Time	00:00-24:00	-
13	Required HWS Temperature	40-60	55
14	Heating Night Setback Temperature	10-30	16
15	Frost Protect Temperature	4-15	10
16	Summer/Winter Changeover Temperature	8-30	30
17	Weather Compensation Curve. If a 0-10 volt signal is the required heat generation control method for the RVA47 / boiler installation this setting must be adjusted to -- on all RVA47s present in the boiler cascade installation. This will result in the Auto, On/Off and Frost lights becoming inactive. Alteration to parameter #170 and #172 will also be required.	0-40	32
18	Actual Room Temperature	0-50	--
19	Actual Outside Temperature (Pressing the + & - buttons simultaneously until the display stops flashing will reset the averaged value.)	-50-+50	--
23	Restore User Level Factory Presets	0-1	0
30	Hot Water Time Switch 1st On Time	00:00-24:00	06:00
31	Hot Water Time Switch 1st Off Time	00:00-24:00	22:00
32	Hot Water Time Switch 2nd On Time	00:00-24:00	-
33	Hot Water Time Switch 2nd Off Time	00:00-24:00	-
34	Hot Water Time Switch 3rd On Time	00:00-24:00	-
35	Hot Water Time Switch 3rd Off Time	00:00-24:00	-
50	Fault Code Display	0-255	--
	Engineer Level		
51	Output Test 0. Automatic control 1. All outputs off 2. HWS pump/valve on 3. Circulating pump on	0-3	0
52	Input Test 0. Return Temperature 1. HWS Temperature 2. Flow Temperature 3. Outside Temperature 4. Room Temperature 5. 0-10 Volt Required Temperature	0-5	0

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[#]	Description	Range	Defaults
53	Plant Type	0-100	--
56	Actual System Flow Temperature	0-140	--
57	Actual System Return Temperature	0-140	--
59	Actual System HWS Temperature	0-140	--
60	Attenuated Outside Air Temperature	-50-+50	--
61	Composite Outside Air Temperature	-50-+50	--
62	Outside Air Temperature Source	00.01/14.16	--
66	Maximum System Flow Temperature	8-85	--
69	Maximum HWS Temperature	8-85	--
70	Nominal Room Temperature Set Point	0.0-35.0	--
71	Set Point Of Room Temperature	0.0-35.0	--
72	System Flow Temperature Set Point	0-140	--
75	Modules Available in Cascade	00.1/16.3	--
76	Lead Module in Cascade	00.1/16.3	--
77	Hour of Operation Until Sequence Change	0.990	--
95	Heating Pump Output (HKP) Output Functions	1-5	1
100	Displacement Of Weather Compensation Curve	-4.5 - +4.5	0
101	Gain Factor/Room Influence 0. Active 1. Inactive	0-1	1
102	Room Temperature Switching Differential	---/0.5-4	---
103	Minimum System Flow Temperature	8-95	8
104	Maximum System Flow Temperature	8-95	82
105	Building Construction Type 0. Heavy 1. Light	0-1	1
106	Adaptation of Heat Curve 0. Inactive 1. Active	0-1	0
107	Optimum Start Time Maximum Forward Shift. 00:00 Inactive	00:00-06:00	00:00
108	Optimum Stop Time Maximum Forward Shift 00:00 Inactive	00:00-06:00	00:00
109	Heating Zone Quick Setback Constant	0-20	2
110	Over Heat Protection Heating Zone Pump	0-1	0
117	Legionella Protection Function 0. Off. 1. On	0-1	0
118	Legionelle Protection Temperature	8-95	65
119	HWS Pump Operation Function. (Stored > Flow Temp) 0. Off 1. Always On 2. Only On When Boiler is Interlocked Off Via 170=3	0-2	0
120	Reduced HWS Temperature Set Point	8-70	40
121	HWS Time Control 0. 24 Hours per Day 1. As Heating Time Switch Settings 2. As HWS Time Switch Settings	0-2	2
122	HWS Pump Control 0. Heating Time Switch Setting Apply 1. HWS Time Switch Settings Apply	0-1	1

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[#]	Description	Range	Defaults
123	HWS Control in Cascade System 0. Controlled Via Master RVA47 Manager 1. Controlled Via All RVA47 Managers in Segment 2. Controlled Via All RVA47 Managers In LPB System	0-2	2
124	HWS Charging Cycles Per 24 Hour Period 0. One Per Day with 2.5 Hour Forward Shift from Heating Time Switch Setting 1. Several Per Day with 1 Hour Forwarding Shifting from Heating Time Switch Setting	0-1	1
125	HWS Temperature Control 0. QAZ21 Sensor 1. Volt Free Enable via Thermostat	0-1	0
126	System Flow Temperature Boost When HWS Enabled	0-30	20
127	HWS Priority / Shifting 0. Absolute Priority 1. Shifting Priority. Heating Reduced to Increase HWS Recovery 2. No Priority. HWS and Heating Operate in parallel 3. Shifting / Absolute Heating Switched OFF, Mixing Circuit Decreased (RVA46) to Increase HWS Recovery.	0-3	1
130	Hours Of Operation Prior to Sequence Rotation	10-990	100
131	Changeover Sequence Program 0. No Exemptions 1. The First Module is Exempt 2. The Last Module is Exempt 3. The First and Last Modules are Exempt	0-3	0
132	Module Designated as Fixed Lead Unit	00.1-16.3	---
133	Cascade Enable Delay Time	1-120	2
134	Anti Cycling Time (Seconds)	0-1800	30
140	LPB Control Address 1. Master RVA47 Manager 2….16. Slave RVA47s Operating From Master RVA47 Manager	0-16	1
141	LPB Control Segment 0. Heat Generating Units (RVA47s) 1…14. Heat Consuming Units (RVA46s)	0-14	0
142	LPB Power Supply 0. Off 1. On	0-1	1
143	Operation of LPB Power Supply	On/Off	On
144	Display of LPB Communication	On/Off	On
145	Changeover Via LPB Connection 0. All Controllers in Same Segment 1. All Controllers in LPB System	0-1	1
146	Summer/Winter Changeover Via LPB 0. Local Control Only 1. Entire Control Via LPB	0-1	0

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[#]	Description	Range	Defaults
147	Central Standby Switching 0. Deactivated 1. Activated	0-1	0
148	Clock Mode 0. Autonomous All Clocks Can Have Different Times 1. System Time Without Adjustment 2. System Time With Adjustment 3. System Clock Master. There Can Only be One Master	0-3	2
149	Auto Time Adjustment Spring Date and Month of Last Sunday in March	Date/Month	25.03
150	Auto Time Adjustment Autumn Date and Month of Last Sunday in October	Date/Month	25.10
170	Operation of H1 Terminal 0. Changeover of Operation When Volt Free Switch is Made. (HWS Stopped) 1. Changeover of Operation When Volt Free Switch is Made. (HWS Unaffected) 2. Minimum Flow Temperature Maintained When Volt Free Switch is Made. (Set at 171.) 3. Heat Generation Stopped When Volt Free Switch is Made.(Frost Active) 4. 0-10 Volt Control to Vary System Flow Temperature. (Curve set at 172) (Terminal #1. 0-10 volt. Terminal #2. Ground.) {If a 0-10 volt signal is the required heat generation control method for the RVA47 / boiler installation this setting must be adjusted to 4. Alterations must also be made to parameter #17. The setting must be adjusted from 32 to – on all RVA47s present in the boiler cascade installation. This will result in the Auto, On/Off and Frost lights becoming inactive. Possible alterations to parameter #172 may also be required.}	0-4	0
171	Minimum Temperature Set Point Via H1 (170 = 2)	8-95	80
172	Maximum Temperature Set Point Via H1 (170 = 4)	5-130	82
173	Operating Action of H1 control contacts. 0. The contact is Normally Closed. 1. The contact is Normally Open. {The RVA47 will operate according to its internal time switches and presets. **If a remote BMS is controlling the RVA47 via a Volt Free switch across H1 '0' should be inserted.** This will allow the boilers operate when the Volt Free switch is made and stopped (Blocked.) when the switch is opened. If you are controlling the lead (master) RVA/Boiler via a volt free switch across H1, all slave modules should be left with '1' as the input. This will allow the AUTO light and the OFF light to indicate their operational mode dictated by the lead (master) RVA/Boiler.}	0-1	1

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[#]	Description	Range	Defaults
	OEM Level		
2	Maximum Module Temperature When Operating In Manual Mode	8-120	82
8	Pump Run On Time System Heating (HKP) and HWS (SLP) Pumps	0-20	5
22	Minimum System Return Temperature	8-95	8
30	Room Influence Gain Factor	0-20	4
32	Boost Room Temperature Set Point Room Sensor Dependant (QAA10/50/70) Increase. Heat Up Time Reduced Decrease Heat Up Time Increased	0-20	5
33	Frost Protection 0. Frost Protection Program Disabled 1. Frost Protection Program Enabled	0-1	1
35	Heat Gains Increase. If Heat Gains are High Decrease. If Heat Gains are Low	-2-+4	0
36	Adaptation Sensitivity 1 Outside Air Range 4-12°C	1-15	15
37	Adaptation Sensitivity 2 Outside Air Range <4°C	1-15	15
40	Maximum HWS Set Point	8-80	60
41	HWS Switching Differential (QAZ21 Sensor Only)	0-20	5
42	Legionella Function 0. Off 1. On.	0-1	0
50	Cascade Strategy 1-3 Automatic 4-6. Fixed	1-6	2
51	Minimum % Output reached Prior to Switching Off a Module In the Cascade	5-100	40
52	Maximum % Output Reached Prior to Switching On a Module In The Cascade	5-100	80
56	Time Spent By Module On Ignition Rate Prior to Modulation (Delay Time Between Modules)	0-1200	0
60	Minimum Temperature Difference Between Flow/ Return Sensor Readings Prior to The Return Sensor Becoming Lead	0-20	2
90	Display Default 0. Time of Day 1. System Flow Temperature (CA)		0
91	Software Version	00.0-99.9	#
92	RVA47 Manager Operating Hours	0-500,000	--

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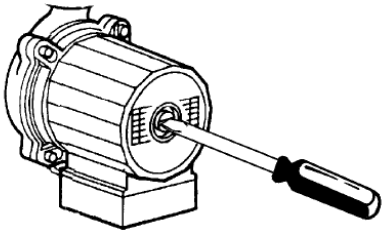
17.0 Commissioning The Appliance

17.1 Pre-Commissioning Checks

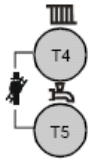
Prior to undertaking the commissioning of the unit please ensure that the system water has been cleansed and treated with a suitable inhibitor as detailed in Filling the system and system water quality.

Prior to applying power to the appliance its circulation pump should be bled and checked to ensure free rotation of the armature. Also ensure that the ignition electrodes spark gap is set to 4mm.



17.2 Combustion System Commissioning.

The commissioning function enables the boiler to be started up in heating mode by pressing the



Buttons simultaneously .

There are two levels of operation accessed via the commissioning mode.

Operation at Maximum Output With No Adjustment.

Pressing the BUTTONS for more than 3 seconds but less than 6 seconds places the appliance in High Fire mode.
To indicate that the module is operating under the control of the commissioning mode an arrow will appear on the display adjacent to the symbol. The display will also indicate 100%

This mode is maintained until the limit thermostat temperature is reached or the coommissioning buttons are pressed from more than 1 second.

Operation at Maximum or Minimum Output For Flue Gas Analysis and Gas Valve Adjustment

Pressing the BUTTONS for more than 6 seconds. places the appliance in High Fire mode.

To indicate that the module is operating under the control of the commissioning mode an arrow will appear adjacent to the symbol.
The display will also indicate 100%.

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The output of the appliance can be altered by using the T6 T7 buttons to move between 100% maximum outout and 0% minimum output.

Alterantaivley the output of the appliance can be altered by using the T8 T9 buttons to descrease or increase the output by 1% per press.

This mode is maintained until the limit thermostat temperature is reached or the coommissioning buttons are pressed from more than 1 second.

Whilst the appliance is operating under the control of the commissioning mode (with adjustment) the gas valve can be adjusted to give correct flue gas analysis readings.

The appliance is equipped with a modulating gas valve.

The modulating gas valve must be set at High Fire and Low Fire to ensure correct operation throughout its modulating range.

It is advisable to check the combustion figures on High and Low Fire prior to carrying out any adjustments.

Adjusting the High Fire has a marked effect on the Low Fire figures. Where as adjusting the Low Fire has little effect on the High Fire figures.

The High fire adjustment is carried out via the 2.5mm Allen Key socket D

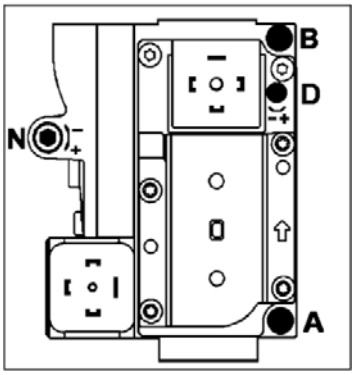
The High Fire adjustment is a Gate type restrictor.

Therefore turning the screw clockwise will close the gate and thus restrict the quantity of gas passing through to the burner.

The Low fire adjustment is carried out via the 2.5mm Allen Key socket N

The Low Fire adjustment is a diaphragm governor.

Therefore turning the screw clockwise will increase the pressure on the diaphragm and thus increase the quantity of gas passing through to the burner.



Legend

A. Valve Inlet Gas Pressure Test Point
B. Valve Outlet Gas Pressure Test Point
D. High Fire Adjuster (Gate Type)
N. Low Fire Adjuster (Governor Type)

A flue gas analyser must be used to ensure that the correct combustion setting are achieved.
This is undertaken by inserting the analyser's probe in to plugged hole within the flue collector of the appliance or in the tapping in the flue immediately above the appliance if present.

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The combustion setting required for all ProCon appliances are as detailed in the following table.

Gas Type	High Fire	Low Fire
Natural Gas (G20)	8.5% $C0_2$	9.0% CO_2
LPG (G31)	11.0% CO_2	11.0% CO_2

17.3 Conversion of the Appliance to Operate on LPG (G31).

Unless specified at the time of ordering the appliance/s will be supplied ready to operate on a Natural Gas (G20) fuel supply.
The appliances data badge will indicate the type of fuel gas the modules have been set to operate with.
Prior to firing the unit for the first time it is advisable to check the size of the gas injector.
The injectors are located on the outlet of module gas valves.
The table below indicates the size of injector for the respective fuel gas.
If the unit is required to operate on a fuel gas different from that to which it is currently set, the following conversion procedure must be undertaken.

Isolate the fuel and electrical supplies at the appliances isolators.

Disconnect the electrical connection for the gas valves solenoid coils.

Disconnect the gas valve from the gas supply tubing at the union immediately prior to the gas valves inlet.

Remove the 'Circlip' located at the outlet of the valve securing the injector to the fan inlet bracket.

Extract the gas valve and injector from the fan inlet bracket.

Install the correctly sized injector into the outlet of the gas valve ensuring to apply the sealing washer.

Reinstall the gas valve/s complete with correct sized injector/s in the reverse order.

Following completion of the re-injectoring of all modules the units will require recommissioning as detailed in section 15.2.

Gas Type	ProCon 16	ProCon 27	ProCon 45	ProCon 75 & 77
Natural Gas (G20)	4.0mm	10.0mm	12.0mm	15.0mm
LPG (G31)	3.5mm	6.0mm	7.0mm	10.0mm

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18.0 Routine Inspection and Servicing. (A QAA73 Room Unit/service tool might be required to reset the modules service interval timer dependent upon boiler age.)

As with all Gas Appliances, we would highly recommended that a competent heating engineer services the ProCon, at least every 12 months. This is assuming a normal daily usage of 8 – 10 hours.
If however the boiler is to be operated 24 hours a day, 7 days, we would recommend services every 6 months.

ProCon boilers will display an E105 Error Code when 12 months has lapsed, indicating that the appliance requires a Routine Service Inspection. This code will also be displayed on the RVA47 cascade manager and room unit if present. (E:105 Indication Reset via H630 bit 6 0-1)

If the Installer/Commissioning Engineer is unable to undertake the Routine Service Inspection, as detailed Section 16.1, please contact the MHG Technical Department, who will be able to arrange the Routine Service Inspection to be undertaken.

18.1 Routine Service Inspection

Before commencing any service/maintenance work, the following tasks must be undertaken.

a) Ask the end user about any problems with the operation of the boiler unit and note their comments.
b) Check the water pressure of the installation.
c) Remove the boiler casing and visually inspect all pipe and water joints for signs of leakage.
d) Inspect the top of the casing and the top of the heat exchangers for signs of water leakage or ingress.
e) Run the unit in Commissioning Mode HIGH FIRE; with the use of a flue gas analyzer record the CO_2 level. See section 15.2
f) Run the unit in Commissioning Mode LOW FIRE; with the use of a flue gas analyzer record the CO_2 level. See section 15.2
g) Listen to the sound of the combustion fan. Utilizing the appliances fascia review the units Operating Error Codes, and note the recorded codes onto the Service Report. (H700 – H722)
h) Undertake a System Water Analysis to check the concentration level of the Water Treatment, and note the level onto the Service Report.
i) Check the flue route including the terminal position for conformity with prevailing regulations, and trim back any foliage that may be around the terminal.
j) Check the plant room/compartment ventilation system for conformity with prevailing regulations.
k) Check the Pressure (Safety) Relief Valve size, rating and orientation, for conformity with prevailing regulations.

The results of the Inspections undertaken above must be acted upon, and all discrepancies should be recorded on the Service Report and brought to the Client / End User's attention.
Undertake any maintenance, and if necessary any preventative maintenance, that's required.

18.2 Routine Cleaning & Maintenance (E:105 Indication Reset via H630 bit 6 0-1)

As part of the Routine Service Inspection, certain areas of the boiler need to the checked and cleaned as necessary.

a) Turn the boiler OFF at the ON/OFF switch and electrically isolate the boiler by removing the plug or fuse from the boiler supply.
b) Turn off the gas at the boiler isolation tap, fitted by the installer, adjacent to the appliance.
c) Remove the electrical connections (Two in the case of 45, 75 & 77) from the units fan assemble.
d) Disconnect the earth lead, HT cap and Lead from the ignition electrodes.
e) Remove the 'Circlip' securing the gas injector into the fan inlet bracket and extract the gas valve and injector assembly. (Inspect and clean both the injector and gas valve assembly.)
f) Disassemble the burner by removing the six M6 nuts around the burner door, using a 10mm Spanner. Pull the burner forward and remove from the heat exchanger. Gently put to one side.
g) Once access has been gained to the combustion chamber and front section of the heat exchanger, visually inspect the heat exchanger coils.
It is usually only necessary to clean the front section of the heat exchanger. If server deposits are found, the rear section of the heat exchanger should also be checked and cleaned, which will necessitate the removal of the heat exchanger from the boiler.
If any coils appear to be significantly dis-coloured, then a blockage of either scale, magnetite, or general system debris has occurred which will have allowed excessive overheating to have occurred within the coil.

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If dis-colouration has occurred, then specialist de-scaling of the heat exchanger will be required, however, stress cracking may have occurred, and the heat exchanger may become porous following the de-scale works.

h) If the heat exchanger has not suffered from dis-colouration, as 'Item g' above, then a Standard Service can be undertaken. Using a natural bristled brush ONLY, remove the worst of the mineral/debris build up. With the use of the dissolved *ProCon Combustion Chamber Cleaning Granules*, spray the solution onto the heat exchanger surface and leave for approximately 5 minutes. This will help to remove any stubborn mineral deposits and clear the condensate drain connections. Finally brush the heat exchanger whilst rinsing thoroughly with copious amounts of fresh water. *ProCon Combustion Chamber Cleaning Granules* are available from MHG Heating Ltd Spares Department. **A STEEL OR PVC BRUSH MUST NOT BE USED TO CLEAN THE HEAT EXCHANGER.**

i) Following the cleaning of the Heat Exchangers, the condensate syphon must be flushed to ensure that all mineral deposits/debris that has been washed from the heat exchanger surface is correctly removed. Open the syphon cleaning point cap at the base of the boiler, with a suitable receptacle directly below to collect the syphon contents. Safely dispose of the contents of the syphon. Replace the receptacle below the cleaning point and poor 2 litres of clean tap water into the heat exchanger, which will drain through the cleaning point. Refit the cleaning point cap and poor half a litre of clean tap water into the heat exchanger to ensure the syphon is re-flooded. Check the cleaning point cap for leaks.

j) Visually check the burner surface for signs of damage and debris build-up. Remove any debris build up with compressed air. If excessive debris build-up is identified, the burner lance should be removed and the inner metal surface should be washed and cleaned. **A BRUSH, OF ANY KIND, MUST NOT BE USED TO CLEAN THE BURNER SURFACE.** If damage has occurred to the burner surface, the burner MUST be replaced.

k) To ensure that the rectification circuit operates correctly the resistance between the burner and burner door must be check with a multi-meter to ensure that it is less than 1 Ohm (<1 Ohm.)

l) Clean with abrasive material and inspect the ignition electrode. Replace if necessary. Adjust the spark gap to 4mm.

m) Check the combustion fan blades for debris build-up. Remove any debris with a soft bristle brush or preferably compressed air. **DO NOT TOUCH, OR SPIN, THE FAN BLADES WITH YOUR FINGERS AS THIS COULD AFFECT THE BALANCING OF THE FAN BLADES.**

n) Re-fit the Burners, in the reverse order of dismantling, ensure that all electrical connections are correctly and securely connected.

o) Inspect all water joints. Any joints found to be leaking MUST be replaced. It is also advisable when replacing water joints to also change any adjacent joints at the same time.

p) Inspect all gas joints with a suitable leak detection method. Any joints found to be leaking MUST be replaced. It is also advisable when replacing gas joints to also change any adjacent joints at the same time.

q) Via the tappings on the boiler connector elbow or straight a flue gas recirculation check must be undertaken when the boiler is operating on high and low fire modes.

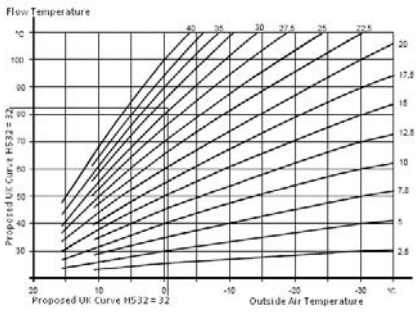
r) Inspect and clean the condensate neutralising tank, replenishing the neutralising granules as required. Granules available from MHG Heating Ltd Spares Department.

s) With the use of a suitable Flue Gas Analyser, check and adjust the combustion settings, as detailed in Section 15.2.

t) Inspect the general condition of the flue system, including the termination, repair as necessary or advise on any remedial action as required.

u) Following the satisfactory completion of the above service procedure, the internal Routine Service Control Timer needs to be reset. Utilising the appliances fascia gain access to the Second Level Parameters, as detailed in Section 14.2, and select Parameter Line H630 – Bit 6. using the + button, adjust the value from 0 to 1 and press the INFO button to reset the Service Interval counter.

19.0 Weather Compensation Slope



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20.0 Optional System Controls.

If required the following controls can be applied to the ProCon HT range to enhance boiler and system operational efficiency and longevity. (Further detailed guidance can be obtained from the respective controller manuals.)

QAA73 Modulating Full Function Room Unit. (Single Boiler Applications Only.)

This modulating full function room unit offers the heating user full remote access to the all functions that effect the provision of heat to the respective zone. The unit also displays information from all attached temperature sensors. Boiler, Hot water, Outside , Boiler Modulation and Operational Status .

RVA47 Cascade Manager.

This cascade manager has the capability to control up to twelve appliances, one CT circuit and one HWS primary circuit. The RVA47 cascade manager communicates with the RVA63 & 46 zone controllers via LPB, offering enhanced communication, zone and module temperature control. A dedicated housing is also available to ease the installation process.

RVA63 Dual Zone Controller.

This dual zone controller has the capability to control up to two independent CT/VT or a mixture of both. The RVA63 dual zone controller communicates with the master boiler mounted RVA47 Cascade Manager via LPB, offering enhanced communication, zone and module temperature control. A dedicated housing is also available to ease the installation process.

RVA46 Single Zone Controller.

This single zone controller has the capability to control one CT/VT zone. The RVA46 single zone controller communicates with the master boiler mounted RVA47 Cascade Manager via LPB, offering enhanced communication, zone and module temperature control. A dedicated housing is also available to ease the installation process.

QAA70 Modulating Full Function Room Unit.(One unit per zone.)

This modulating full function room unit offers the heating user full remote access to the all functions that effect the provision of heat to the respective zone. The unit also displays information from all attached temperature sensors. Boiler, Hot water, Outside and remote tamperproof room unit(QAW44).

QAA50 Modulating Limited Function Room Unit.(One unit per zone.)

This modulating limited function room unit offers the heating user reduced remote access to operating mode and temperature functions that effect the provision of heat to the respective zone.

QAA10 Modulating Tamper-proof Room Sensor. (One Unit per zone.)

This modulating tamper-proof room unit offers room temperature feedback from the heated space that effects the provision of heat to the respective zone.

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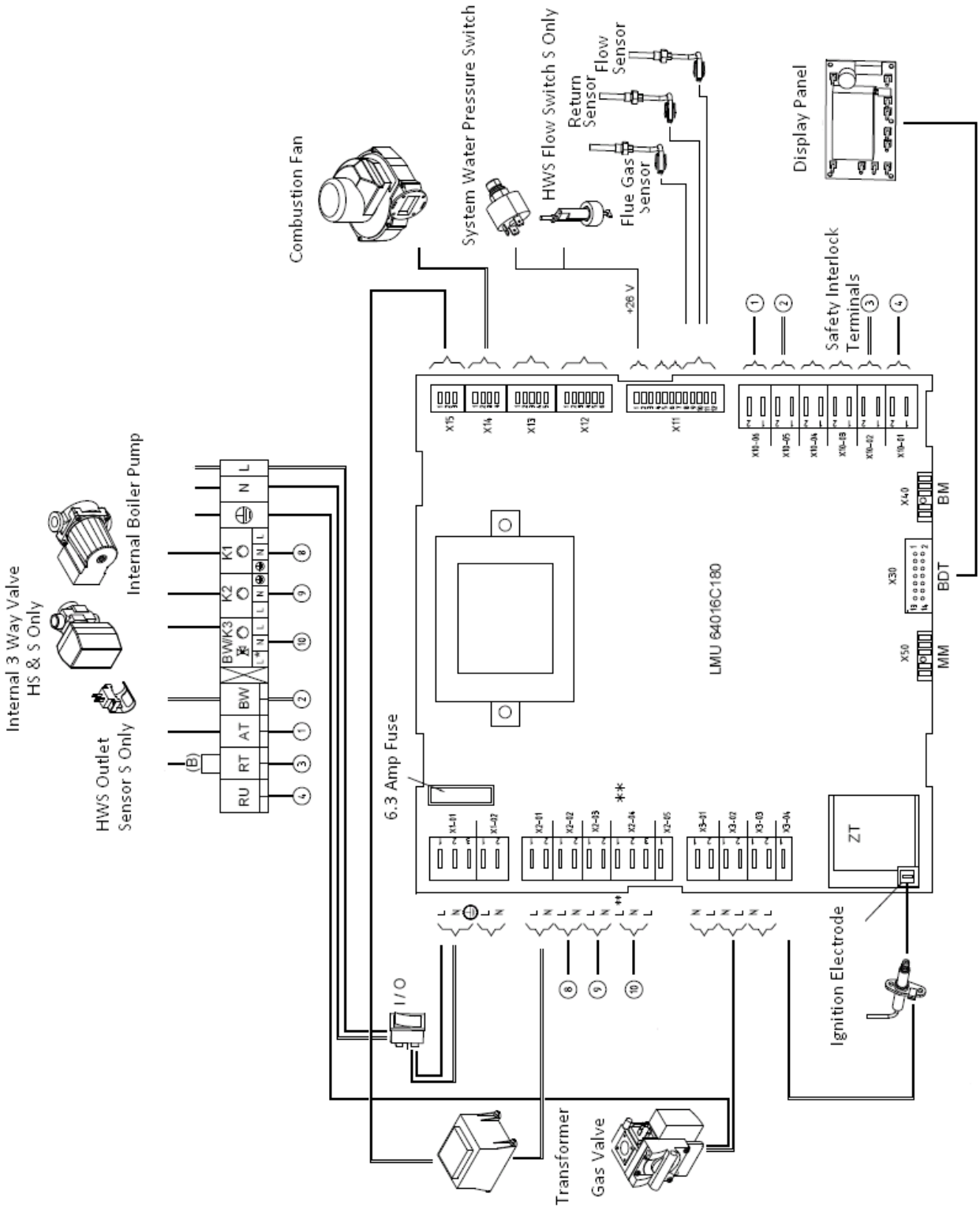
21.0 Internal Wiring

The internal wiring configurations of the ProCon differ dependant upon the model. H HS S and HM.

21.1 Internal Wiring Diagram 16 , 27 H HS & S



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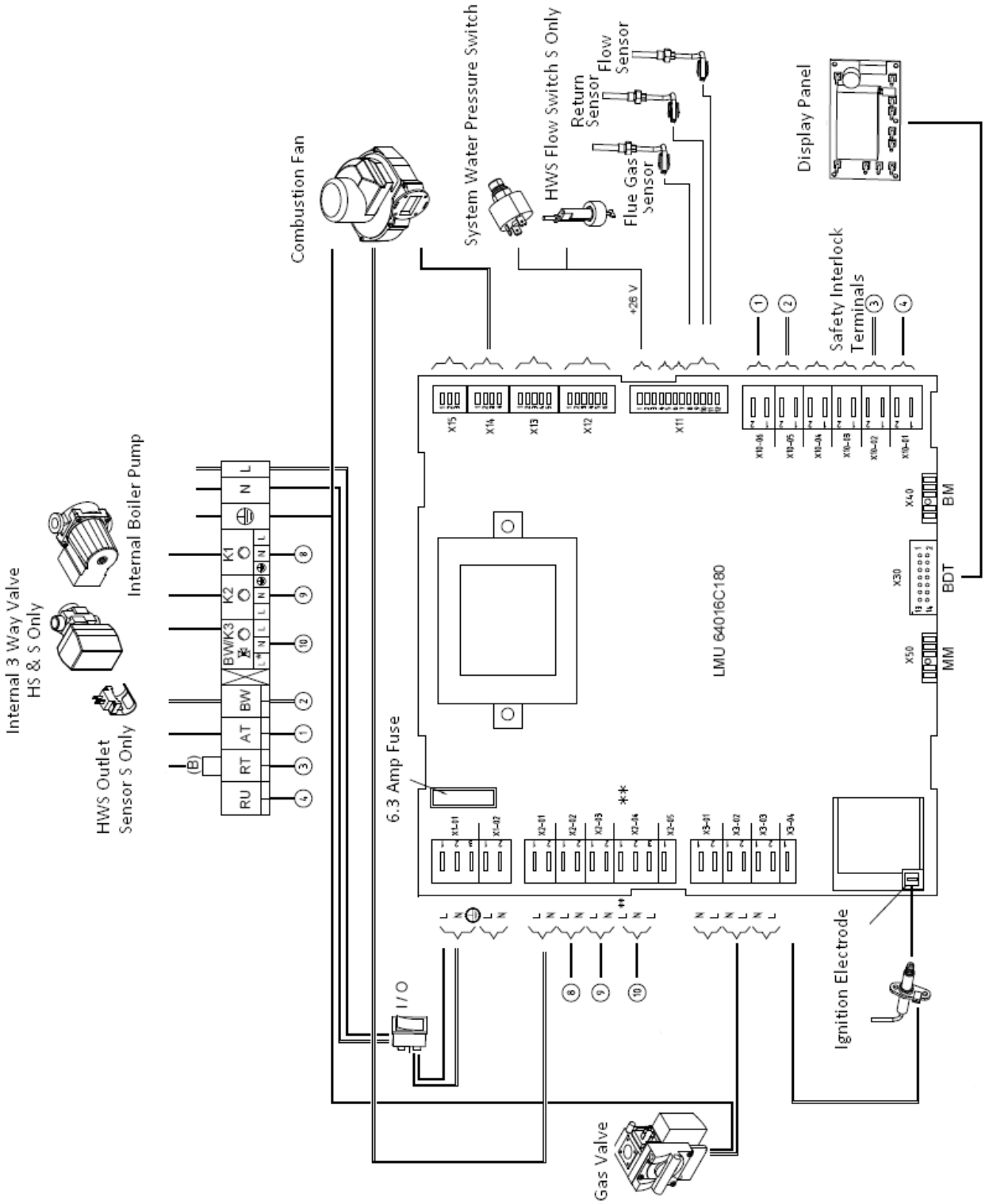
21.2 Internal Wiring Diagram 47 H & S



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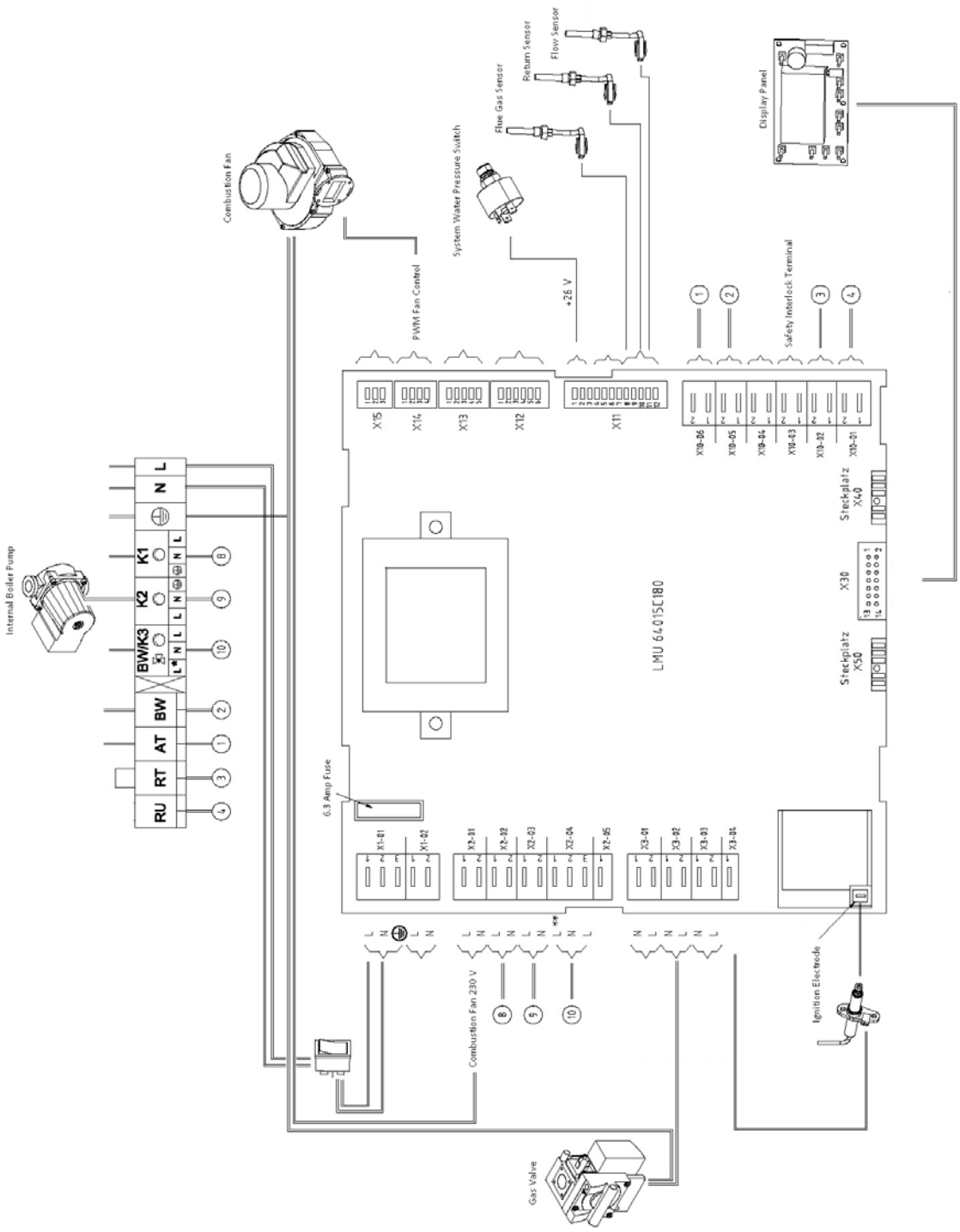
21.3 Internal Wiring Diagram 75 & 77 H



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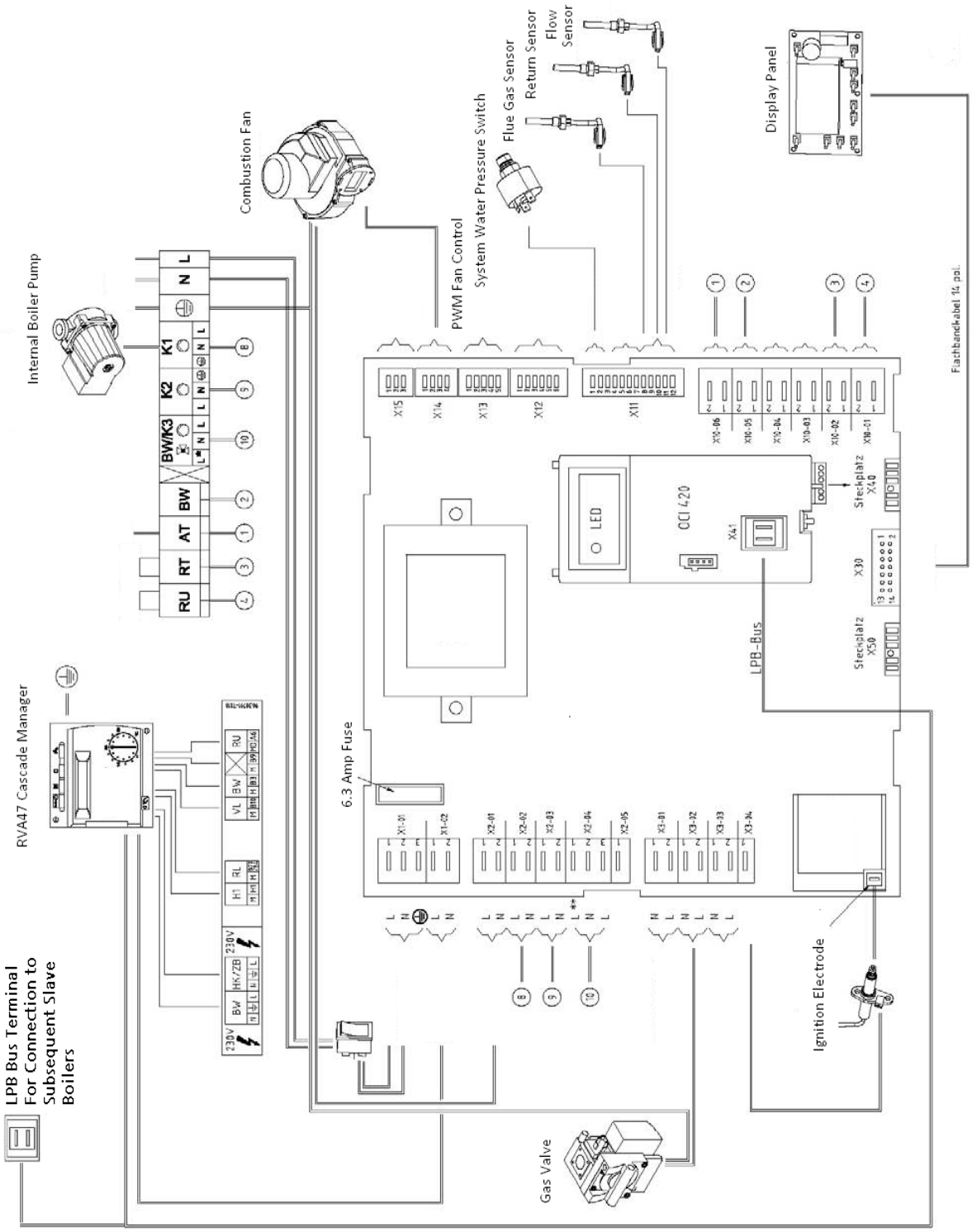
21.4 Internal Wiring Diagram 75 & 77 HM



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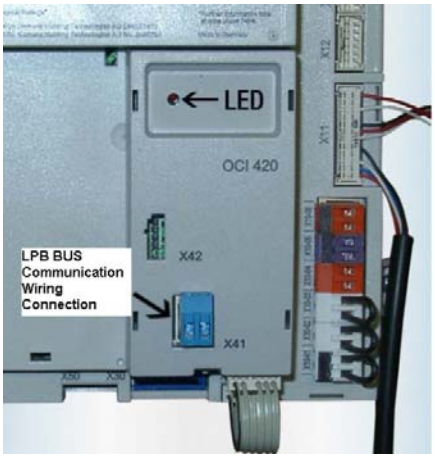
22.0 HM Appliances and Slave units equipped with OCI420 Communication Clips.



Communication Operation Indications

The RED LED on the OCI420 communication clip mounted on the front of each LMU64 module controller flashes to indicate the detected operational status of the module dictated by the LPB communication from the RVA47 Cascade Manager.

LED FLASH STATUS	INTERPRETATION OPTIONS
LED ON Constantly	OCI420 not configured to operate with LMU64
LED OFF Constantly	OCI420 Configured. LPB Short Circuit / No Power.
LED ON 93% OFF 7%	OCI420 and LUM64 Not Compatible / LPB Address inadmissible.
LED ON 5% OFF 95%	Boiler being controlled via LPB and required to be not operating.
LED ON 5% OFF 20% ON 5% OFF 70%	Boiler being controlled via LPB and required to be operating.

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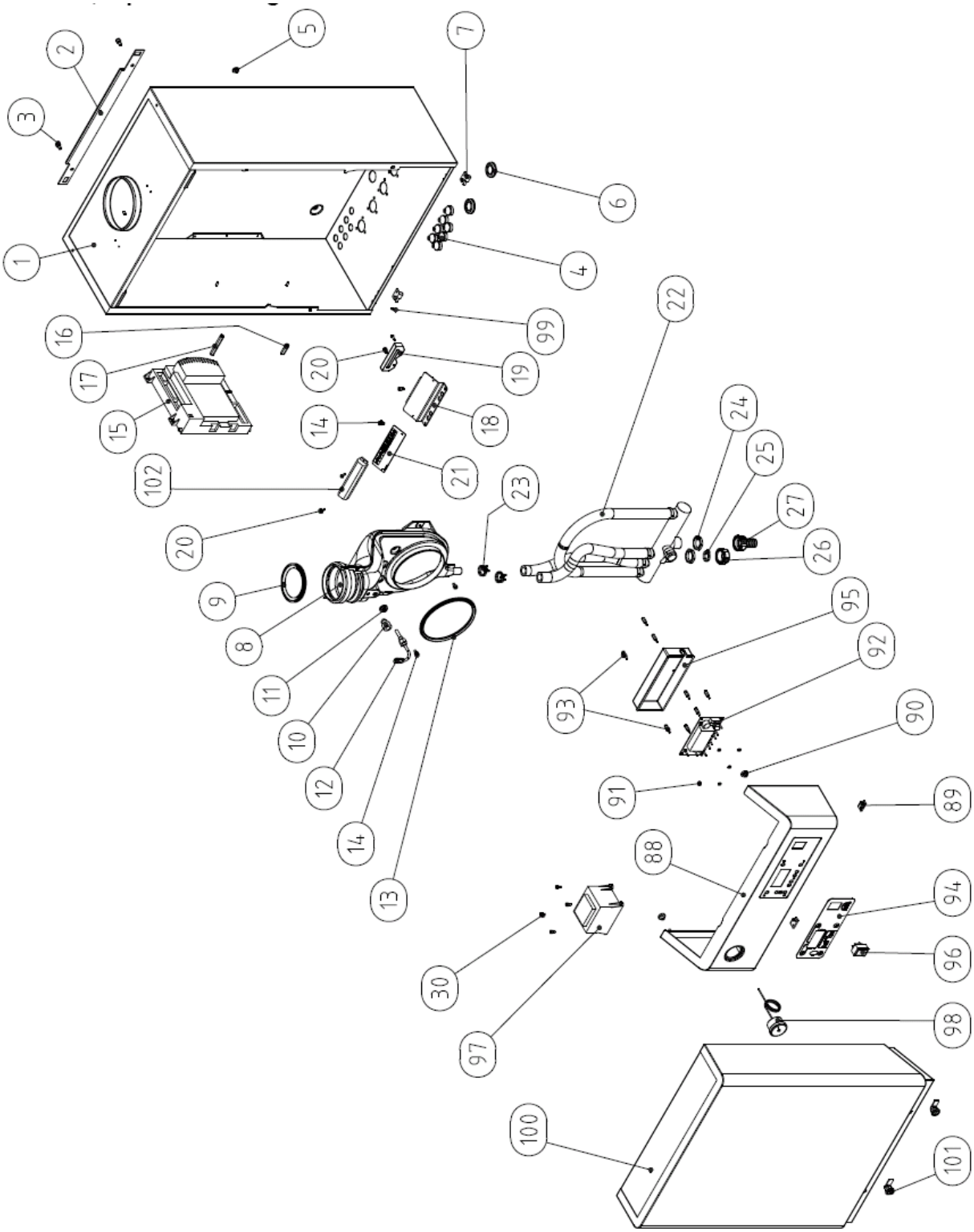
23.0 Exploded Spares Diagram 16, 27 & 47



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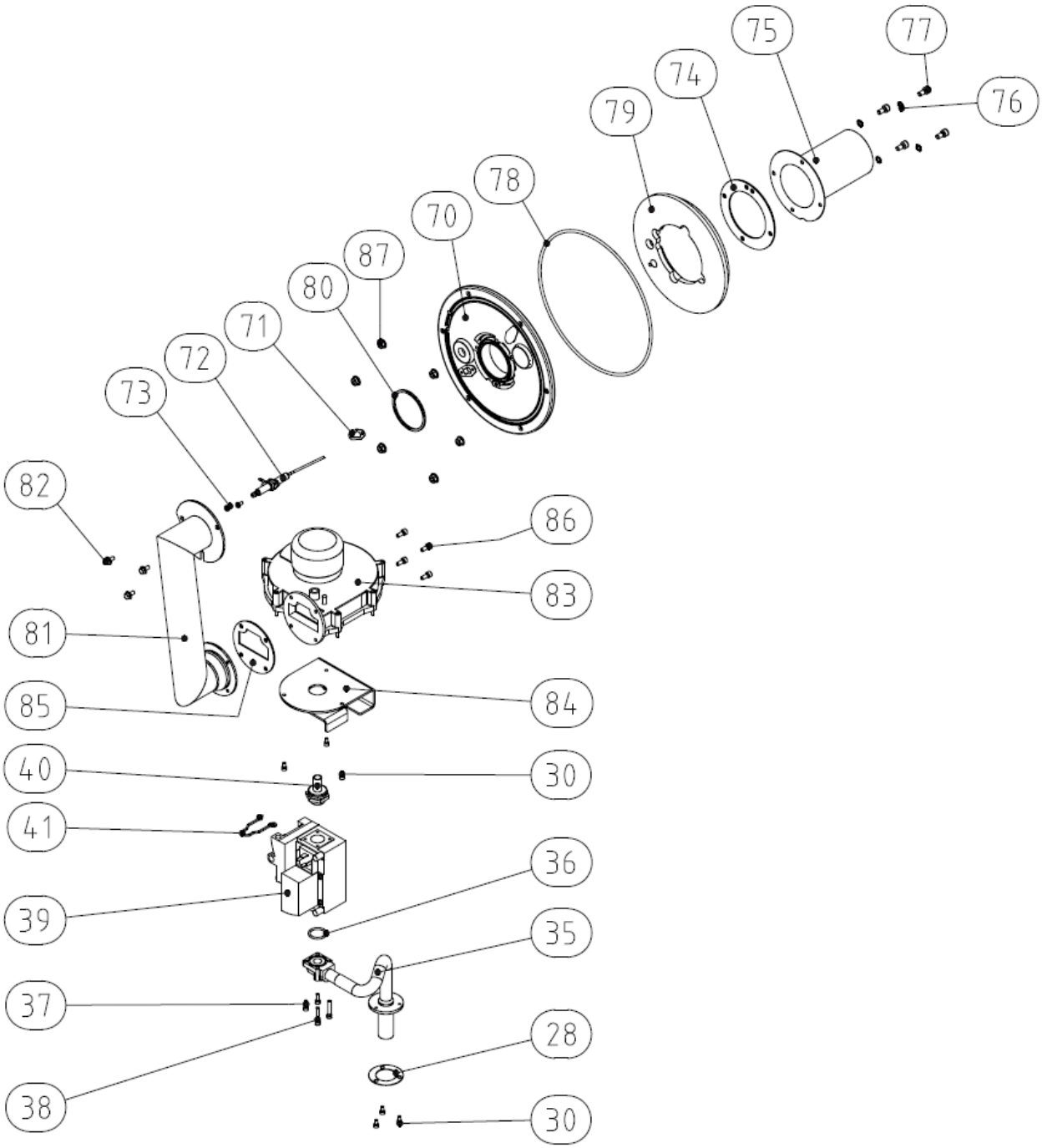
23.0 Exploded Spares Diagram 16, 27 & 47



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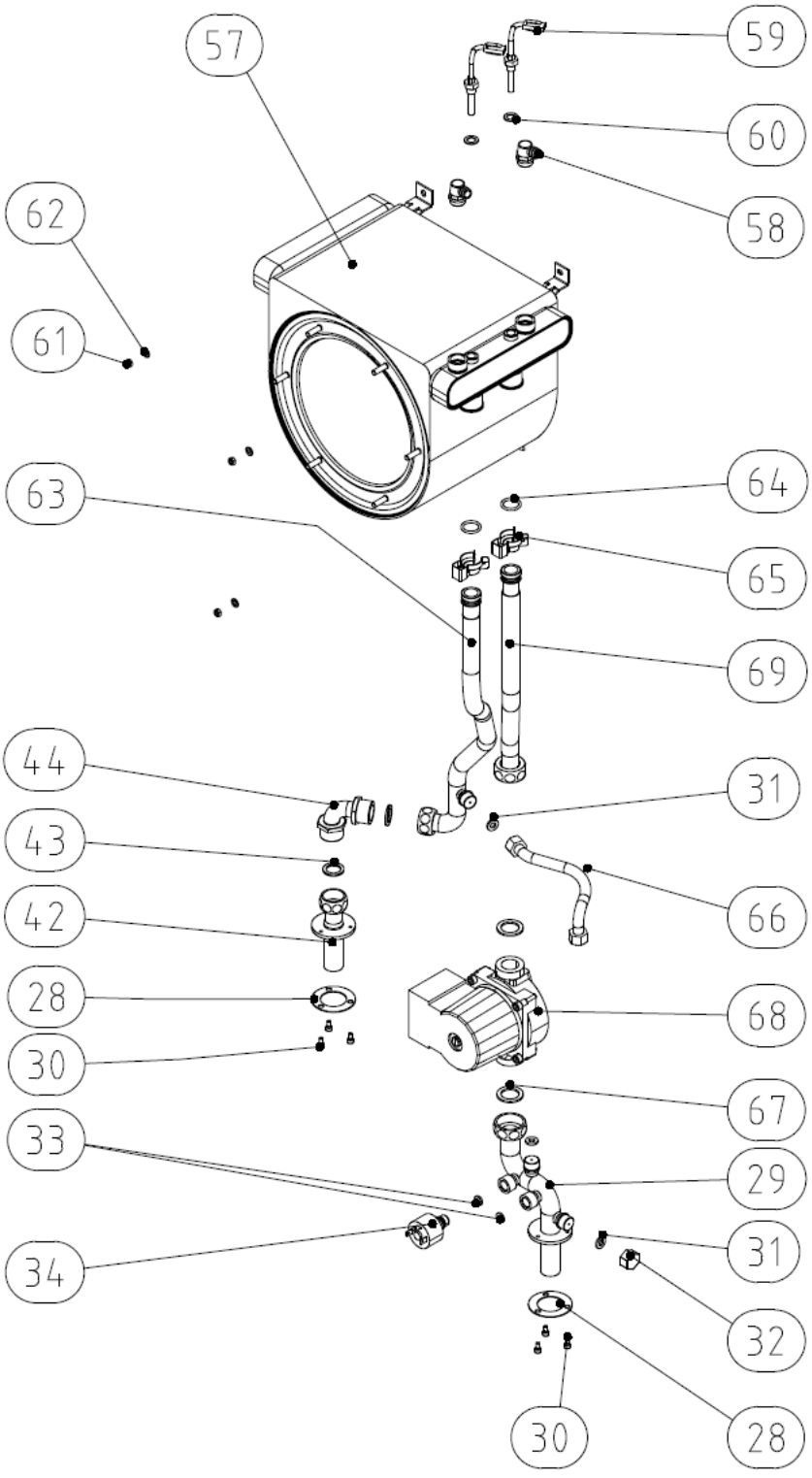
23.0 Exploded Spares Diagram 16, 27 & 47



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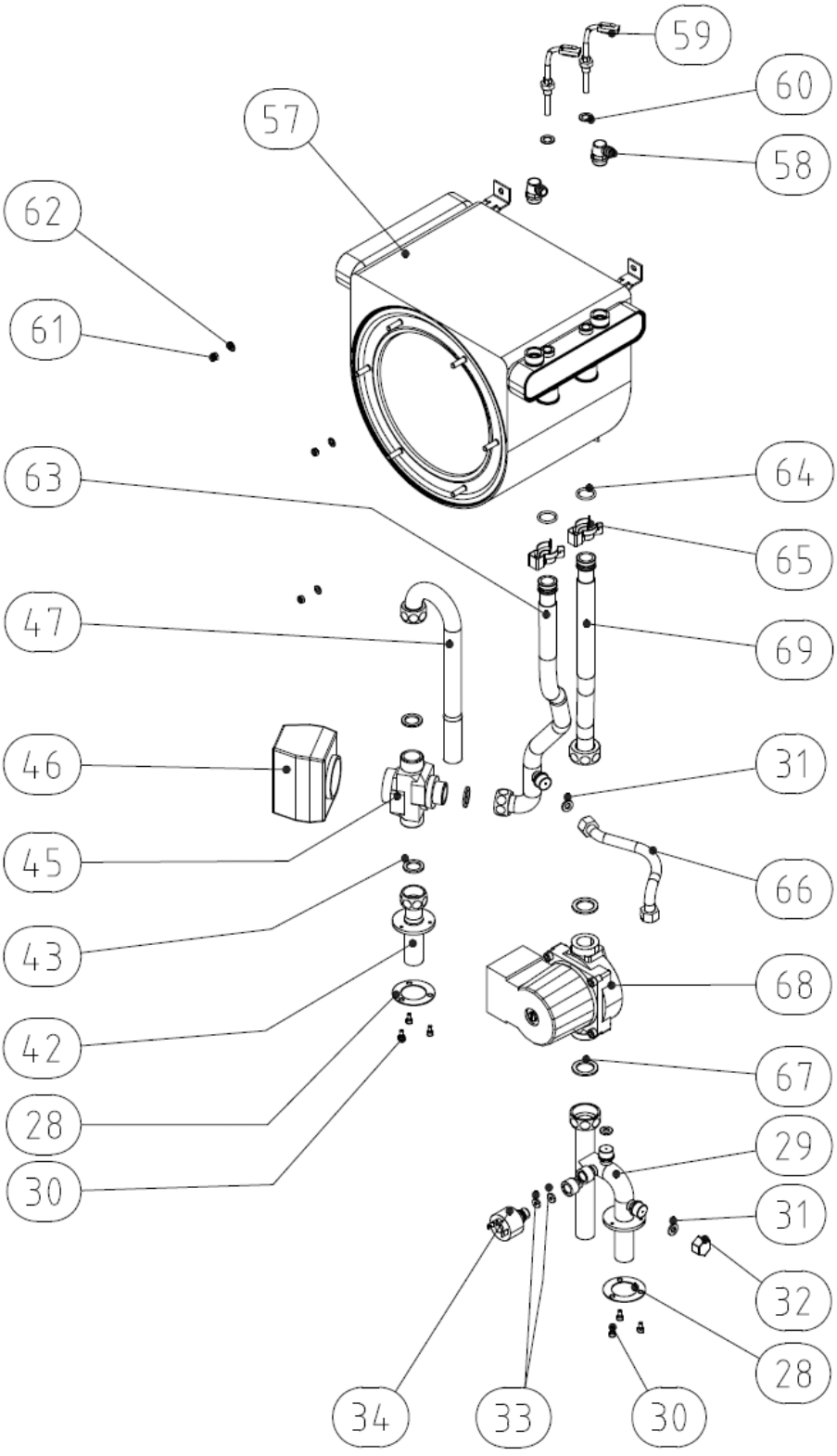
23.0 Exploded Spares Diagram 16, 27 & 47



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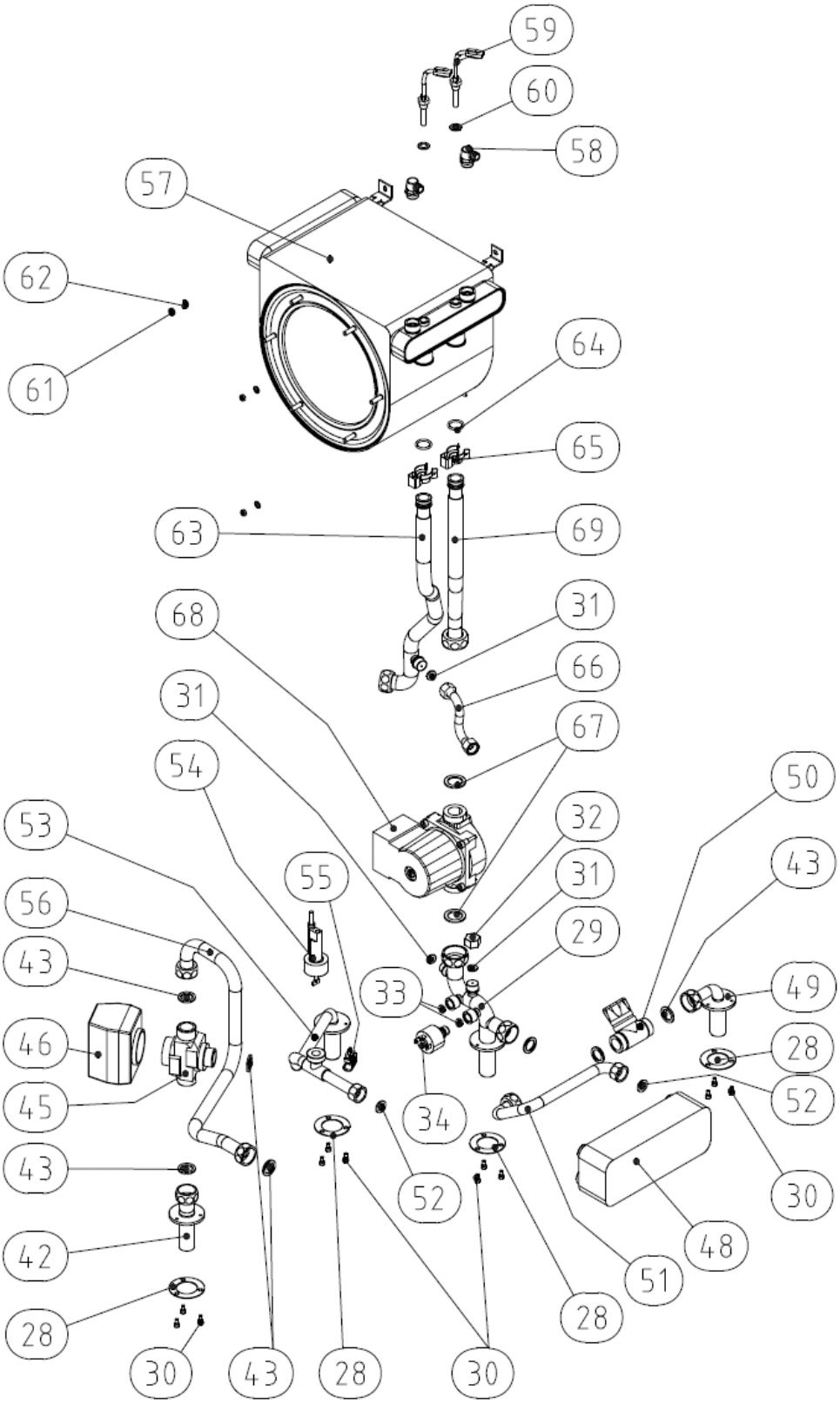
23.0 Exploded Spares Diagram 16, 27 & 47



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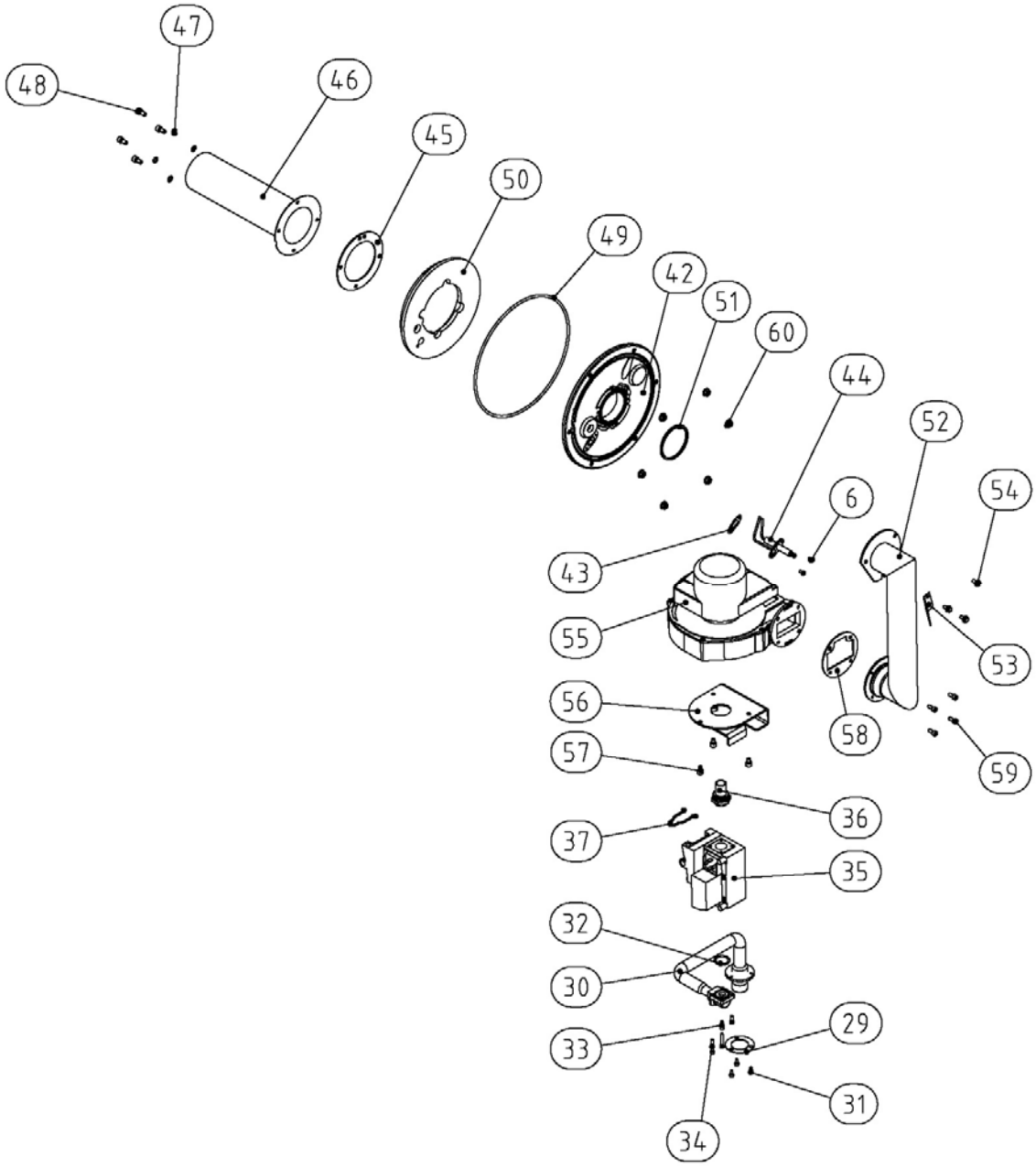
23.0 Exploded Spares Diagram 16, 27 & 47



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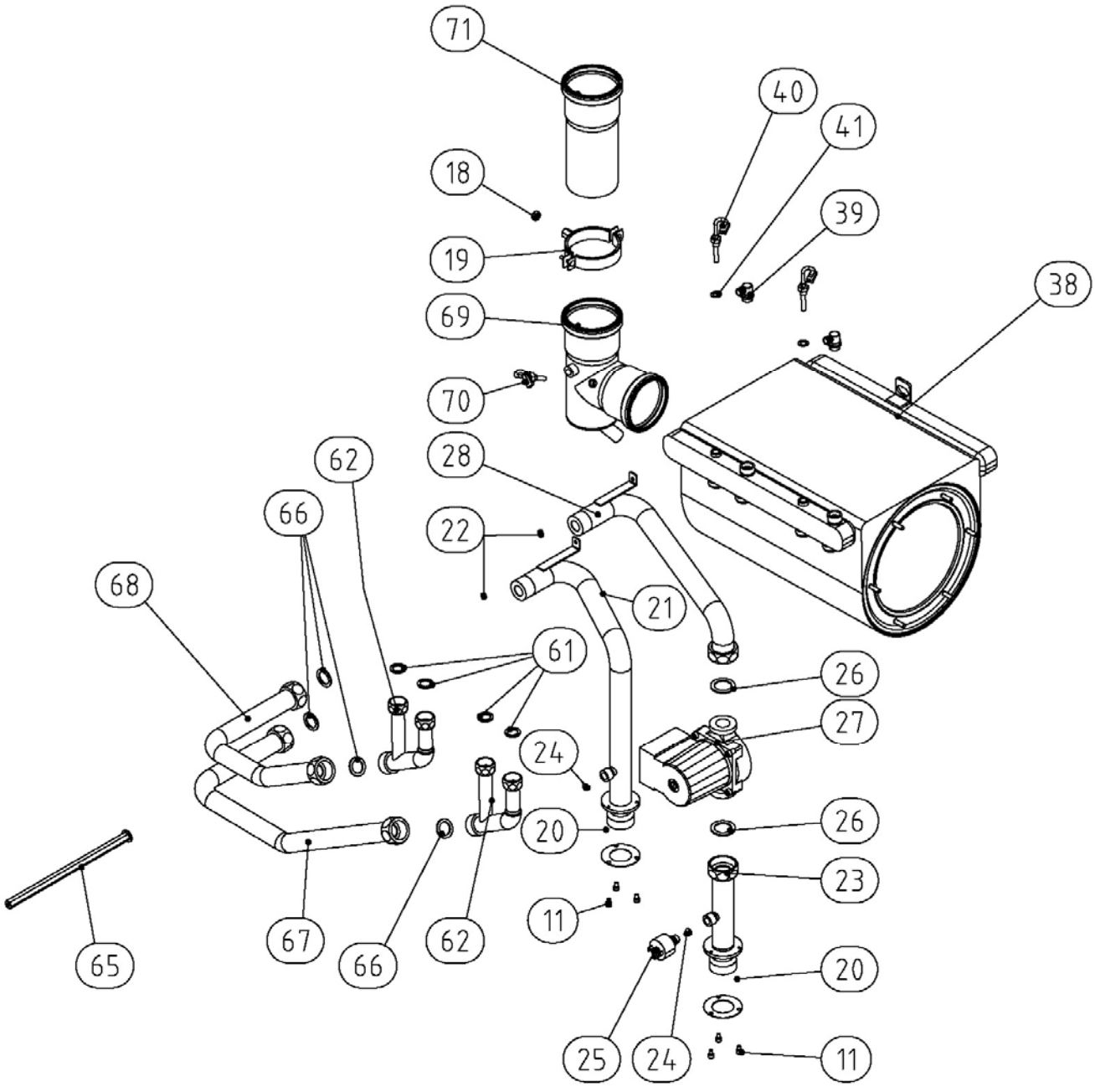
24.0 Exploded Spares Diagram 75



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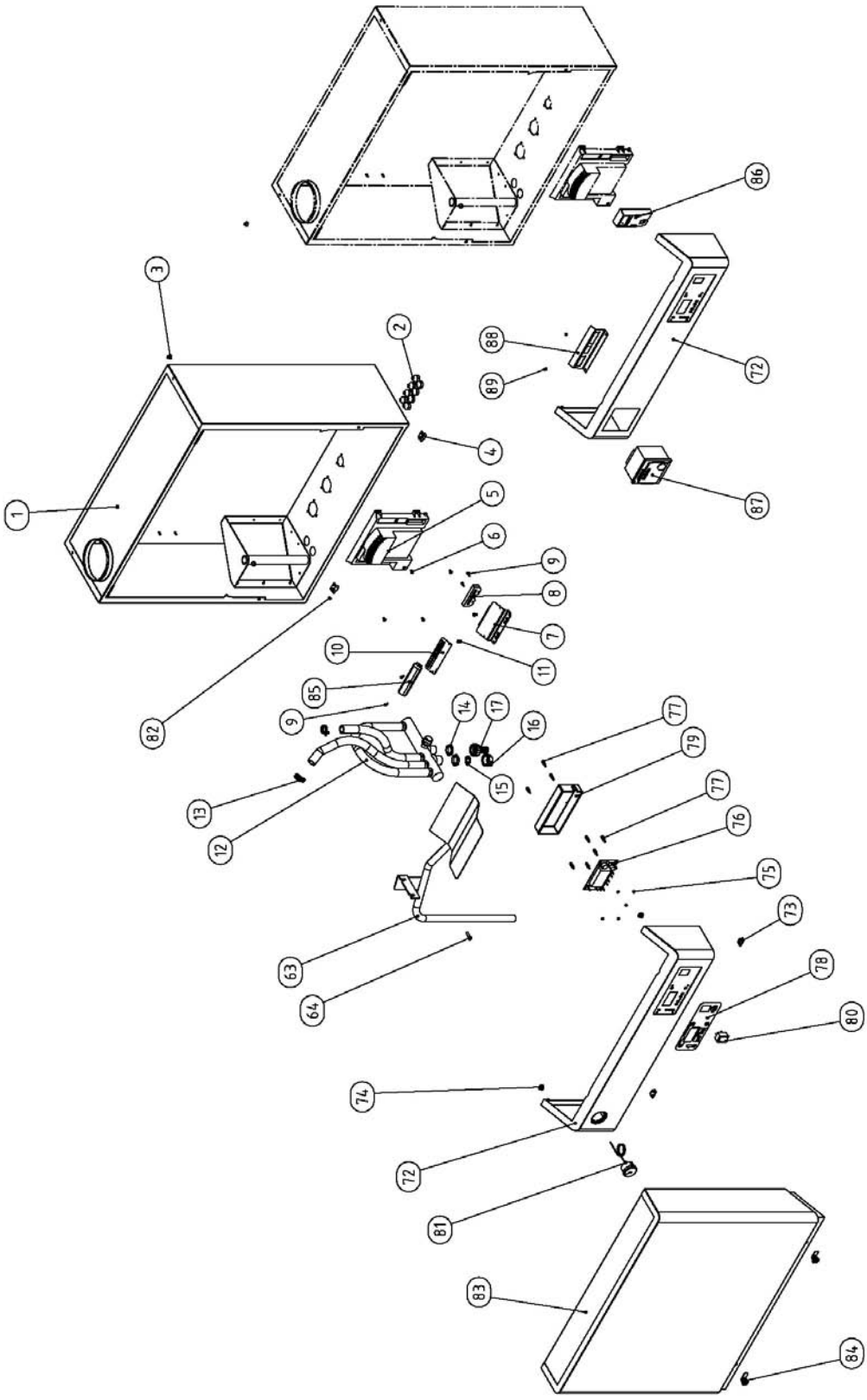
24.0 Exploded Spares Diagram 75



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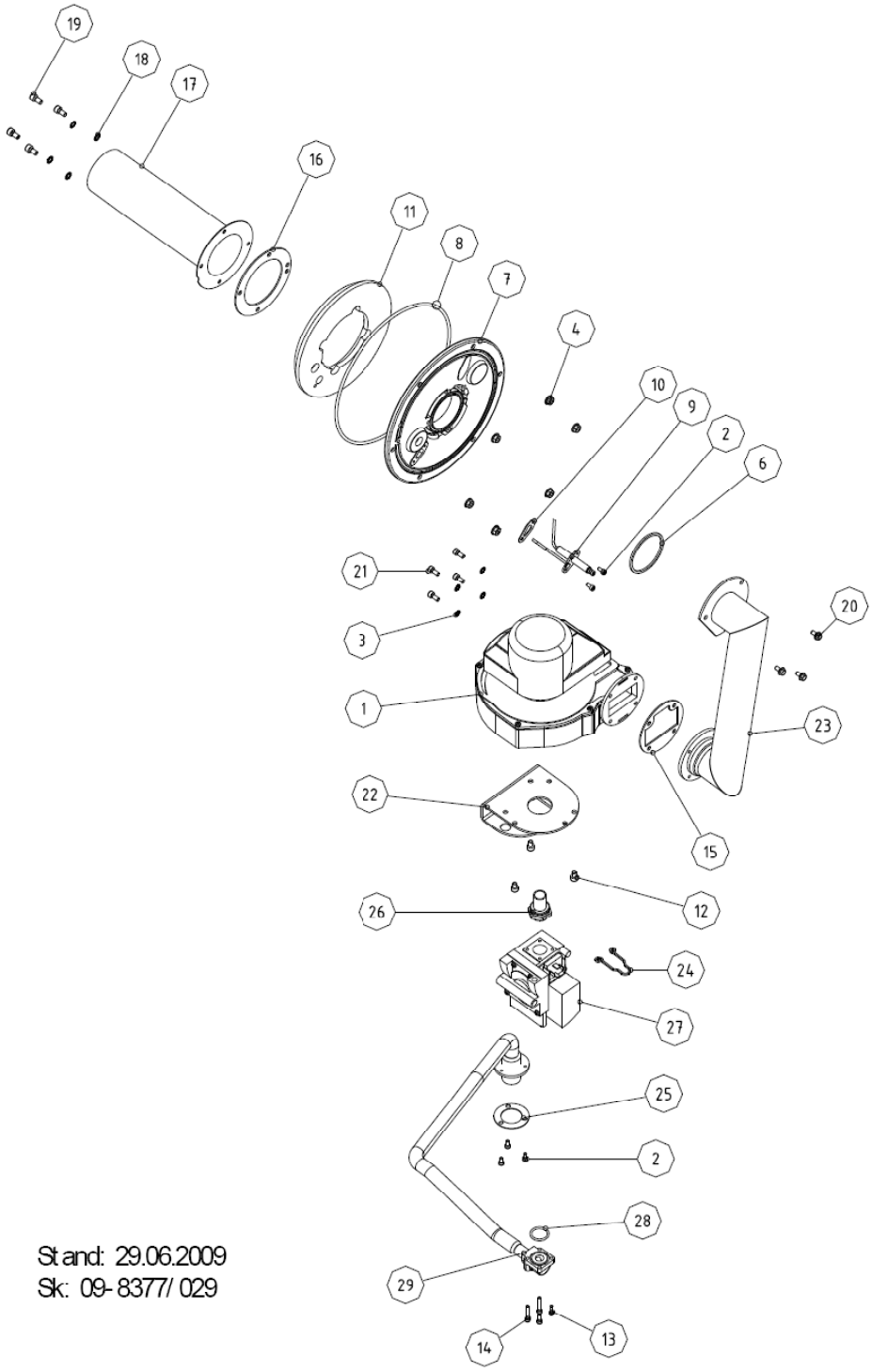
25.0 Exploded Spares Diagram 77



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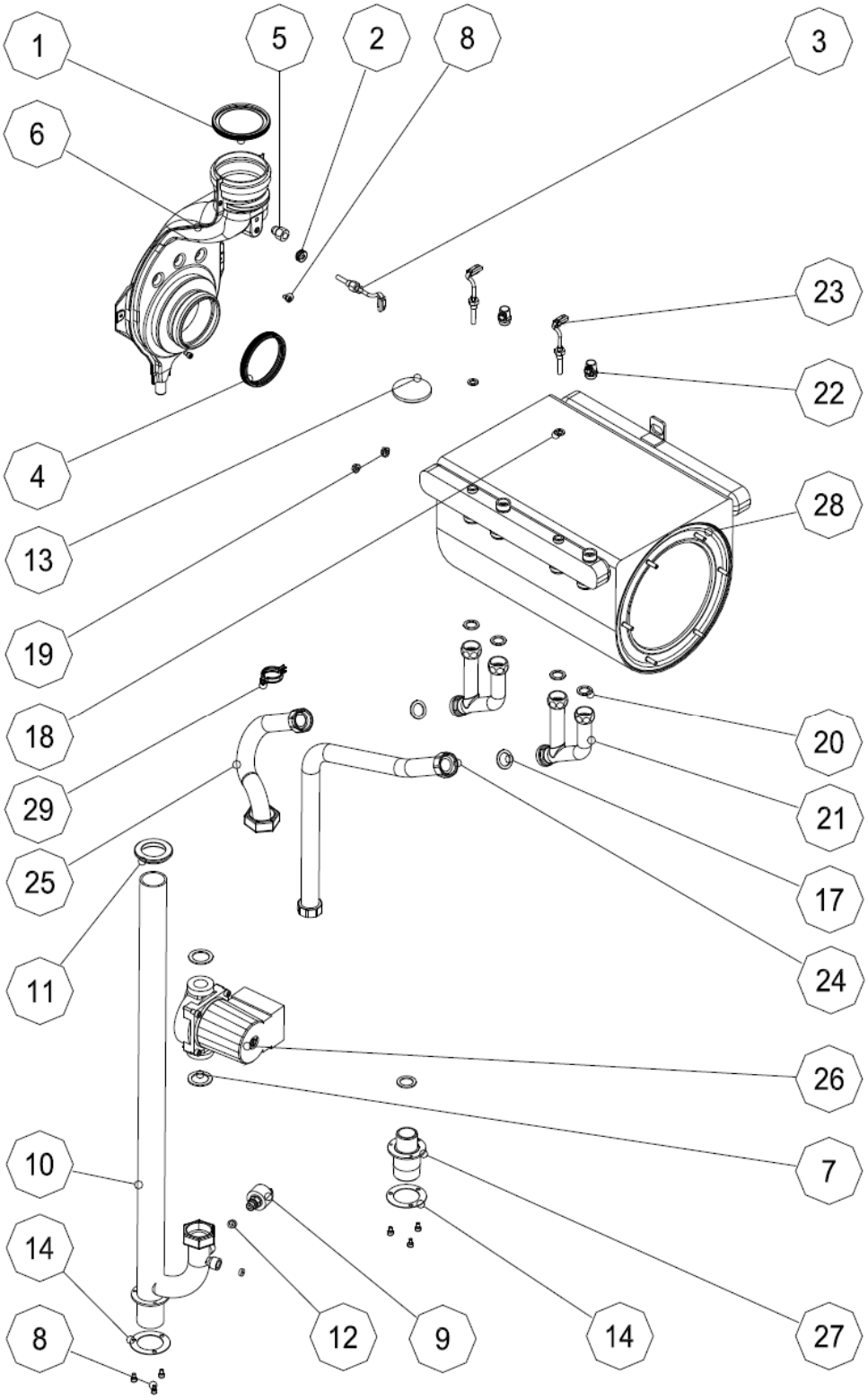
25.0 Exploded Spares Diagram 77



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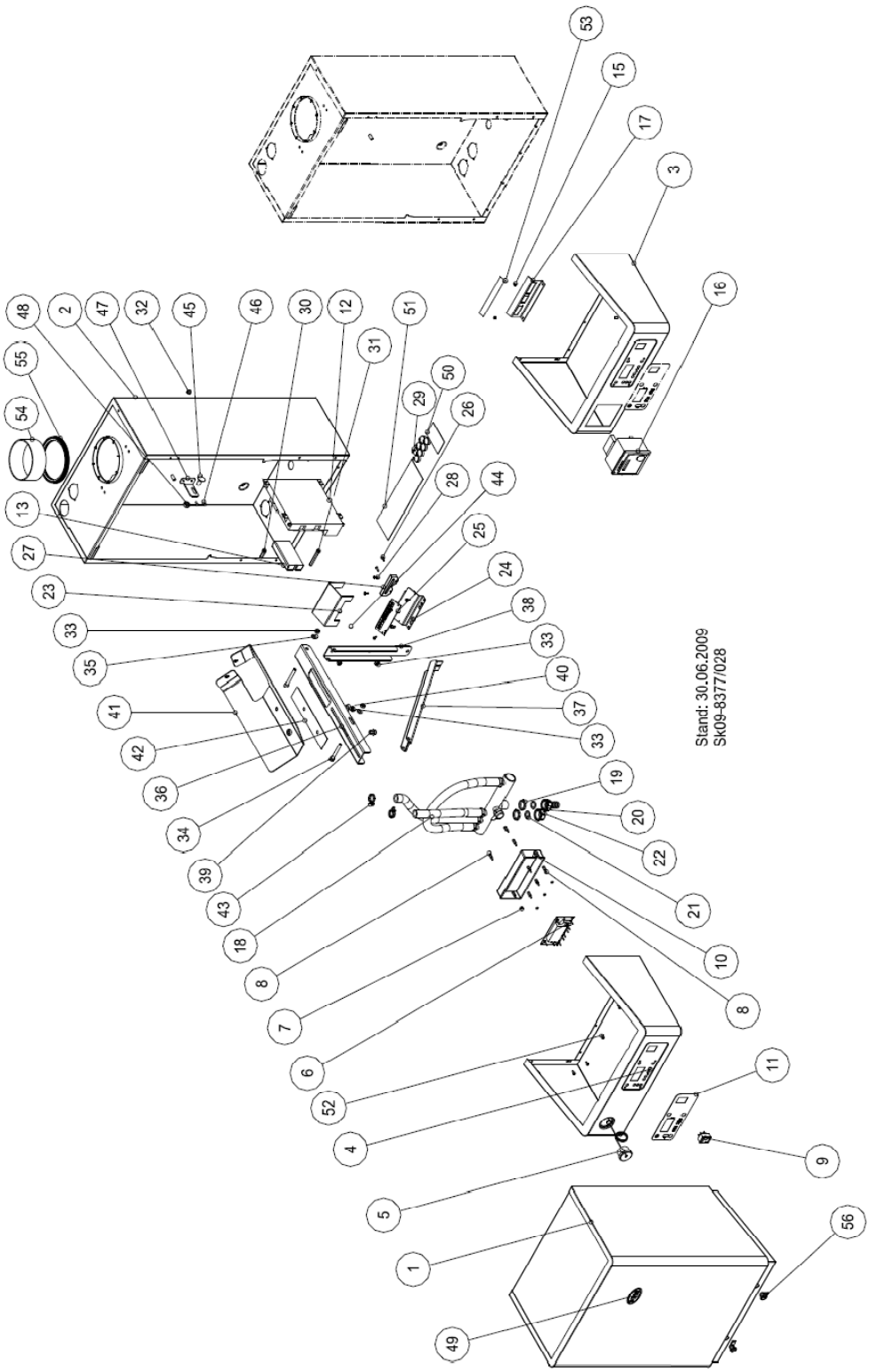
25.0 Exploded Spares Diagram 77



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