



Hamworthy Wessex Modumax

High Efficiency, Fully Modulating Boilers
Condensing & Non Condensing,
Pre-mix, Gas Fired
Outputs 100kW to 750kW



Heating *at work.*

Wessex ModuMax

High Efficiency, Condensing & Non Condensing, Fully Modulating, Pre-mix, Modular Gas Fired Boilers

The Wessex ModuMax is a compact floor standing boiler range, which offers the choice of high efficiency condensing or non-condensing models.

Available in 15 condensing models with outputs from 100kW to 750kW, the Wessex ModuMax condensing boiler operates at up to 20°C Δt temperature rise with minimum return temperature of 30°C.

For those refurbishment applications that require a high efficiency performance operating at traditional 80°C flow temperature, there are 9 Wessex ModuMax non-condensing models ranging from 110kW to 660kW output.

Wessex ModuMax boilers feature a control system that uses proven technology from a world-class leader in building control systems. Utilising an LPB bus communications system, which simplifies the controls requirements, clip-in modules integrate the boiler and building control capabilities.

The extensive range of control options include a boiler sequencing cascade controller, which can manage up to 12 boilers in a multiple boiler installation.

Completing the Wessex ModuMax package is a range of optional manifold kits to simplify design and installation. The manifold kits are available for 2 or 3 modules and are factory tested and assembled for ease of installation.

Options

- **Boiler sequencing cascade controller**
- **Room & outside sensors**
- **LPB bus communications modules**
- **Zone controller**
- **DHW cylinder sensor kit**
- **Pipe work header kit**
- **Remote monitoring unit**
- **LPG Propane - condensing models only**

- **Compact space saving design**
- **Fully assembled for fast installation**
- **Energy saving high efficiency performance**
- **Large waterways, tolerant of older systems**
- **Comprehensive integrated control options**
- **Superior monitoring capability**

BENEFITS

A small footprint and space saving design make the Wessex ModuMax the only commercial boiler that can provide up to a massive 985kW per square metre, saving valuable plant room space.



Two Wessex ModuMax 250/750c boilers with a total output of 1500kW.

Specification

Wessex ModuMax Natural Gas

This new generation Wessex ModuMax range builds on the extraordinary pedigree of the Wessex boiler, which was first launched in 1979. The Wessex ModuMax has a fully modulating pre-mix burner and can accurately match the building load requirements using the optimum number of boilers.

- Retaining the Wessex M Series philosophy, the modules can be assembled 1, 2 or 3 high, and the high efficiency performance now extends to condensing models in all sizes.
- 9 high efficiency, non condensing models with copper finned heat exchanger
- 15 condensing models with stainless steel heat exchanger
- Up to 10 bar water pressure
- Fully welded stainless steel combustion chamber
- European Class 5 NOx performance
- Flue connection with tri-lip seal
- BMS compatible
- Full modulation control with 0-10 volt analogue signal
- Optional pipe work kits
- Optional sequence control system

The modulating burner operates to 20% of full output per module for very close load matching on demand. The boiler casing is air cooled and requires no fibrous insulation material, increasing the environmentally friendly attributes of the product. Standing losses are extremely low, less than 1%, and the Wessex ModuMax range achieves the highest rating for low NOx emissions, European Class 5 performance.

The low water content enables the Wessex ModuMax range of boilers to provide rapid response to demand for heat, whilst the modulation responds to closely match the load, saving energy and reducing the number of firing operations, which saves wear and tear on the boiler.



Wessex ModuMax 120/360c condensing boiler with a total output of 360kW

The Wessex ModuMax boilers feature a fully modulating pre-mix burner control system. An electronic thermostat monitors the boiler operating conditions and automatically adjusts the output to suit.

The gas/air ratio control system ensures that clean and efficient combustion is maintained throughout the maximum modulation range, down to a minimum of 20% capacity.

Ultra Compact

For the space conscious designer, large boiler outputs are easily achievable within a minimal environment. The ModuMax range packs nearly 1MW into just one square metre of floor space. This unprecedented output changes the requirements for all future plant rooms, not only by saving space but also by providing condensing performance to maximise efficiency.

Low Weight Design

The boiler's lightweight design, compared with traditional cast iron sectional boilers, offers perfect solutions for roof top installations without the need for excessive structural reinforcement.

Around one-third of the weight of conventional boilers, the Wessex ModuMax weighs in at less than 1kg per kW output on the larger models.

Remote Monitoring Unit

The Hamworthy Wessex ModuMax range of high efficiency boilers is designed for use with the new Hamworthy remote monitoring unit, to provide remote access to the heating plant using a standard Internet browser interface.

Using the latest technology from Trend Control Systems, the remote monitoring unit (RMU) provides an advanced monitoring solution for commercial heating and hot water plant, with features including:

- 24 hour alarm monitoring
- Predictive maintenance
- Performance monitoring
- Energy services
- 24 hour bureau support

The RMU offers choice in connectivity via an existing IT network, or via the Internet, or using an existing Trend BMS network.



Remote monitoring unit for multiple boilers

Specification

Wessex ModuMax Natural Gas

Construction

Wessex ModuMax boilers have individual combustion chambers which allow any module to be fired in any sequence, to achieve even usage of the modules. Each combustion chamber is manufactured from high quality stainless steel and is fully welded to ensure watertight containment of condensate.

The boilers are normally delivered fully assembled, but for plant rooms with difficult access, it is a simple task to separate the individual modules for easier handling.

The boilers are finished externally using smart side panels and moulded plastic front and top covers.

Each assembled boiler has a pallet design base and can be manoeuvred easily using a pallet truck, and will pass through a standard single doorway.



Easy handling through a single door

Heat Exchanger

All Wessex ModuMax boilers have a highly efficient cylindrical primary heat exchanger. The high efficiency non condensing models have a heat exchanger constructed from copper finned tubing. The tubes are expanded at each end into cast iron tube plates. These tube plates are sectioned to provide even flow through each tube in a multi pass arrangement.

The relatively large 22mm diameter tubes combined with the high water flow velocities considerably reduces the risk of blockage in comparison with alternative heat exchanger designs, which have smaller waterways.



Section of copper finned heat exchanger tube

The condensing primary heat exchanger is also a multi-pass finned tube construction using high quality stainless steel to withstand the corrosive nature of the condensate.

Hot Surface Ignition

Fully automatic ignition is achieved utilising a hot surface ignition system. This highly effective and reliable form of ignition requires less maintenance than conventional spark ignition and eliminates electrical interference that is sometimes associated with that type of system. Flame proving is achieved using a flame rectification probe. Wessex ModuMax boilers are fitted with a transformer to reduce the mains voltage to 120 volts for the hot surface ignition supply, providing a more reliable power system.

The Gas Train

A zero governor gas valve is used to precisely control the mixture of gas and air entering the burner as the firing rate modulates. This is achieved by measuring the pressure drop across a venturi at the fan inlet and adjusting the gas pressure accordingly.

Burner

A cylindrical burner is positioned centrally within the primary heat exchanger and is constructed using a FeCrAl Aconit woven mesh. This design of burner allows for good flame stability at low turndown rates. The woven fibre construction of the burner also results in lower flame temperatures being achieved and thus lowers NOx emissions.

Thermostats

All Wessex ModuMax Series boilers are fitted with a manual reset limit thermostat, which has a range of 90-110°C. This will normally be factory set to 100°C.

An electronic temperature control thermostat regulates the boiler flow temperature up to a maximum of 90°C.

To accommodate multiple boiler installations the limit thermostat is adjustable up to a maximum of 110°C however where the boiler control thermostats are to be set higher than 83°C, adequate system pressure must be available either by gravity head or system pressurisation.

The Wessex ModuMax boiler also incorporates a return temperature sensor, which in conjunction with the flow temperature sensor governs the modulation set point of the boiler.

Room Sealed Models

Wessex ModuMax single module boilers, WM 100c, WM 120c and WM 110he can be arranged with a room sealed twin duct system, to supply combustion air from outside the plant room. The 100mm diameter air inlet and flue ducts can be run to a maximum of 10m in horizontal or vertical configurations.

Water System

The Wessex is designed for a maximum working pressure of 10 bar. Each module is supplied with a connection for fitting a pressure and temperature relief valve, (not Hamworthy supply).

Where the boiler feed water has a high degree of hardness, it is recommended that the water be treated to prevent precipitation of scale or sludge in the boiler water passageways.

Power Supply

An independent isolator and fused electrical supply is recommended for each module, to enable each module to be shut down without losing the entire boiler output. 230 volt, 50Hz single phase.

Remote Signalling

Volt free contacts are fitted as standard to all models to indicate common fault and normal run. The contacts are BMS compatible and allow the boiler to connect to a Building Management System to monitor boiler operation and status.

Manifold Kits

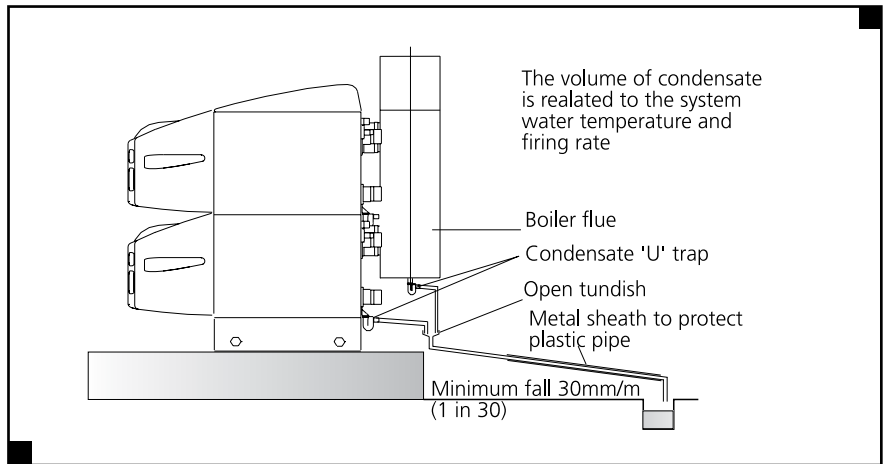
Designed to save time and simplify procurement, optional manifold kits are available for the Wessex Modumax.



Refer to pages 12 & 13 for details.

Condensate Discharge

Due to the high thermal efficiency of all boilers, condensation will occur within the boiler casing during firing from start-up, low load conditions, and on the condensing models when the return temperature falls below 55°C. A drain with an integral trap is fitted to the rear centre of each module to enable the disposal of the condensate.



The condensate drains on the boiler must be connected to a suitable drainage system, typically as shown above. The material should be a suitable PVC plastic system with glued sealed joints to prevent the escape of condensate.

Drain traps and an open tundish should be incorporated into the design, and the pipe work given appropriate protection from physical damage.

The pipe work should be installed with at least a 3 degrees fall (approximately 50mm per metre). In addition to the boiler condensate drain, the two-module and three-module boilers have a condensate drain connection fitted to the close-coupled flue header. This is a 22mm diameter drain stub which should be connected in a similar manner via a suitable trap.

Flue System

Each of the boiler variations is designed for direct connection to a flue system. The two-module and three-module boilers are supplied with a separate close-coupled flue header, and the outlets from more than one boiler may be connected to a single chimney.

A fixed draught diverter is not required in the flue system, however, a draught stabiliser is recommended for some installations.

The flue system must be capable of handling the wet flue gases, and horizontal sections should incorporate a fall for drainage of the condensate that forms in the flue system.

The Hamworthy Masterflue MF system is designed specifically for high efficiency condensing boilers and features fully welded construction and a unique factory fitted tri-lip silicone sealing ring with every component. The Masterflue MF range of components also includes a standard range of tees and elbows at 87 and 43 degrees to facilitate easy drainage without alignment problems.

Refer to page 30 for further details on the flue system.

Multiple Boilers

Wessex ModuMax

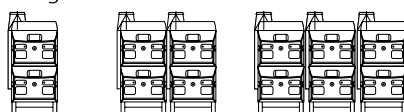
The flexibility of the Wessex ModuMax range means there is a configuration to meet the constraints of most plant rooms, and in most cases can reduce the size of the plant room required.

Boilers can be arranged horizontally or vertically, up to three modules high to give outstanding space utilisation. Two and three high modular boilers are supplied complete with a close coupled flue header to simplify installation.

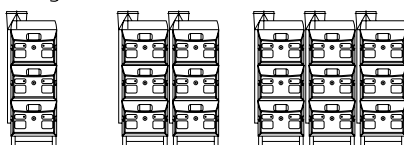
1 high modules



2 high modules



3 high modules



Wessex ModuMax Configurations.

Advantages

- **Closely matched module size reduces number of modules required**
- **Fewer modules, lower servicing costs**
- **3 modules per boiler reduces installation time and costs**
- **Integrated sequence control simplifies operation**
- **Easier load sharing to reduce wear and tear**

High Efficiency Non Condensing Models

Wessex ModuMax high efficiency boiler, fully modulating, pre-mix, gas fired, fully automatic, volt free contacts. Output @ 80/60°C.

Model	Output (kW)	No of Modules	Module Size (kW)
WM 110/110he	110	1	110
WM 110/220he	220	2	110
WM 110/330he	330	3	110
WM 160/160he	160	1	160
WM 160/320he	320	2	160
WM 160/480he	480	3	160
WM 220/220he	220	1	220
WM 220/440he	440	2	220
WM 220/660he	660	3	220

High Efficiency Condensing Models

Wessex ModuMax condensing boiler, fully modulating, pre-mix, gas fired, fully automatic, volt free contacts. Output @ 50/30°C.

Model	Output (kW)	No of Modules	Module Size (kW)
WM 100/100c	100	1	100
WM 100/200c	200	2	100
WM 100/300c	300	3	100
WM 120/120c	120	1	120
WM 120/240c	240	2	120
WM 120/360c	360	3	120
WM 150/150c	150	1	150
WM 150/300c	300	2	150
WM 150/450c	450	3	150
WM 200/200c	200	1	200
WM 200/400c	400	2	200
WM 200/600c	600	3	200
WM 250/250c	250	1	250
WM 250/500c	500	2	250
WM 250/750c	750	3	250



Technical Data

Wessex ModuMax Condensing Boilers - Performance and General Data

	Module Size		WM 100c			WM 120c			WM 150c		
	Model	No of modules	/100 1	/200 2	/300 3	/120 1	/240 2	/360 3	/150 1	/300 2	/450 3
Energy	Building regulations seasonal efficiency (%)gross		91.2			91.4			91.7		
	Boiler output 80/60°C	kW	98	195	293	117	234	351	143	287	430
		Btu/h x 1000	333	665	998	399	798	1197	489	978	1467
	Boiler output 50/30°C	kW	100	200	300	120	240	360	150	300	450
		Btu/h x 1000	341	682	1023	409	819	1228	512	1024	1535
	Boiler input (gross) Maximum	kW	109	218	327	133	266	399	163	326	490
Btu/h x 1000		372	743	1115	454	908	1361	557	1114	1671	
Boiler input (nett) Maximum	kW	98	196	294	120	240	360	147	294	441	
	Btu/h x 1000	334	669	1003	409	819	1228	501	1003	1504	
Boiler output Minimum 80/60°C	kW	20			23			30			
	Btu/h x 1000	68			80			102			
Water	Water content (not including headers) litres		16	32	48	16	32	48	22	44	66
	Minimum flow rate @ 20°C Δt rise l/s		1.2	2.4	3.6	1.4	2.8	4.2	1.8	3.6	5.4
	Water side pressure loss @ 20°C Δt rise mbar		20			27			145		
	System design flow rate @ 11°C Δt rise l/s		2.2	4.4	6.6	2.6	5.2	7.8	3.3	6.6	9.9
	Water side pressure loss @ 11°C Δt rise mbar		61			91			500		
	Maximum water pressure barg					10					
Gas	Gas flow rate natural gas (G20) - Maximum m ³ /h		11	22	33	12.7	25.4	38.1	16.5	33	49.5
	Nominal gas inlet pressure natural gas (G20) mbar		20								
	Maximum gas inlet pressure natural gas (G20) mbar		25								
Flue	Approx. flue gas volume @ 15°C, 9.1% CO ₂ , N.T.P m ³ /h		143	286	429	160	320	480	214	428	642
	Maximum flue gas temperature °C		83			83			78		
	NO _x Emission (DAF) European Class 5 mg/kWh		35			37			36		
	Pressure at flue outlet	Pa	150			89					
mbar		1.5			0.89						
Connection	Water flow/return connections		G1 ¹ / ₂ "M						G2 ¹ / ₂ "M		
	Gas inlet connection pipe thread size		R1"						R1 ¹ / ₄ "		
	Nominal flue diameter (I/D) mm		100	180	180	100	180	180	150	250	250
	Condensate trap connection(s) (O/D) mm		32								
Electrics	Power consumption - maximum W		170	340	510	170	340	510	250	500	750
	Nominal supply voltage		230V 1PH 50Hz								
	Module start current	Start Amps	1.2						1.3		
Run Amps		0.8						0.9			
Approx. shipping weight	kg		180	355	540	180	355	540	226	452	678
	Noise emission @ 1m	Max dB (A)	60						65		
		Min dB (A)	47						47		

Technical Data

Wessex ModuMax Condensing Boilers - Performance and General Data

Module Size		WM 200c			WM 250c			
Model	No of modules	/200 1	/400 2	/600 3	/250 1	/500 2	/750 3	
Energy	Building regulations seasonal efficiency (%) gross	91.1			91.7			
	Boiler output 80/60°C	kW Btu/h x 1000	194 663	389 1327	583 1990	246 839	493 1682	739 2521
	Boiler output 50/30°C	kW Btu/h x 1000	200 681	400 1361	600 2042	250 853	500 1706	750 2559
	Boiler input (gross) Maximum	kW Btu/h x 1000	219 749	439 1497	659 2246	275 938	550 1877	825 2815
	Boiler input (nett) Maximum	kW Btu/h x 1000	198 674	395 1348	593 2022	248 845	495 1689	743 2534
	Boiler output Minimum 80/60°C	kW Btu/h x 1000	40 136			49 168		
Water	Water content (not including headers)	litres	22	44	66	22	44	66
	Minimum flow rate @ 20°C Δt rise	l/s	2.4	4.8	7.2	3.0	6.0	9.0
	Water side pressure loss @ 20°C Δt rise	mbar	246			395		
	System design flow rate @ 11°C Δt rise	l/s	4.3	8.6	12.9	5.4	10.8	16.2
	Water side pressure loss @ 11°C Δt rise	mbar	850			1300		
	Maximum water pressure	barg	10					
Gas	Gas flow rate natural gas (G20) - Maximum	m³/h	21.4	42.8	64.2	27.9	55.8	83.7
	Nominal gas inlet pressure natural gas (G20)	mbar	20					
	Maximum gas inlet pressure natural gas (G20)	mbar	25					
Flue	Approx. flue gas volume @ 15°C, 9.1% CO ₂ , N.T.P	m³/h	279	558	837	354	708	1062
	Maximum flue gas temperature	°C	83			82		
	NO _x Emission (DAF) European Class 5	mg/kWh	36			39		
	Pressure at flue outlet	Pa mbar	90 0.9			150 1.5		
Connection	Water flow/return connections		G2½" M					
	Gas inlet connection pipe thread size		R1¼" M					
	Nominal flue diameter (I/D)	mm	150	250	250	150	250	250
	Condensate trap connection(s) (O/D)	mm	32					
Electrics	Power consumption - maximum	W	250	500	750	250	500	750
	Nominal supply voltage		230V 1PH 50HZ					
	Module start current	Start Amps Run Amps	1.3 0.9					
	Approx. shipping weight	kg	226	452	678	226	452	678
	Noise emission @ 1m	Max dB (A) Min dB (A)	65 47					



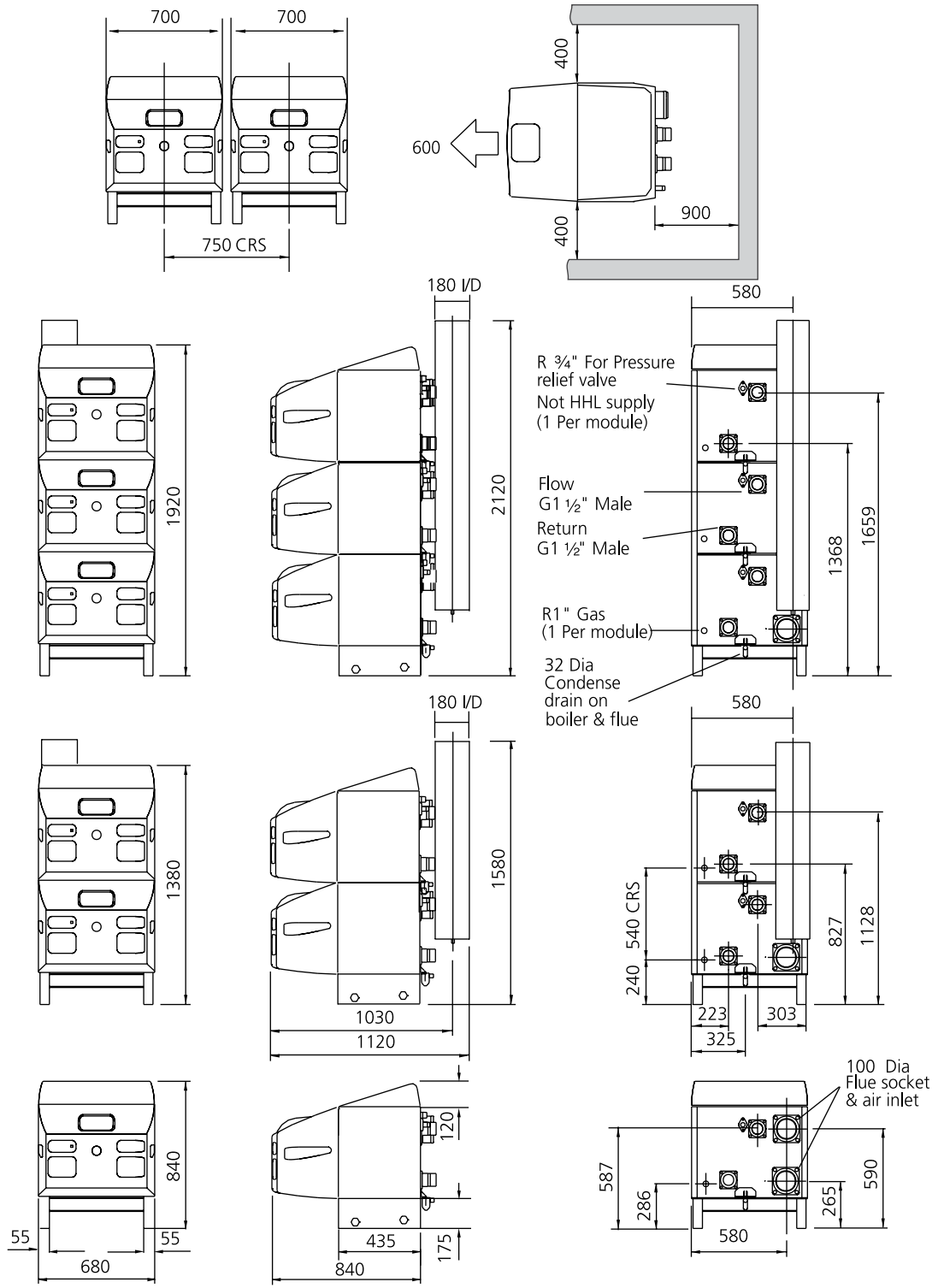
Technical Data

Wessex ModuMax High Efficiency Boilers - Performance and General Data

Module Size		WM 110he			WM 160he			WM 220he			
Model		/110	/220	/330	/160	/320	/480	/220	/440	/660	
No of modules		1	2	3	1	2	3	1	2	3	
Energy	Building regulations seasonal efficiency (%)gross	87.3			86.7			86.6			
	Boiler output 80/60°C	kW	110	220	330	160	320	480	220	440	660
		Btu/h x 1000	375	757	1126	546	1092	1638	750	1501	2252
	Boiler input (gross) Maximum	kW	125	250	375	190	380	569	262	524	787
		Btu/h x 1000	427	853	1280	648	1295	1943	894	1788	2685
Energy	Boiler input (nett) Maximum	kW	113	225	338	171	342	513	236	472	708
		Btu/h x 1000	384	768	1152	583	1166	1749	805	1610	2416
Energy	Boiler output Minimum 80/60°C	kW	22			32			44		
		Btu/h x 1000	73			109			150		
Water	Water content (not including headers)	litres	14	28	42	17	34	51	17	34	51
	Minimum flow rate @ 20°C Δt rise	l/s	1.3	2.6	3.9	1.9	3.8	5.7	2.6	5.2	7.8
	Water side pressure loss @ 20°C Δt rise	mbar	25			144			190		
	System design flow rate @ 11°C Δt rise	l/s	2.3	4.6	6.9	3.4	6.8	10.2	4.8	9.6	14.4
	Water side pressure loss @ 11°C Δt rise	mbar	86			487			595		
	Maximum water pressure	barg	10								
Gas	Gas flow rate natural gas (G20) - Maximum	m³/h	11.9	23.8	35.7	18.4	36.8	55.2	25	50	75
	Nominal gas inlet pressure natural gas (G20)	mbar	20								
	Maximum gas inlet pressure natural gas (G20)	mbar	25								
Flue	Approx. flue gas volume @ 15°C, 9.1% CO ₂ , N.T.P	m³/h	161	322	483	239	478	717	321	642	963
	Maximum flue gas temperature	°C	129			118			129		
	NO _x Emission (DAF) European Class 5	mg/kWh	38			34			39		
	Pressure at flue outlet	Pa	150			142			150		
	mbar	1.5			1.42			1.5			
Connection	Water flow/return connections		G1½" M			G2½" M					
	Gas inlet connection pipe thread size		R1" M			R1¼" M					
	Nominal flue diameter (I/D)	mm	100	180	180	150	250	250	150	250	250
	Condensate trap connection(s) (O/D)	mm	32								
Electrics	Power consumption - maximum	W	170	340	510	250	500	750	250	500	750
	Nominal supply voltage		230V 1PH 50Hz								
	Module start current	Start Amps	1.2			1.3					
	Run Amps	0.8			0.9						
General	Approx. shipping weight	kg	175	345	515	220	440	660	220	440	660
	Noise emission @ 1m	Max dB (A)	60			65					
	Min dB (A)	47			47						

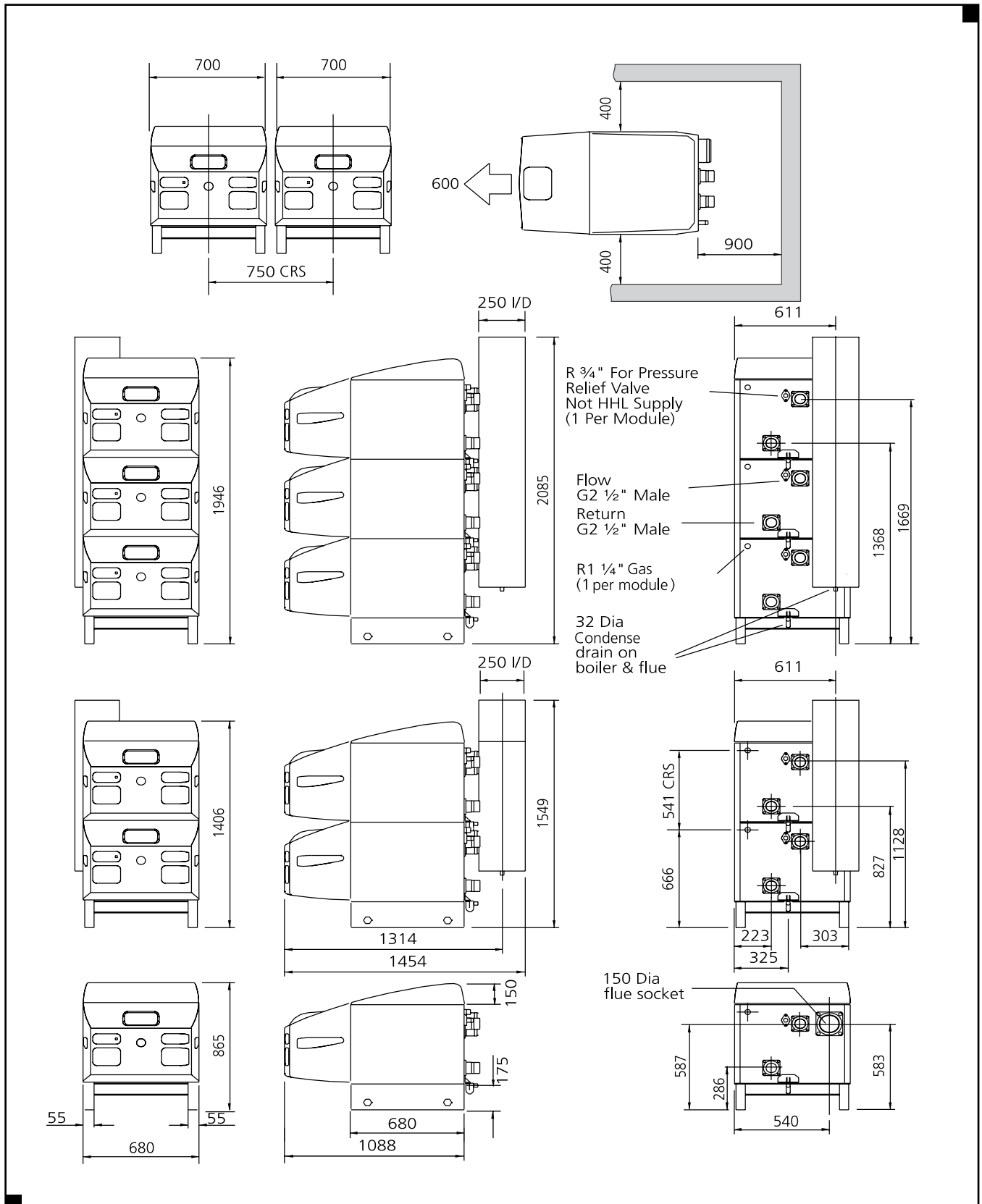
Dimensional Details

Wessex ModuMax WM 100c / 110he / 120c Boiler Dimensions and Clearances



Dimensional Details

Wessex ModuMax WM 150c / 160he / 200c / 220he / 250c Boiler Dimensions and Clearances



Dimensional Details

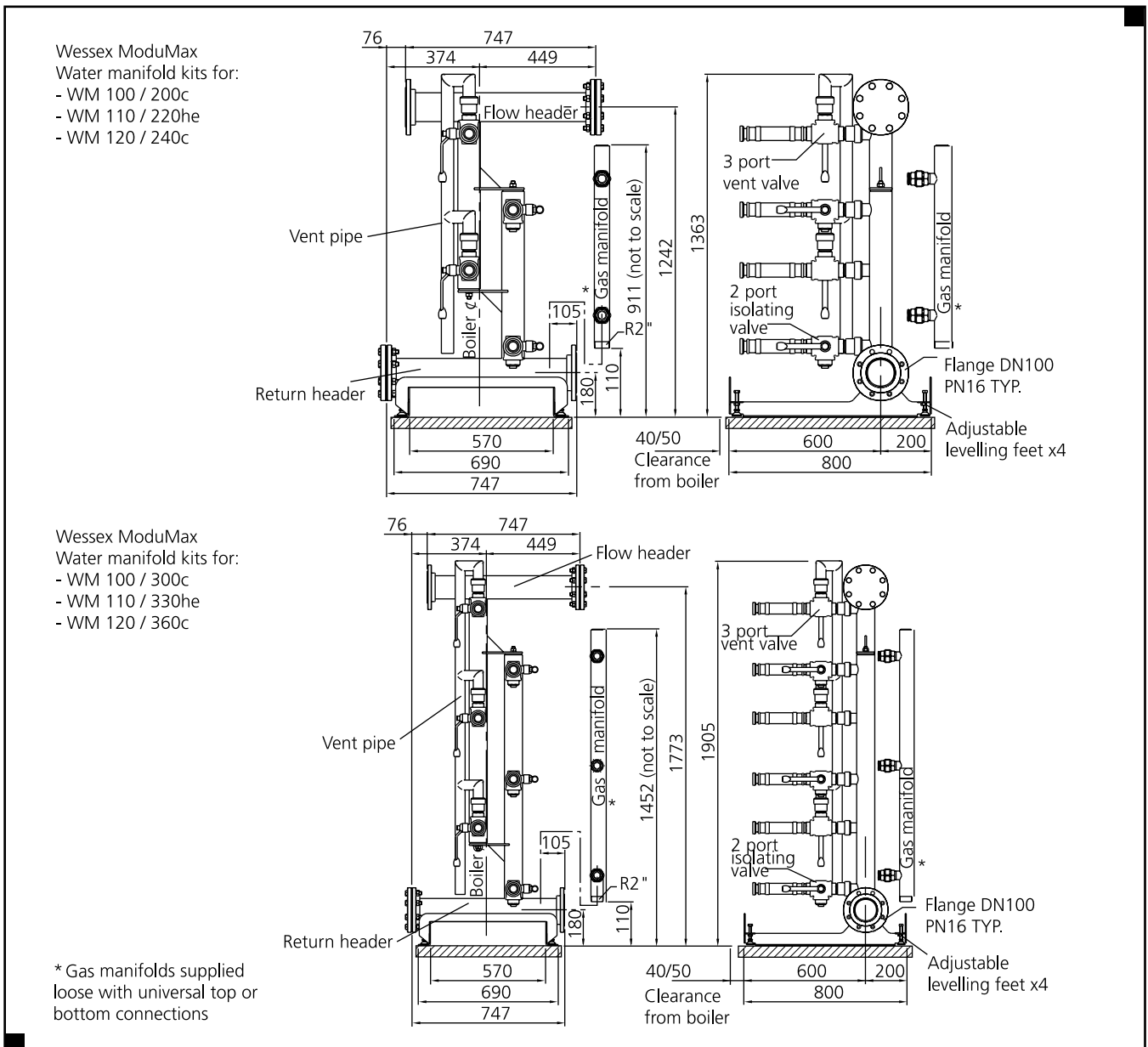
Wessex ModuMax WM 100c / 110he / 120c Manifold Kits

Designed to save time and simplify procurement, optional manifold kits are available for the Wessex ModuMax. The kits enable multiple boilers to be connected in configurations of 2 and 3 modules. The manifold kits are factory tested and supplied part assembled for ease of installation.

Manifold kits include:

- Isolating ball valves for water flow and return connections on each boiler module
- Flow and return headers plus gas manifold
- Pre assembled flow and return header assemblies
- Pre assembled flow and return pipe sub assemblies between boilers and headers
- Blanking flanges for header ends
- Adjustable levelling feet

Boiler Model	No of Modules	Manifold Kit Weight Approx (kg)
WM 100/200c	2	120
WM 110/220he	2	120
WM 120/240c	2	120
WM 100/300c	3	160
WM 110/330he	3	160
WM 120/360c	3	160

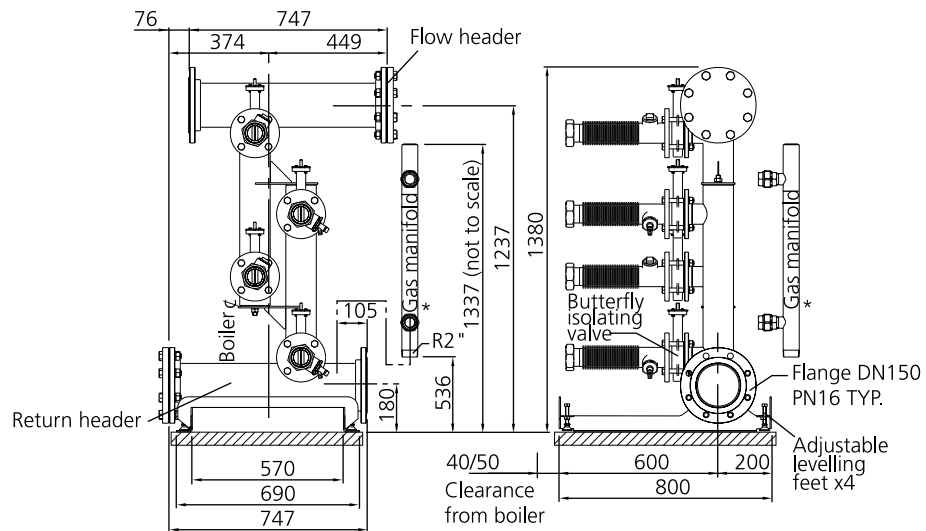


Dimensional Details

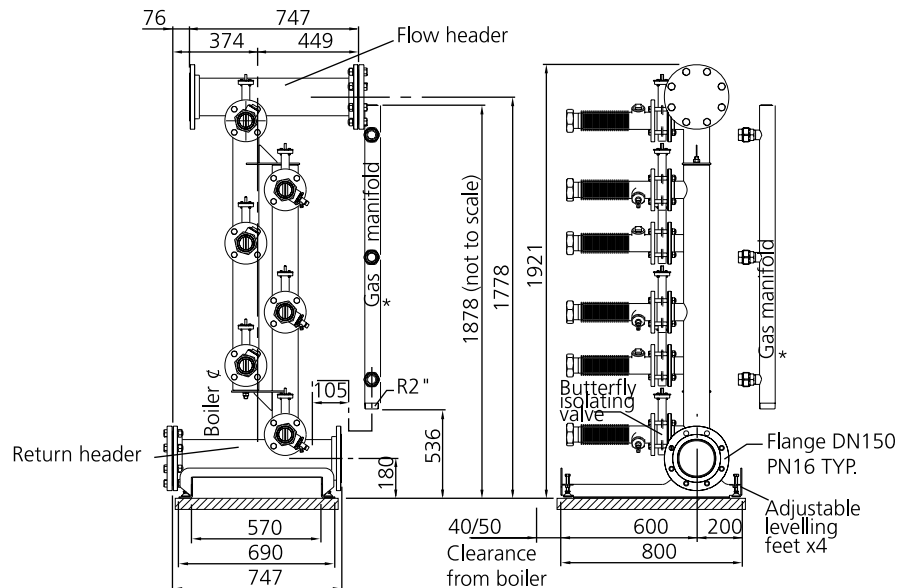
Wessex ModuMax WM 150c / 160he / 200c / 220he / 250c Manifold Kits

Boiler Model	No of Modules	Manifold Kit Weight Approx (kg)
WM 150/300c	2	192
WM 160/320he	2	192
WM 200/400c	2	192
WM 220/440he	2	192
WM 250/500c	2	192
WM 150/450c	3	233
WM 160/480he	3	233
WM 200/600c	3	233
WM 220/660he	3	233
WM 250/750c	3	233

Wessex ModuMax
Water manifold kits for:
- WM 150 / 300c
- WM 160 / 320he
- WM 200 / 400c
- WM 220 / 440he
- WM 250 / 500c



Wessex ModuMax
Water manifold kits for:
- WM 150 / 450c
- WM 160 / 480he
- WM 200 / 600c
- WM 220 / 660he
- WM 250 / 750c



* Gas manifolds supplied loose with a universal top or bottom connection.

Controls Overview

Wessex ModuMax

Wessex ModuMax boilers can be installed in a wide variety of configurations, from single boiler stand alone units to multiple boilers controlled locally or by a building management system. The controls package is extremely versatile and can be tailored to meet the exact needs of the heating system.

Integrated Systems

The full benefits of installing high efficiency boilers can only be realised if the heating system is equipped with appropriate controls, that integrate the boiler and the other system components, to create a cohesive solution. For that reason, the Wessex ModuMax range of boilers incorporate a control system that is easy to integrate and communicates with the leading building management system protocols. The microprocessor based boiler control system (LMU) accommodates clip-in modules providing relay contacts for remote alarm and signalling, for external control and LPB bus communications, for use with the boiler Cascade controller for multiple boiler installations.



Clip in modules on the LMU

The Wessex ModuMax boiler incorporates a number of inbuilt and optional controls features that enable the end user to achieve desired operational mode whilst maintaining the optimum efficiency of the system. The controls are housed within a fabricated steel enclosure, and each module fascia features a visual display allowing the user to monitor the current operating status of the boiler. The panel also displays comprehensive fault code information in the unlikely event of a boiler lockout.

Volt Free Contacts

All Wessex ModuMax modules are fitted with a multi-function clip-in module to provide volt free contacts as standard.

Remote alarm signalling is provided for a general fault alarm and boiler normal run indication.

0-10 Volt DC Analogue Input

The standard multi-function clip-in module also provides a 0-10 volt DC analogue signal interface to control the modulation level of the burner, or to set the flow temperature set point. The 0-10 volt signal can be used for remote connection of the boilers to a Building Management System, (BMS) to enable modulating control remotely.

LPB Bus Communications Module

The optional LPB bus communication clip-in kit is used to connect the boiler LMU control unit to the optional Cascade sequence control module. Each boiler in a modular installation requires a clip-in LPB bus communications module to communicate with the Cascade controller.

Outside Air Temperature Sensor

Wessex ModuMax boilers can be supplied with an optional outside temperature sensor to exploit the full functionality of the boiler controls and enable direct temperature compensation on the boiler, maximising the condensing operating conditions. The outside temperature sensor is to be used in conjunction with the optional Cascade control module.

When fitted with an outside temperature sensor, the boiler's own thermostat is overridden and the flow temperature is controlled as a function of external temperature conditions. The flow temperature is adjusted according to a preset heating curve built into the standard boiler controls. This slope can be adjusted to suit the needs of individual systems by for example using a steeper slope on underfloor heating systems.

Programmable Room Sensor

An optional combined room sensor and digital programmer can be connected to the boiler to provide both temperature control of ambient conditions and to programme up to three daily periods for heating or hot water.

Note: An outside sensor must be used when using the room sensor and programmer.

Separate ambient temperatures can be set for each time period with an override facility, enabling the user to switch the system either on or off at their request. The programmer will display the current system operating parameters and also indicate any boiler fault conditions that might occur.

Frost Protection

The boiler control system features a two stage frost protection system. When the boiler is not operating, the frost protection system fires the boiler to maintain a minimum water temperature, to prevent freezing of the heating system water.

Additionally, if an external temperature sensor is connected, the circulation pump will be run intermittently when the outside temperature falls below 1.5°C.

Cascade Control Module

For use with multiple boilers, the optional Cascade controller can sequence up to 12 modules. The controller is supplied with two clip-in LPB bus communications modules as part of the standard Cascade kit, and for each additional boiler in the modular installation, further clip-in LPB bus communications modules must be ordered separately. (IE: A four module installation with a Cascade control kit requires two additional LPB modules).

Controls Details

Wessex ModuMax Single Boiler Installations

The control options for single Wessex ModuMax boilers are different to those for multiple boilers. *Please refer to page 16 for controls on multiple boilers.*

All controls functions are managed via the 'boiler management unit' Siemens LMU64. Using a combination of options, the level of control is expandable for up to 2 heating circuits and 1 domestic hot water cylinder.

A circulation pump overrun timer is incorporated within the boiler LMU.

Programmable Room Sensor

A single boiler Wessex ModuMax system can be fitted with a single programmable room sensor, which should be located in the first heating zone. This room thermostat allows heating circuit management to be based on both the internal and external air temperature. The boiler will manage the heating circuit pump via a contactor according to the program requirements of the programmable room unit.

Features:

- Individual 7 day program with auto summer / winter hour change for heating circuit 1, heating circuit 2 and DHW
- 3 periods per day per time program
- Constant or variable temperature flow
- Compensated flow temperature based on external and room air temperatures
- Optimised start / stop based on external and room air temperatures
- Building frost protection based on room air temperature
- Summer shutdown based on outside air temperature
- Holiday period with frost protection
- Reduced temperature, night set back for non occupancy hours
- Pump kick for pumps controlled from boiler
- Programme lock to prevent tampering
- Individual temperature settings for each zone

To achieve full functionality an outside air sensor must be fitted.

Options for a Single Boiler only

- **Programmable room sensor (QAA73)**
- **Outside air sensor (QAC34)**
- **2nd Heating Circuit Clip-in relay kit (AGU2.500)**
- **DHW Cylinder Sensor Kit (QAZ21)**

Outside Air Sensor

An optional outside air temperature sensor may be wired directly to the boiler to exploit the direct weather compensation functionality of the boiler controls. This sensor may be connected to the control scheme and should ideally be positioned on an external wall with northerly aspect.

2nd Heating Circuit Clip-in Relay Kit

To control a second heating circuit, an additional clip-in relay kit is required for fitting directly to LMU. The kit comprises a relay and water temperature sensor complete with pocket.

This kit provides outputs for a pump and mixing valve.

- Mixing valve allows second heating circuit to operate at a different temperature set-point to heating circuit 1
- Second heating circuit should operate at the same or lower temperature than circuit 1, e.g. underfloor heating
- Programmed via QAA73 programmable room sensor
- Compensated flow based on outside air temp and using a curve separate to that of heating circuit 1 owing to mixing valve
- Optimised start/stop based on outside air temperature
- Frost protection based on water temperature in second heating circuit

For the second heating circuit, the boiler will manage the circuit pump and / or mixing valve via contactors, according to the program requirements of the programmable room sensor and the water temperature sensor.

Only one programmable room sensor may be connected, therefore the second heating circuit management is derived from time control and external air temperature measurement.

DHW Cylinder Sensor Kit

This kit is for a domestic hot water (DHW) circuit directly controlled from the boiler, but programmed via the QAA73 programmable room sensor, and features:

- Immersion sensor complete with pocket
- DHW cylinder sensor and pump output directly from boiler LMU
- Frost protection based on stored water temperature
- Reduced storage temperature for non-occupancy hours
- Anti-Legionella function

For the DHW cylinder circuit, the boiler will manage the primary coil pump according to the program requirements of the programmable room unit and the DHW cylinder sensor.

Controls Details

Wessex ModuMax Multiple Module Installations

The control options for multiple Wessex ModuMax boilers are different to those for single boilers. *Please refer to page 15 for controls on a single boiler.*

The Wessex ModuMax boiler may be controlled by a boiler sequencing cascade controller, in a multiple boiler installation. This provides cascade control from either external enable signals or from internal time clock settings. Up to 12 boiler modules may be controlled and communication between the cascade controller and boilers is via an LPB bus.

The boiler sequencing cascade controller is a sophisticated controller which, when used with a room temperature sensor and outside air sensor, will provide enhanced comfort control for the heating zone it is connected to.

Additionally a domestic hot water cylinder circuit may also be controlled from the boiler cascade controller.

Where the building has more than one heating zone, additional zone controllers can be added to provide a comprehensive building heating control.

Programmable Room Sensor

The programmable room sensor communicates room temperature to RVA47 Cascade Controller and allows the user full adjustment of the room temperature, time clock, holiday periods and frost protection settings. The unit also displays fault codes from the boiler plant. Alternatively, non adjustable and offset adjustable room sensors are also available, for installations requiring users to have less access to system settings.

- 3 programmable periods per day
- Reduced temperature/night set back for non occupancy hours
- Holiday period. Frost protection remains active
- Programme lock to prevent tampering
- indication of operating parameters and boiler fault condition
- 7 day time clock with automatic summer/winter clock adjustment

Options for Multiple Boilers only

- **Boiler sequencing cascade controller (RVA47)**
- **LPB bus communications Clip-in module (OCI420)**
- **Programmable room sensor (QAA70)**
- **Outside air sensor (QAC31)**
- **Room sensor non-adjustable (QAA10)**
- **Room sensor offset adjustable (QAA50)**
- **Zone controller (RVA46)**
- **DHW Cylinder Sensor Kit (QAZ21)**

LPB Bus Communications Clip-in Module

1 clip-in module is required for every boiler module in a multiple boiler arrangement. Two clip-in modules are supplied as part of the Boiler Sequencing Cascade Controller kit, so for three boilers or more, additional clip-in modules must be ordered.

Boiler Sequencing Cascade Controller

Multiple Wessex ModuMax boilers can be sequenced using this cascade control kit. The kit includes:

- RVA47 controller
- Insertion type water temperature sensor with pocket
- Two clip-in LPB bus communication modules*

* *Note: When controlling more than two boilers, then additional clip-in LPB bus communication modules must be ordered separately.*

Features:

- Provides cascade control from either external enable signals, or 0-10v analogue heat demand signal or built-in time clock setting
- Up to 12 boilers may be sequenced
- Lead boiler rotation
- 7 day time clock with automatic summer/winter clock adjustment
- 3 programmable periods per day
- Constant or variable temperature flow
- Compensated flow temperature based on external and room air temperatures
- Optimised start and stop based on external and room air temperatures
- Frost protection based on boiler water temperature
- Building frost protection based on room air temperature
- Summer shutdown based on outside air temperature
- Holiday period. Frost protection remains active
- Reduced temperature/night set back for non occupancy hours
- Pump kick for pumps controlled from boiler
- RVA47 controller is designed for mounting in a remote panel (not HHL supply)

To achieve full functionality an outside air sensor must be fitted.

The boiler cascade will operate according to the integral seven-day time clock with automatic summer / winter hour change. Three time periods are programmable for each day. When there is no time demand, the boiler will revert to the reduced temperature / night set back set point, provided a room temperature sensor is fitted. Otherwise the cascade will not operate unless the frost protection function of the boiler and/or cascade is activated.

Outside Air Sensor

To be used with cascade controller, the optional outside temperature sensor may be wired directly to the cascade controller to exploit the full control functionality, including weather compensation.

This sensor may be connected to the control scheme and must be positioned on an external wall with northerly aspect.

Room Sensor Non-Adjustable

For installations where controls are not to be adjusted by the building occupants, the QAA10 non adjustable room sensor may be used. This prevents tampering and communicates room temperature to RVA47 Cascade Controller. No user adjustment is possible.

Room Sensor Offset Adjustable

For installations where limited control is required by the building occupants, the QAA50 offset adjustable room sensor may be used. This permits adjustment +/- 3°C from the programmed temperature set point and communicates room temperature to RVA47 Cascade Controller.

Zone Controller

Multiple heating zones may be connected into the system to provide a comprehensive building control. A zone controller and sensors are required for each zone.

- 3 programmable periods per day
- Optimised start / stop
- Constant or variable temperature
- Pump output to control zone pump via relay / contactor (not HHL supply)
- Mixing valve output
- Reduced temperature / night set back for non occupancy hours
- Frost protection
- 7 day time clock with automatic summer/winter clock adjustment

Zone Control

Additional to the cascade control, multiple heating zones can be connected into the system to provide a comprehensive building control. Each zone has an individual 3 program timer which together with outside and inside air temperature sensors can provide optimised start/ stop for that circuit.

Using the RVA46 controller, zones can be configured for either constant temperature or variable temperature. Heat demand is calculated according to zone air temperature and where applicable outside air temperature. Using the same compensation heat curves and parallel displacement curves as the cascade controller (*shown on page 19*), each zone can be configured to operate individually from any other zone in the system. Individual night set back and frost protection settings as well as summer shut down settings can also be programmed.

Demands for heat are communicated to the cascade controller via the LPB bus to initiate heat generation when required. The cascade will set the primary circuit operating temperature according to the highest heat demand, therefore where multiple heating zones are used, these are best configured as variable temperature circuits making use of the zone controller mixing valve outputs. This way, when differing heat requirements exist across multiple zones, the lower temperature zones can modulate the mixing valve to maintain water temperature requirements.

Each zone control has a pump output that can be used to control the zone pump via a relay / contactor. When a heat demand exists within the zone, the pump will be started until the demand for heat is satisfied.

An individual room air temperature sensor is required in each zone. The same selection of room temperature sensors are used as for the cascade controller. External air temperature is communicated via the LPB from the sensor connected to the cascade controller.

Each zone controller also has a DHW time program, which can be used to initiate the cascade controller for hot water production. Using the same cylinder as the cascade circuit, the cascade will produce hot water whenever there is a hot water demand from one of the zones or from the cascade controller integral hot water time program providing a central hot water facility.

Domestic Hot Water

A domestic hot water cylinder may be connected to the cascade controller. With the immersion temperature sensor connected directly to the cascade controller, hot water will be produced whenever there is a demand within the timer programmed periods. The hot water circuit is provided with its own three period time clock, and also has a separate night set back feature, frost protection and an anti legionella function.

The primary circuit to the calorifier is controlled using the domestic hot water pump output, which is energised only when a hot water demand is present. This pump should be connected to the controller via a relay contactor.

Multiple Boilers

Wessex ModuMax Modulating Burners

Optimising Life Time Performance

In addition to providing system security, accurate load matching is one of the major advantages of using multiple boilers. When first introduced, modular boilers operated in a basic mode, where modules were switched on or off to meet the system demand for heat. The requirement for turndown was met by increasing or decreasing the number of modules (boilers) in an installation.

As boiler designs advanced, so two stage modular boilers became more popular, and high/low firing boilers changed the parameters for turndown.

Today, most high efficiency boilers have fully modulating capability and this once again changes the methodology for achieving close control in a multiple boiler installation.

When selecting modulating high efficiency boilers, consideration should be given to the life time costs associated with service and maintenance of the boilers. Opt for too many small output (kW) boilers and the servicing costs will be higher, whereas too few large output (kW) boilers will result in less back up and system security.

It is important therefore to select the optimum size boiler output and number of modules to achieve a balanced lifetime cost and ensure system security.

The Hamworthy range of Wessex ModuMax boilers has been designed to satisfy a wide range of commercial systems. Available as condensing and non-condensing boilers, with fully modulating burners, multiple boiler applications enable accurate load matching using the optimum number of boiler modules.

Each module (boiler) can modulate to part load conditions, where efficiency performance will be the greatest.

Setting the boiler sequence controller to fire each boiler at low fire before modulating up to high fire will not only provide the best efficiency performance, but also enable the boilers to share the system load and even out wear and tear on the plant.

In practice, heating systems rarely operate at full load conditions and so configuring the system to optimise the part load performance is an effective way of maximising the energy saving of the heating plant.

Wessex ModuMax Boiler Sequencing Cascade Controller

The boiler sequencing cascade controller available with Wessex ModuMax boilers can be configured to sequence boilers in traditional cascade mode or in unison mode.

Cascade Control

Steps a boiler module on at its lowest rate and then modulates it to its maximum rate, before switching on the next boiler module at its lowest rate, to match the system load. Maintains the lowest number of boiler modules in operation for a given heat load.

Unison Control

Steps each boiler module on in turn at its lowest rate, and then modulates all boiler modules simultaneously to higher rates to match the system load. This method of sequencing can offer higher operating efficiencies, taking advantage of the higher part load efficiencies available at low firing rates.

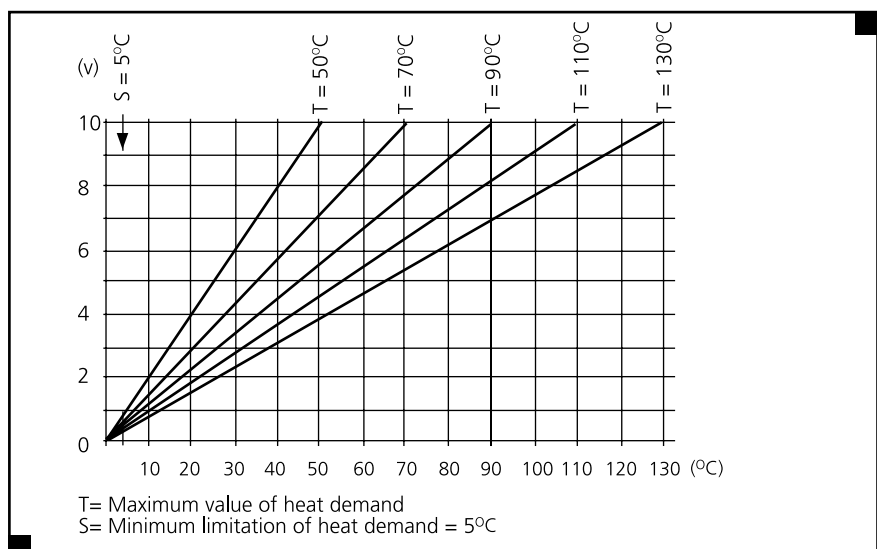
Using BMS Signals to Initiate Cascade

Temperature control 0 -10 Volt DC analogue input.

The cascade controller can be configured to accept a BMS analogue input to initiate heat generation. Where analogue inputs are used, the cascade controller provides heat generation according to the magnitude of the input signal only.

NOTE: When using the BMS to initiate cascade control via a 0-10 volt analogue signal, then the internal time clock and remote enable circuit functions are disabled.

Input signals to the RVA47 cascade control must be temperature configured. The input signal is translated to a temperature set point for the flow temperature, and translation is according to a linear graph from 5°C to an upper limit set by parameters during commissioning. 10 Volts corresponds with the upper limit with a maximum 90°C setting.

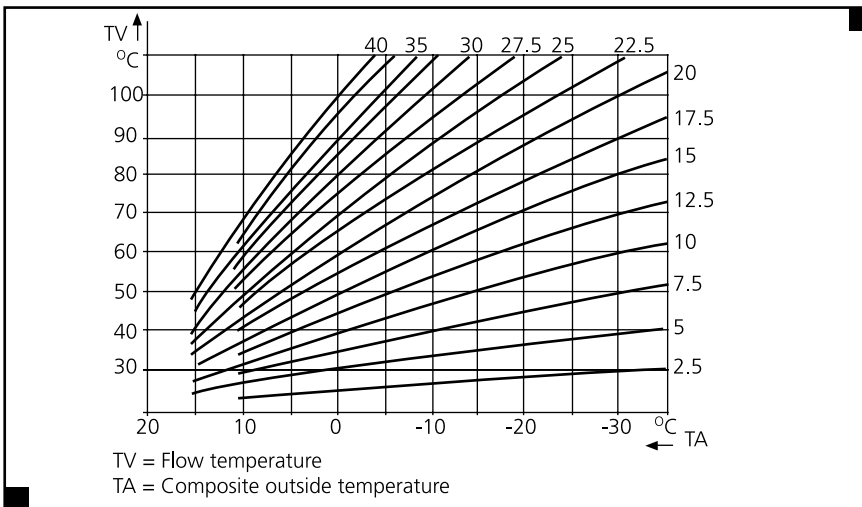


When there is no analogue input, the boilers will not fire unless the frost protection function of the boiler is activated. It is recommended that the BMS has a frost protection setting higher than 5°C water temperature, to prevent the boiler from firing without circulation. *Please refer to the section on pump control, page 19.*

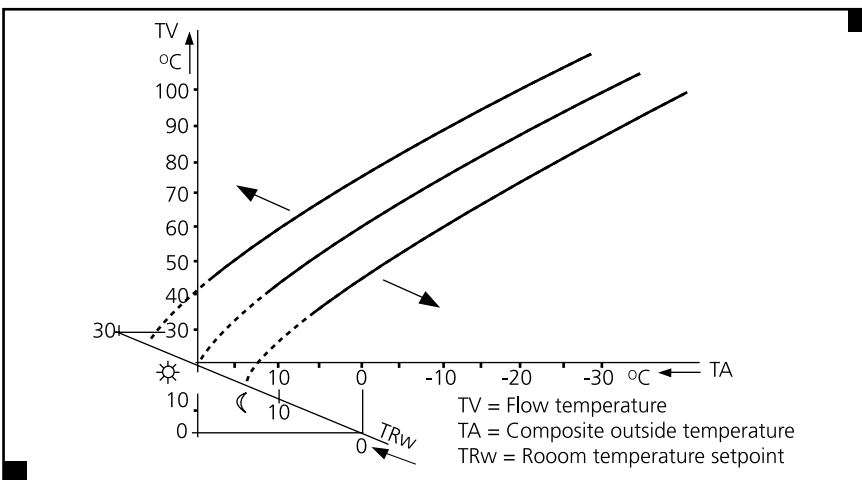
Whilst operating with an analogue input signal, the cascade controller will provide lead boiler rotation programmable for number of hours run.

Weather Compensation

When using an external air temperature sensor with remote enabled system (not 0 – 10 Volt) and the integral time clock, the flow temperature can be directly compensated. The heating curve corresponding to the required flow temperature conditions is fully adjustable with curve settings from 2.5 to 40.



To further enhance comfort levels within the building, when used in conjunction with a room temperature sensor, the cascade flow temperature set-point will be adjusted, dependent on the actual room temperature. I.e. if the room temperature is high then the control will further reduce the flow temperature automatically. Further enhancements for comfort can be made using the offset adjustment for the heating curve, programmable to reset the curve parallel to the original $\pm 4.5^{\circ}\text{C}$



When the remote on / off contact is open the boiler will not operate unless the frost protection function of the boiler and / or the cascade is activated. Where optimised start/stop is required this must be incorporated within the remote time clock circuitry.

Room Temperature Set Point

The required room temperature is set from the cascade controller and the actual room temperature communicated to the cascade controller from a remote room temperature sensor.

Primary Circuit Pump Control

In all installations it is recommended that the primary circuit pump start signal is provided from the boilers. Each boiler has a shunt pump output that should be connected to an individual relay/contactator in the primary pump power supply circuit. The primary pump power supply circuit should be configured to ensure the primary pump starts whenever an individual relay, or multiple relays are energised via the boiler shunt pump circuits.

By energising the primary pump via the boilers, the boilers are prevented from firing without circulation, in frost protection mode.

Should control of the primary pump be required from an alternative source, such as a BMS system, then the frost protection set point for starting the primary pump should be higher than 5°C water temperature. This will ensure that the primary pump will have started before the boilers can operate under the influence of their integral frost protection, which is set at 5°C water temperature.

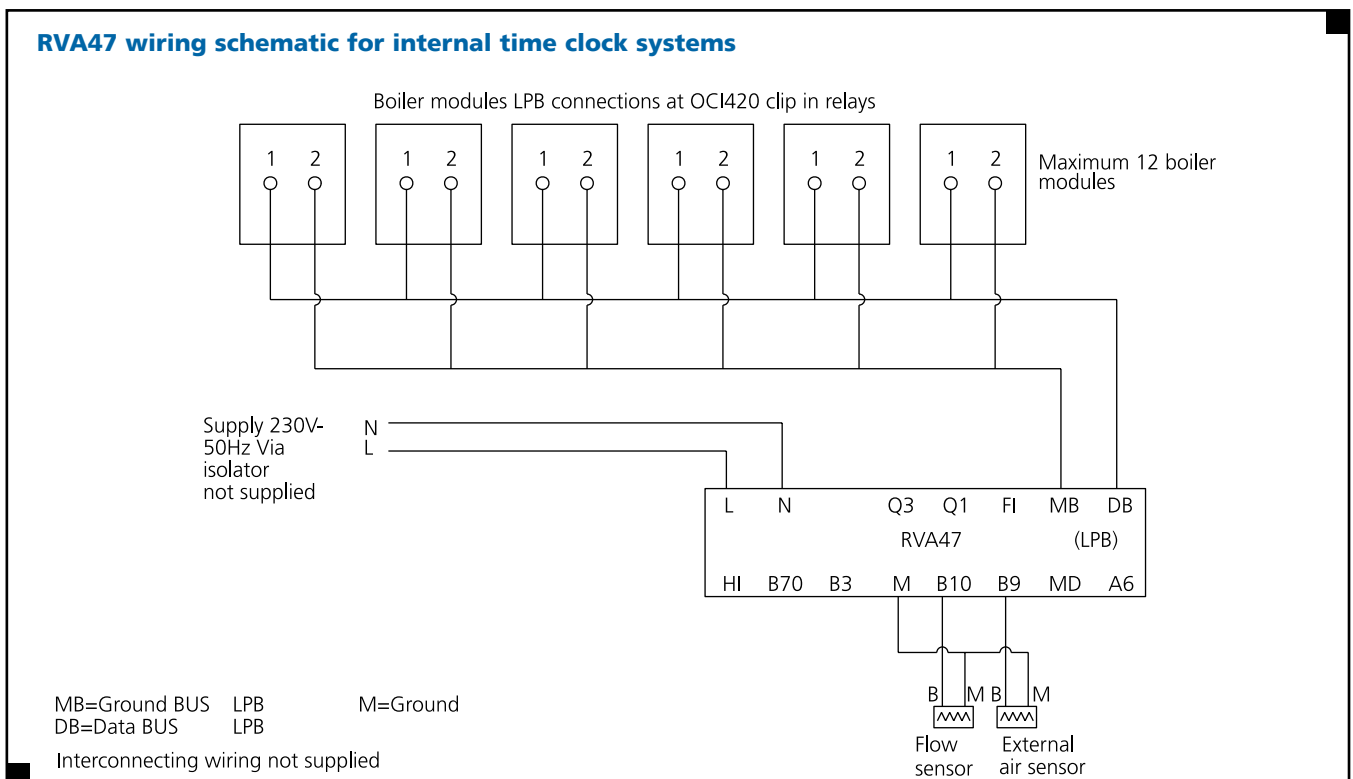
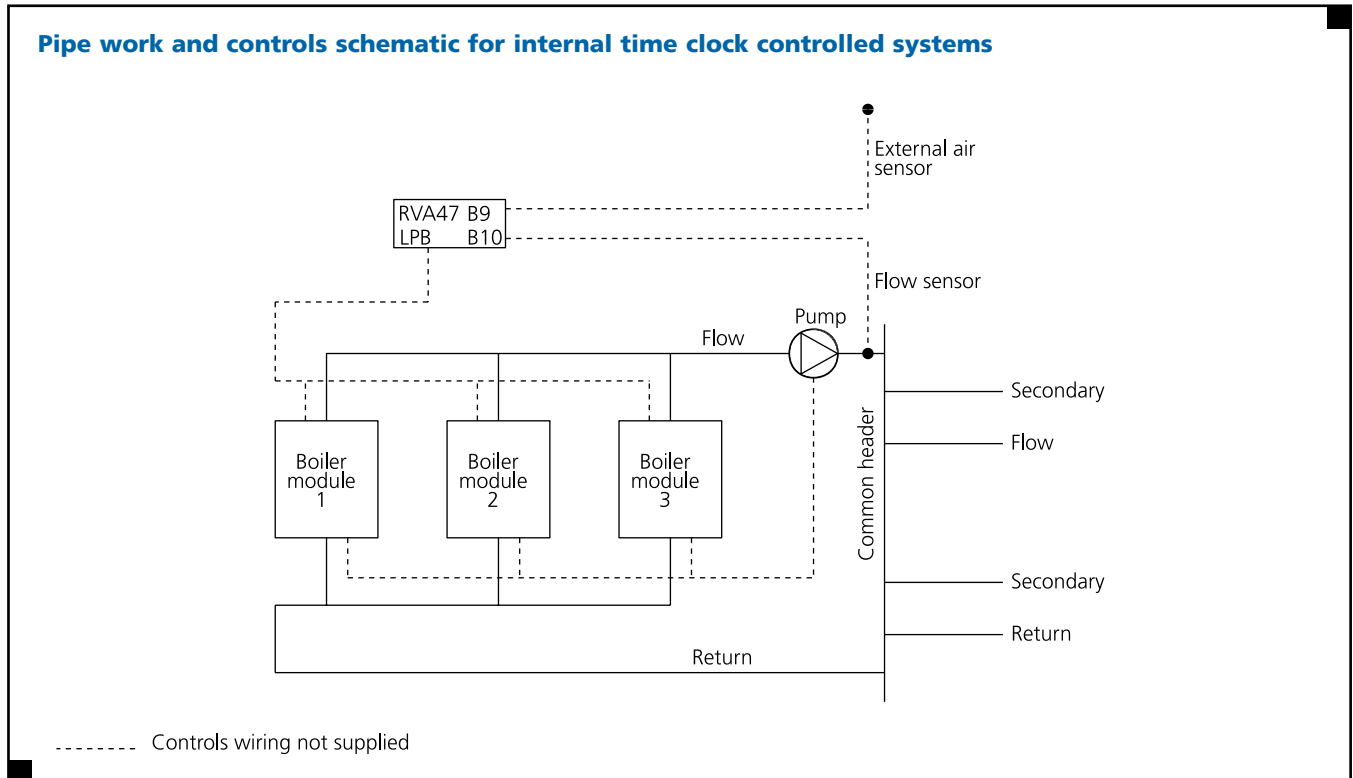
Interlocks

Remote interlocks, e.g. pressurisation unit, flue fans etc can be connected directly to each boiler module using the safety interlock circuit input. Neither the RVA47 cascade controller nor the RVA46 zone controller have safety interlock circuit inputs.

Controls Scheme 1

Wessex ModuMax Boilers

Internal Time Clock Controlled System using RVA47

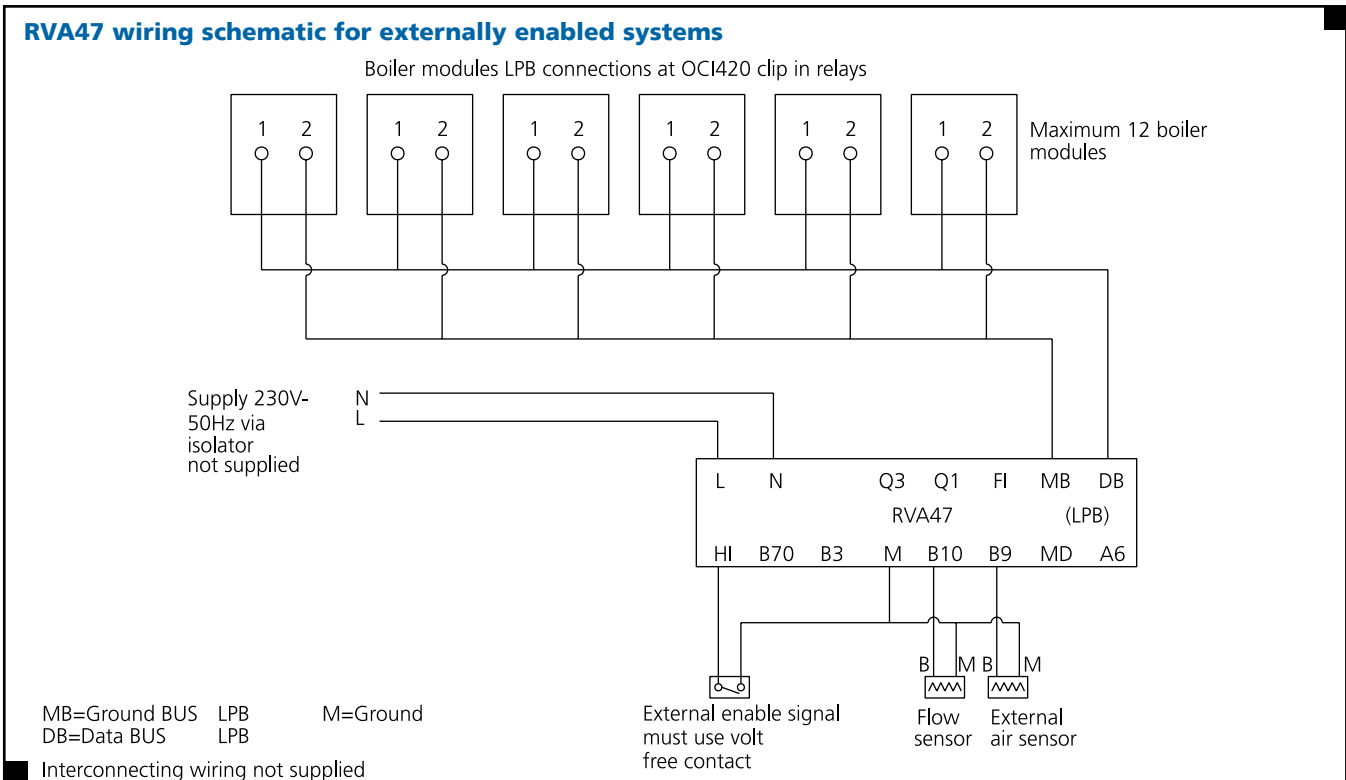
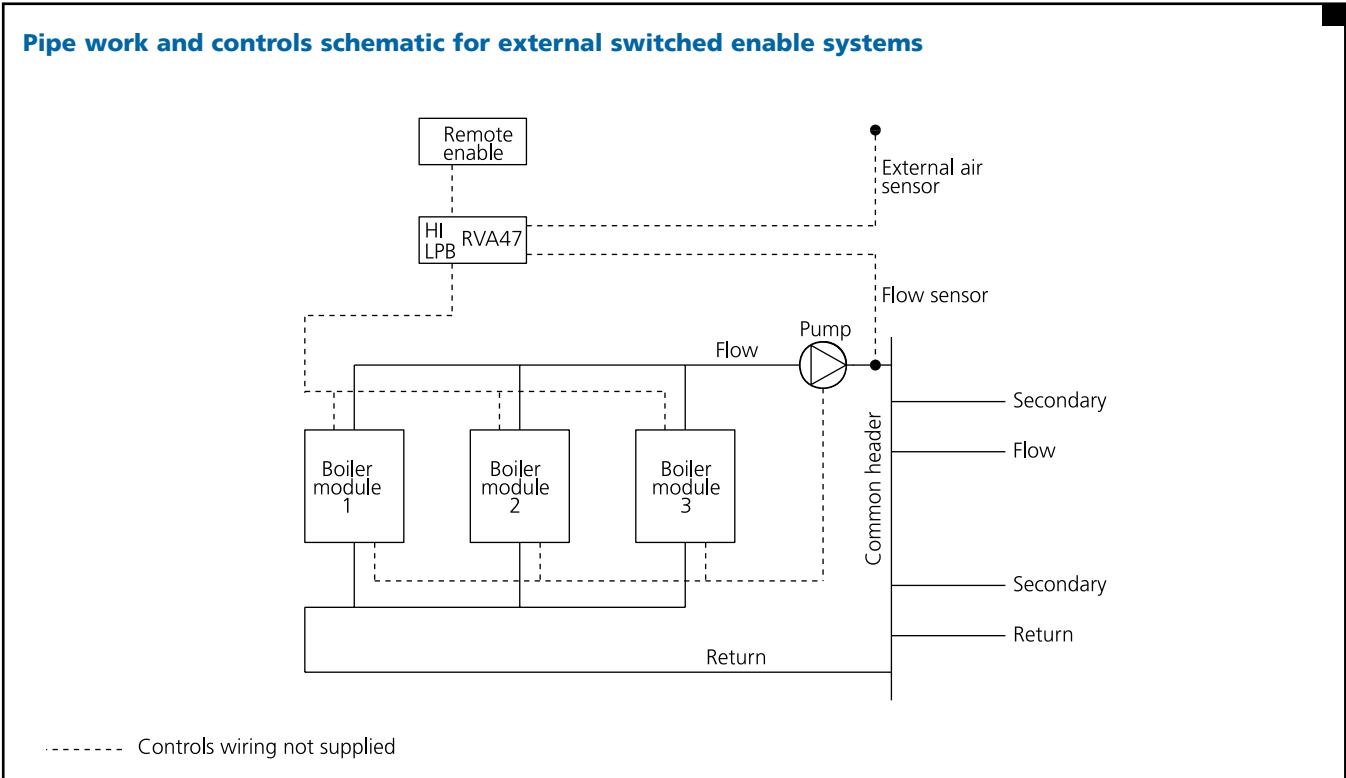


These schematics are available to download at www.hamworthy-heating.com

Controls Scheme 2

Wessex ModuMax Boilers

External Switched Remote Enable with RVA47



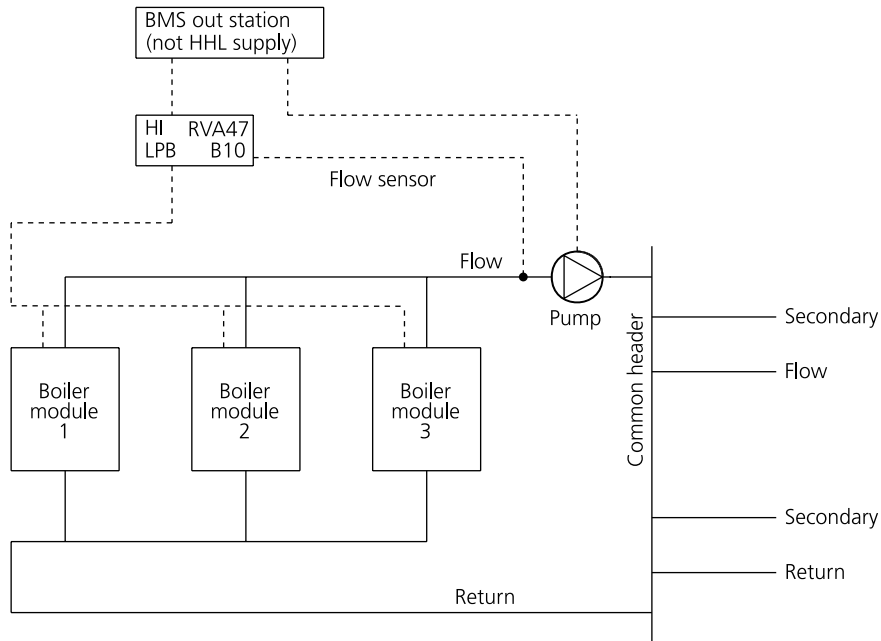
These schematics are available to download at www.hamworthy-heating.com

Controls Scheme 3

Wessex ModuMax Boilers

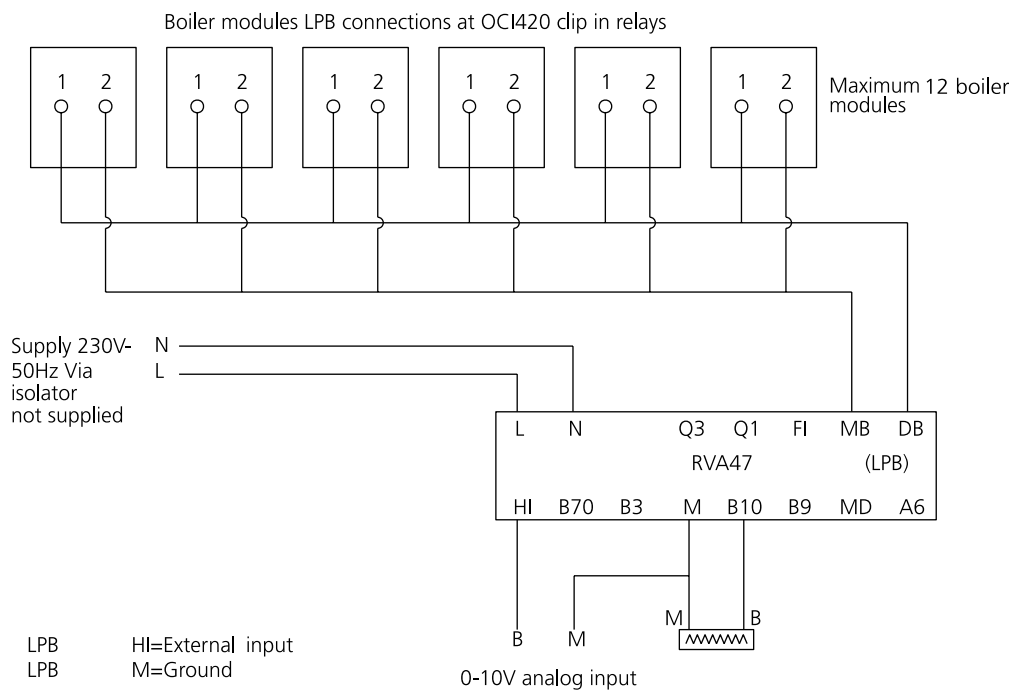
External 0-10 volt Enabled System with RVA47

Pipe work and controls schematic for external 0-10v enabled systems



----- Controls wiring not supplied

RVA47 wiring schematic for external 0-10V enabled systems



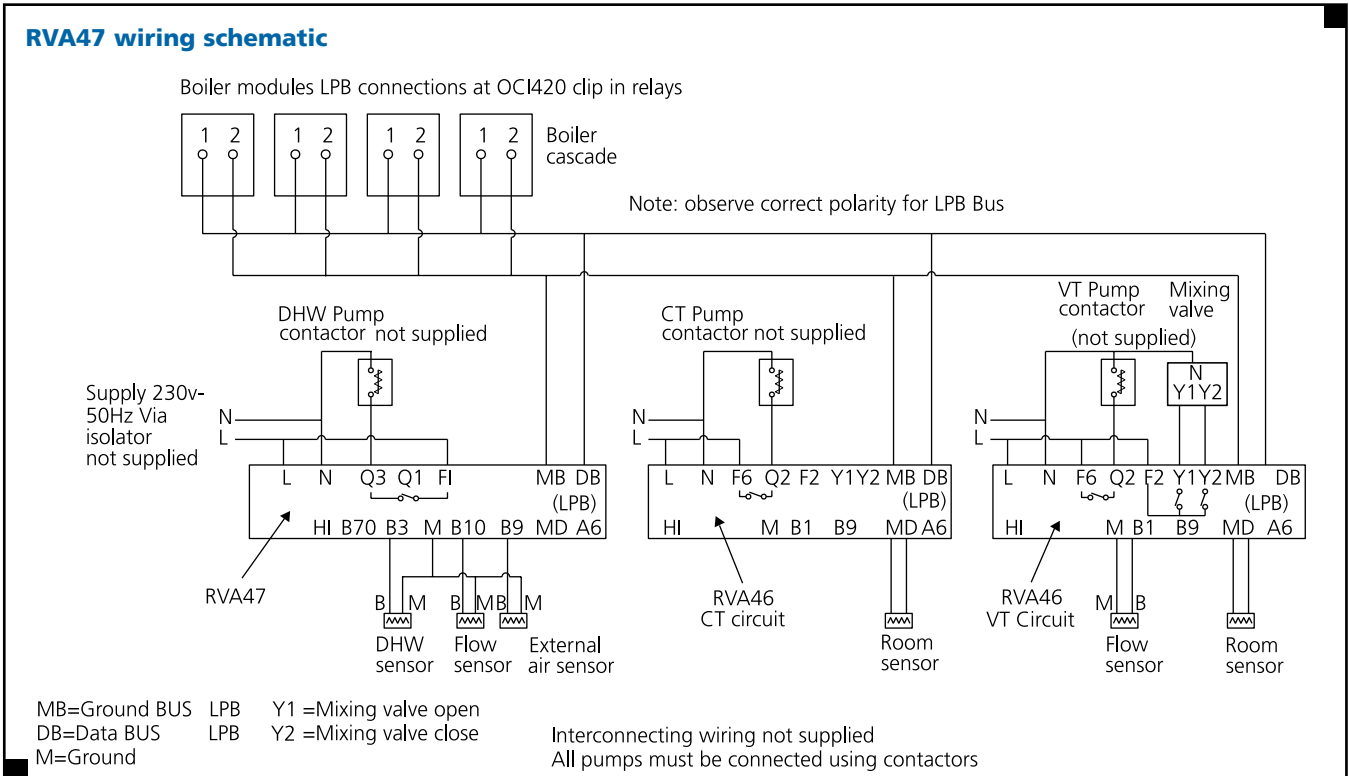
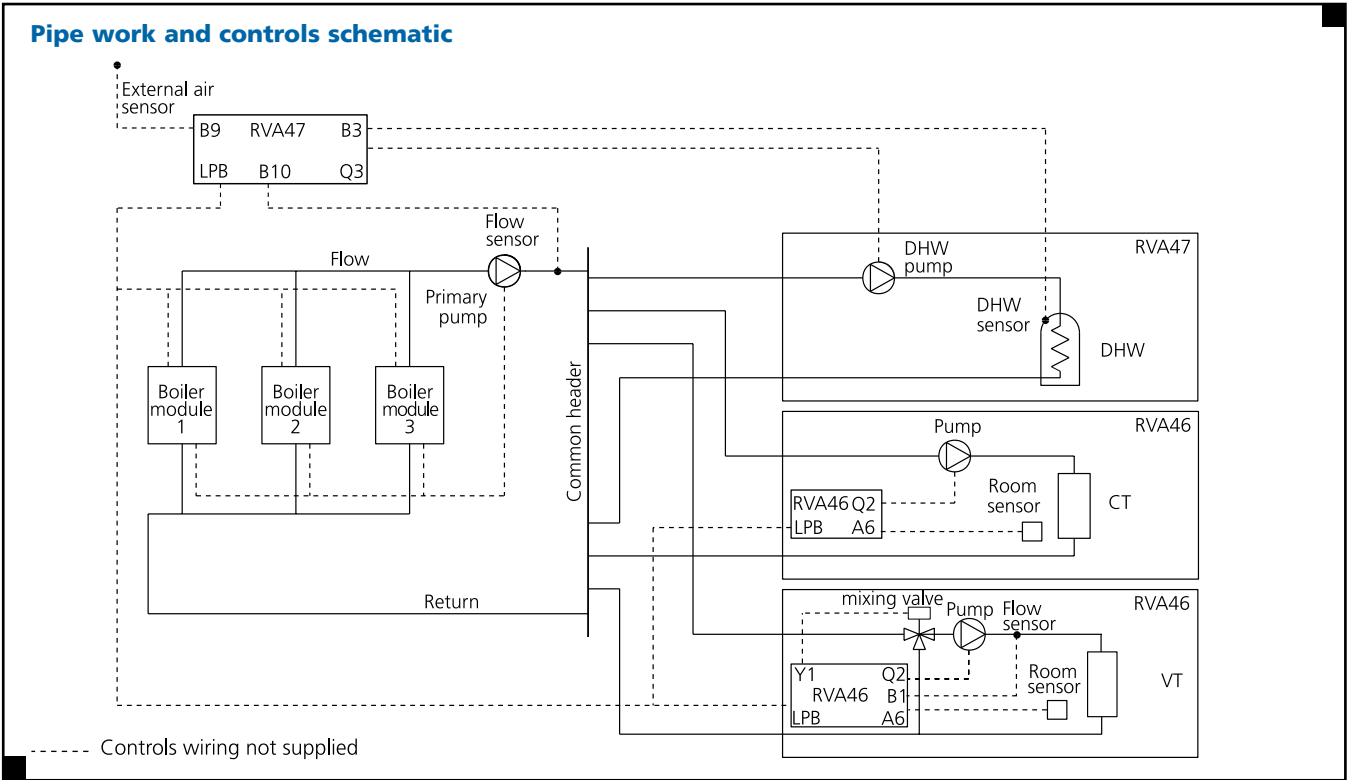
Interconnecting wiring not supplied

These schematics are available to download at www.hamworthy-heating.com

Controls Scheme 4

Wessex ModuMax Boilers

RVA47 Control of Primary Circuit, Time Control of Secondary Circuits using RVA46



These schematics are available to download at www.hamworthy-heating.com

Application & System Data

Wessex ModuMax Boilers

The installation of the boiler MUST be in accordance with the relevant requirements of the Gas Safety Regulations, Building Regulations, IEE Regulations and the Water Supply (Water Fittings) Regulations. It should also be in accordance with any relevant requirements of the local gas region and local authority and the relevant recommendations of the following documents :

These British Standard Codes of Practice and additional publications have relevant recommendations regarding the installation of Wessex ModuMax boilers.

British Standards

BS 6644 Installation of Gas Fired Hot Water Boilers, 70kW to 1.8MW (nett input).

BS 6700 Design, installation, testing and maintenance of services supplying water for domestic use.

BS EN 806-2 Specification for installations inside buildings conveying water for human consumption – Part 2: Design.

BS 6880 Part 1,2 & 3 Code of practice for low temperature hot water heating systems of output greater than 45kW

BS 7074 Application, selection and installation of expansion vessels and ancillary equipment for sealed water systems. Part 2 Code of practice for low and medium temperature hot water systems.

BS EN 60335 Part 1 Safety of household and similar electrical appliances – general requirement.

I. Gas E. Publications

IGE/UP/1 Soundness testing and purging of industrial and commercial gas installations.

IGE/UP/1A Soundness testing and direct purging of small low pressure industrial and commercial natural gas installations.

IGE/UP/2 Gas installation pipe work, boosters and compressors in industrial and commercial premises.

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

Health and Safety Executive

Guidance note PM5 - Automatically controlled steam and hot water boilers.

CIBSE Publications

CIBSE Guide B Heating, ventilating, air conditioning and refrigeration.

CIBSE Guide H Building Control Systems

CIBSE Guide Energy Efficiency in Buildings

CIBSE Commissioning Code B: 2002

Third edition of the 1956 Clean Air Act Memorandum

Department of the Environment, Scottish Development Department & Welsh Office.

Location

The location chosen for the boiler must permit the provision of a satisfactory flue system and an adequate air supply. The location must also provide adequate space for servicing and air circulation around each unit. This includes any electrical trunking laid along the floor and to the appliance.

Any combustible material adjacent to the boiler and the flue system must be so placed or shielded to ensure that its temperature does not exceed 65°C. Further details regarding boiler location are given in BS 6644.

Wessex ModuMax boilers should be positioned on a level non combustible surface that is capable of supporting the boiler weight when filled with water, plus any ancillary equipment. Adequate space should be allowed for installation and servicing.

Refer to dimensional drawings on pages 10 & 11 for more details.

Adequate Water Flow

The Wessex ModuMax boiler is designed as a rapid response, low water content unit to run continuously with minimal operating problems. Care should be taken in the initial design and layout, having due regard for adequate water flow through the boilers, and the influence of the control system. Hamworthy strongly recommend that Wessex ModuMax boilers are installed using the primary circuit design to ensure adequate water flow regardless of secondary circuit operating conditions. Refer to technical data tables for minimum water flow requirements.

The control system and valves, where fitted, should be regulated to avoid lower flows occurring.

Condensing models are designed to operate with systems operating at 20°C differential temperatures and return temperatures as low as 30°C. Increased flow rates may be used for lower temperature differentials with due regard for the increased pressure loss through the boiler.

Non-condensing models are designed for more traditional systems operating at 11°C differential temperatures and return temperature no lower than 50°C. Maximum differential temperature for all boilers is 20°C.



Water Systems

Wessex ModuMax boilers are suitable for both open vented or sealed pressurised systems. Sealed systems must comply with Health and Safety Document PM5 requirements for fuel supply cut off in the event of low and high-pressure conditions. To ensure compliance, consider using a proprietary pressurisation unit with correctly sized expansion vessels.

In multiple boiler installations, the flow and return headers should be connected in a "reverse return" arrangement (i.e. the water flow in each header follows the same direction) thus providing equal flow through each boiler. This also ensures that the pressure loss across any number of boilers will never be greater than the head loss across one boiler plus local pipe work losses.

System Feed Water Quality

If the boiler feed water has a high degree of hardness, it is recommended that the water be treated to prevent precipitation of scale or sludge in the boiler water passageways. Details of additives can be obtained from any reliable manufacturer of water treatment products or the local water authority.

Open Vent Pipe and Cold Feed Pipe Data

Boiler	Open Vent Size	Cold Feed Size
<60kW	25mm (1 in)	19mm (¾ in)
60kW - 150kW	32mm (1¼ in)	25mm (1 in)
150kW - 300kW	38mm (1½ in)	32mm (1¼ in)
300kW - 600kW	50mm (2 in)	38mm (1½ in)

Pressure Relief Valve

Each boiler must be fitted with a pressure relief valve to BS EN ISO 4126-1. When using a Hamworthy pipe manifold kit, dependant on the boiler model, it is possible to use a single pressure relief valve for a bank of boilers.

Wessex ModuMax models: 100, 110 & 120

Pipe manifold kits for these boilers are provided with a 3 port venting / isolation valve on each boiler flow pipe connection. Therefore on these boiler models it is possible to use a single appropriately sized pressure relief valve mounted in the common flow pipe work before any additional system isolation valve.

Wessex ModuMax models: 150, 160, 200, 220 & 250

Pipe manifold kits for these boilers are provided with a 2 port isolation valve on the flow pipe connection. Therefore with these boiler models an appropriately sized individual pressure relief valve must be fitted on each boiler module. A dedicated connection is provided on each boiler module for this purpose.

BS6644 provides comprehensive information for the selection and location of pressure relief valves and attention is drawn to the higher capacity requirements of pressure relief valves for pressurised hot water systems.

LPG Propane Option - Condensing Models Only

Where Natural Gas supplies are not available the Wessex ModuMax can be factory modified for firing LPG propane. LPG fuel must be specified at the time of ordering. When using LPG supplies it is recommended that additional gas detection equipment is installed within the plant room at low level to detect any gas leak that may occur. Additional low level ventilation should be fitted to connected spaces below locations of boilers fired with LPG.

Delivery

Wessex ModuMax Series boilers are supplied fully assembled from the factory. The assembled boiler can be easily manoeuvred using a pallet truck and will pass through a standard single doorway.

The two and three high models are supplied with a separate close-coupled flue header, which has to be fitted to the boiler on site.

All Hamworthy products are delivered to site on a tail-lift vehicle, and deliveries are closely co-ordinated with the customer, to suit the site construction programme. Standard delivery is to ground level from the tail-lift of the vehicle. To enquire about special delivery services, please contact our customer services team.

Commissioning

Hamworthy Heating strongly recommend that all boilers are commissioned by our service department. On completion, Hamworthy will issue a boiler log book which will provide details of the initial operating settings. The log book should be used to record any future maintenance and service work.

For more information on commissioning contact Hamworthy Heating Service Department: Tel 0845 450 2866.

Warranty

Products from Hamworthy carry a standard two-year warranty on parts, and where the product is commissioned by Hamworthy service engineers, then the warranty covers parts and labour. In offering flexible solutions for after sales support, Hamworthy can tailor packages to suit individual customer requirements, many of which include extended warranty benefits.

System Head

Guidance Note PM5 Health and Safety Executive

This note states that "hot water boilers should have an automatic control apparatus to cut off fuel to the burners of gas fired plant when the water at or near the boiler flow outlet rises to a pre-determined temperature. This should provide a margin of at least 17°C below the temperature of saturated steam corresponding to the pressure at the highest point of the circulation system above the boiler." To comply with this recommendation, the minimum system pressure is dependant on system design flow temperatures and in the case of modular installations, the temperature rise across each module.

Single Installations

The minimum pressure must be equal to the gauge pressure equivalent to the saturated steam temperature obtained by adding 17°C to the required boiler flow temperature. The highest point of the circulation system above the boiler should never be less than 2m (6.5ft).

- Required flow temperature 90°C
- Safety margin 17°C
- Equivalent saturated steam temperature 107°C

From steam tables corresponding gauge pressure 0.3 bar – 3.0m head of water.

Modular Installations

The minimum pressure should be equal to the gauge pressure equivalent to the saturated steam temperature. This is obtained by adding 17°C to the sum of the required mixed flow temperature plus the temperature rise

across the modules.

■ System Δt	11°C	20°C
■ Required mixed flow Temperature	82°C	80°C
■ Temperature rise across modules at minimum flow rate	11°C	20°C
■ Safety margin	7°C	7°C
■ Equivalent saturated steam temperature	10°C	117°C
■ From steam tables corresponding gauge pressure	0.43 bar (4.40m)	0.80 bar (8.20m)

From steam tables corresponding gauge pressure at 11°C Δt 0.43 bar, 4.40 m

From steam tables corresponding gauge pressure at 20°C Δt 0.80 bar, 8.2 m

Air Supply and Ventilation

An adequate supply of fresh air for combustion and ventilation must be provided in accordance with BS 6644.

The air supply should be free from contamination such as building dust and insulation fibres from lagging. To avoid unnecessary cleaning and servicing of the burner, we recommend that the boilers are not fired whilst building work is being undertaken.

The air supply should be achieved using:

- Natural ventilation supplying air with a low level opening and discharge through a smaller sized high level opening.
- A fan to supply air to a low level opening with natural discharge through a high level opening.

- A fan to supply air to a low level opening and discharged by means of a fan at a high level.

Note: Fans must be selected such that a negative pressure is not created in the boiler house relative to outside air pressure.

The air supplied for boiler house ventilation should be such that the maximum temperatures within the boiler house are as follows:

- At floor level 25°C or 100mm above the floor level)
- At mid level 32°C (1.5m above floor level)
- At ceiling level 40°C (or 100mm below ceiling level)

Where natural ventilation is used suitable permanent openings at low level and high level connected directly to the outside air should be provided. These openings must be fitted with grilles that cannot be blocked or flooded.

The free area of the grilles should be as follows:

Low Level (Inlet)

4cm² per kW of net heat input.

High Level (Outlet)

2cm² per kW of net heat input.

Ventilation

Where a boiler installation is to operate throughout the summer months, e.g. for domestic hot water production for more than 50% of the time, then additional ventilation allowances are required. Refer to BS6644 for more detailed information.

The Building Regulations 2000

Conservation of fuel and power 2006 edition

Approved Document AD L2A New Buildings, other than dwellings

Approved Document AD L2B Existing Buildings, other than dwellings

These new regulations came into force 6 April 2006. Compliance with the latest regulations now requires a whole building approach to reduction in carbon emissions. The 2006 edition requires the use of heat generating plant as detailed in the supporting 2nd tier guide - Non Domestic Heating, Cooling and Ventilation Compliance Guide.

Seasonal Efficiency

The efficiency data used for evaluating commercial boilers is known as the heat generator seasonal efficiency and this guide states that for new buildings and existing buildings, the minimum heat generating system seasonal efficiency is 84% gross for natural gas.

The heat generator seasonal efficiency for Wessex ModuMax boilers exceeds the minimum requirement, Individual boiler figures can be found on pages 7, 8 & 9.

Primary Circuit Pump

Wessex ModuMax Boilers

Pumps for circulation through the boilers should be sized according to the flow rate and pressure loss requirements for a boiler, or group of boilers, and associated local pipe work. For details of flow rate requirements and boiler pressure loss, please refer to data tables on pages 7,8 and 9.

Hamworthy Heating is the exclusive distributor of Biral pumps in the UK. With a wide range of models available, you can closely match pump performance to suit your requirements.

The high quality design with innovative features include:

- Unique Can system – no seals to leak
- Low, medium and high speed ranges
- High torque starting
- Ultra low power consumption
- Flat performance curves – less system noise
- Operating pressures up to 16 bar
- Temperatures from -20°C to 140°C
- Whisper quiet pump operation

Pumps are matched to the smallest circulator for the duty

Matched Biral Pumps for 20°C Δt Primary Circuit - Condensing Wessex ModuMax Boilers

Model	Primary Pump Model
WM 100/100c	LX321
WM 100/200c	LX325
WM 100/300c	LX403
WM 120/120c	LX322-2
WM 120/240c	LX326 or LX402
WM 120/360c	LX503
WM 150/150c	LX402
WM 150/300c	LX503
WM 150/450c	LX652
WM 200/200c	LX503
WM 200/400c	LX653
WM 200/600c	LX653
WM 250/250c	LX653
WM 250/500c	LX654
WM 250/750c	LX655 or LX803*

Matched Biral Pumps for 11°C Δt Primary Circuit - Condensing Wessex ModuMax Boilers

Model	Primary Pump Model
WM 100/100c	LX401
WM 100/200c	LX503
WM 100/300c	LX652
WM 120/120c	LX502
WM 120/240c	LX652
WM 120/360c	LX652
WM 150/150c	HX402-1
WM 150/300c	HX502-1
WM 150/450c	HX652
WM 200/200c	HX652
WM 200/400c	HX802
WM 200/600c	L1004
WM 250/250c	EBZ 85V4-200-3kW
WM 250/500c	EBZ 100V4-200-5.5kW
WM 250/750c	EBZ 100V4-200-5.5kW

Matched Biral Pumps for 20°C Δt Primary Circuit - Non Condensing Wessex ModuMax Boilers

Model	Primary Pump Model
WM 110/110he	LX326 or LX403
WM 110/220he	LX503
WM 110/330he	LX504
WM 160/160he	LX402
WM 160/320he	LX503
WM 160/480he	LX652
WM 220/220he	LX403
WM 220/440he	LX653
WM 220/660he	LX654

Matched Biral Pumps for 11°C Δt Primary Circuit - Non Condensing Wessex ModuMax Boilers

Model	Primary Pump Model
WM 110/110he	LX402
WM 110/220he	LX504
WM 110/330he	LX652
WM 160/160he	HX402-1 or LX654
WM 160/320he	LX655
WM 160/480he	LX804
WM 220/220he	HX502-1
WM 220/440he	HX652
WM 220/660he	L1002

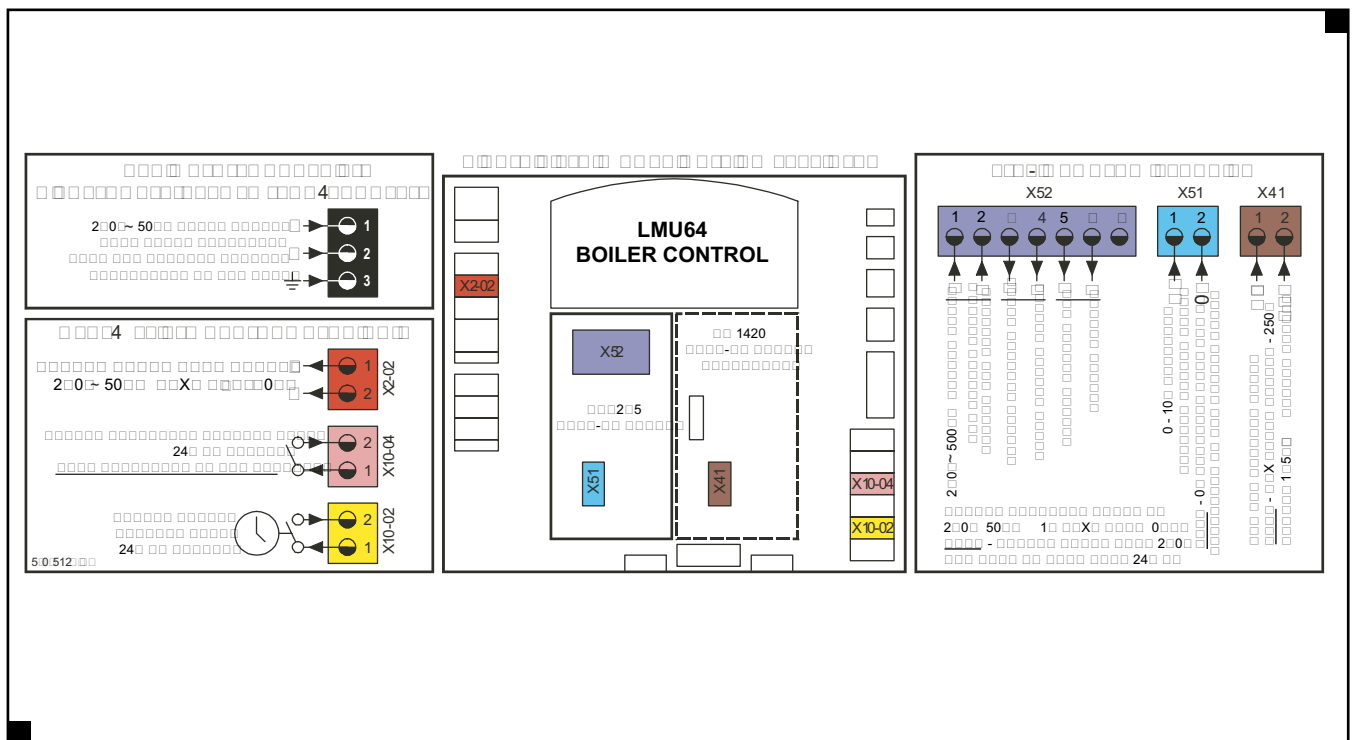
* Matched pump selection depends on installation pipe size. Contact our technical department on 01202 662379 for guidance.

Wiring Diagram

Wessex ModuMax Boilers

The following electrical connections are provided on each module:

- Supply live neutral and earth
- Supply input for boiler fault and normal run signals
- Boiler fault alarm system signal output
- Boiler normal run signal output
- 0-10v analogue control signal input
- Remote on / off control input
- Boiler shunt pump output
- Safety interlock circuit input



Electrical Connections

There is a gland plate fitted to each boiler module at the lower left hand side of the controls cover assembly to accept cables for power supply and controls. External wiring connections are made to dedicated colour coded plugs within the boiler module control panel. Plug in connectors facilitate easy access to components during servicing and maintenance.

Power Supply

An independent isolator and fused electrical supply is recommended for each boiler module. Supply 230 volt, 50Hz, single phase. Wiring external to the boiler must be installed in accordance with IEE Regulations and any local regulations which apply. Wiring must be completed in heat resistant 3 core cable, (size 1.0 mm² c.s.a.) Fascia fuse rating is 2 amp. External fuses should be 6 amp for all single boiler sizes.

To prevent drawings excessive current (>1 amp) through the boiler control panel, it is recommended that pumps are connected via contactors.

Wiring Diagram

Cascade and Heating Zone Controls

Controls Installation

The RVA46 and RVA47 controls are designed for panel mounting. It is recommended that the controls are mounted with the fascia exposed externally for ease of use.

All electrical connections use polarised coloured screwed terminal blocks to ensure that once installed and commissioned, connections are easy to relocate in their original position, if removed.

The LPB bus communication cable between controllers and boiler can be extended to a maximum 250 metres length. Cable should be (non interchangeable) two core twisted with 1.5mm² CSA.

Room temperature sensors, QAA10, QAA50 and QAA70, may be located up to 50 metres from their respective RVA controller.

Wiring between controllers and the room sensors using 2 wire (interchangeable) cable. Max 1.5mm² CSA.

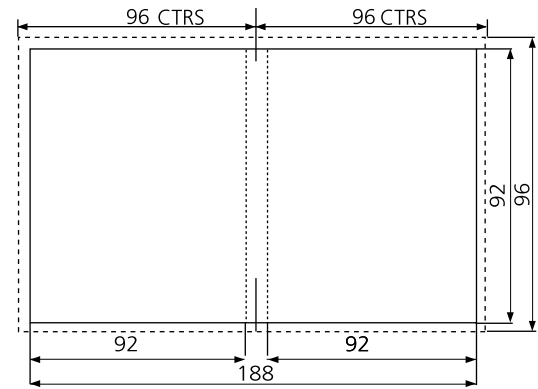
External air sensor QAC34 may be located up to maximum 120 metres from the RVA controller. Usually connected to the RVA47, wiring using 2 wire (interchangeable) cable. Max 1.5mm² CSA.

Water temperature sensors, QAZ21, may be located up to maximum 120 metres from the RVA controller. Wiring using 2 wire (interchangeable) cable. Max 1.5mm² CSA.

Pump outputs are volt free contacts rated to 2 amps 230V max.

It is strongly recommended that pumps and mixing valves are connected via contactors, where higher running currents will be experienced.

Panel cut-out dimensions for RVA46 & RVA47 controllers.



The mechanical mounting allows fitting in panel fronts that have a thickness of 2mm to 10mm.

Wiring terminal connections - RVA47 cascade controller								Wiring terminal connections - RVA46 zone controller																										
Low voltage terminals				Mains voltage terminals				Low voltage terminals				Mains voltage terminals																						
6	5	4	M	2	1	M	M	3	2	F	4	3	2	F	L	N	6	5	4	M	2	1	M	M	3	2	F	4	3	2	F	L	N	
H1	B3	M	810	B9	MDA6	MBDB		Q3	Q1	F1							H1	M	B1	B9	MDA6	MBDB			Y2	Y1	F2		Q2	F6	L	N	L	N
Remote enable circuit - H1/M - Volt free / 0-10 v Dc DHW cylinder sensor - B3/M Ground for sensors and remote enable circuit Cascade sensor - B10 / M Outside air sensor - B9 / M Ground for room sensor Signal for room sensor Ground for LPB Bus Communication Signal for LPB Bus Communication								Live output for DHW cylinder pump max 1AMP load Live input for DHW cylinder pump 230v 50Hz Live supply 230v 50Hz 5AMP Neutral								Remote enable circuit - H1/M - Volt free / 0-10 v Dc Ground for sensors and remote enable circuit Flow sensor for mixing valve - B1/M Outside air sensor - B9/M Ground for room sensor Signal for room sensor Ground for LPB bus communication Signal for LPB bus communication Close output for mixing valve max 1AMP load Open output for mixing valve max 1AMP load Live input for mixing valve 230v 50Hz								Live output for heating zone pump max 1AMP load Live input for heating zone pump 230v 50Hz Live supply 230v 50Hz 5AMP Neutral										

Flue System

Wessex ModuMax Boilers

Wessex ModuMax boilers have a pressurised flue outlet, enabling a flue installation to be designed using smaller diameter components.

The following points should be noted:

- A suction condition within the flue is not required, so it may be possible to achieve a lower chimney terminal height, however all installations must still comply with the requirements of the Clean Air Act 1956 Memorandum.
- The flue system must be capable of handling saturated flue gases in a positive pressure system, particularly for the condensing models, however, there will also be condensate generated from the non condensing models during certain operating conditions.
- The boilers may be flued individually, using Hamworthy fully welded Masterflue components. *Details of flue sizes and length of flue runs are shown on page 31.*
- Multiple boilers may be installed using a common flue header. *Please consult with our flue technical team for further advice.*
- The flue components should be fully welded and CE marked for positive pressure application.
- Draught conditions generated from vertical risers should not exceed 10Pa. Where draught conditions are likely to exceed 10 Pa, it is recommended that a draught stabiliser is fitted.
- Where multiple boilers are used, a draught stabiliser located in the end of the header is preferred to individual draught stabilisers located on each boiler outlet.
Draught generated:
at 140°C, 4 Pa/m
at 80°C, 2 Pa/m
at 40°C, 0 Pa/m
- The flue system must be self supporting and facilitate access for cleaning and maintenance near the boiler connection.

- When designing the flue system, care must be taken to ensure that any condensate that may form within the system can be drained safely to a suitable waste point, and that the flue and drain materials are resistant to the corrosive effect of condensate.
- Wessex ModuMax boilers are suitable for installation in a balanced compartment in accordance with the requirements of BS 6644.

Flues from Hamworthy

The Masterflue MF system from Hamworthy is a modular, twin wall, insulated, fully welded flue solution, optimised for high efficiency and condensing boiler applications.

Leak-Free

- Unique factory fitted tri-lip silicone gasket as standard- leak proof, high temperature seal, impervious to water and vapour
- All components fully welded and pressure tight, including traditionally troublesome elbows

Corrosion-Free

- Premium grade stainless steel construction for inner and outer walls
- 87 degree elbows and tees to ensure condensate drains effectively

Worry-Free

- Fast, push-fit assembly with no need for additional sealants
- Precision finished, reliable components for high quality installation
- Range of 'Tru-Align' adjustable wall brackets for simplifying alignment, achieving a faster installation and neater finish
- Continuous insulation from base to stub
- Fire resistant - 4 hour fire rated
- Stress-free thermal expansion
- CE mark accredited to meet 2005 legislation

Hamworthy also have the Masterflue ME flue component range which is a single wall construction, fully welded flue system. The Masterflue ME range is totally compatible and interchangeable with the Masterflue MF twin wall range.

Design & Install or Supply Only

Hamworthy's extensive knowledge of combustion systems, and the flue requirements for each boiler, makes a boiler and flue package the perfect solution for every project.

Offering a comprehensive range of flue and chimney equipment for natural draught, fan assisted and fan dilution applications, Hamworthy works in partnership with Midtherm Engineering to provide a comprehensive flue design and installation package.

Alternatively, Hamworthy can provide components on a supply only basis for the contractor to install.

Speak with Hamworthy Midtherm about your flue requirements and get peace of mind on your next project - guaranteed.

Tel: 0845 450 2867

Email: hamworthy@midtherm.co.uk

Flue Guide

Wessex ModuMax Boilers

Flue System for Individually Flued Single Boilers Only

The table below provides a guide to the maximum flue length allowed for each boiler **non-condensing** boiler.

Wessex ModuMax High Efficiency Non Condensing Boilers				
Boiler model	Flue diameter (mm)	Maximum flue length (m)	Equivalent length (m)	
			90° elbow	45° elbow
110/110he	100	15	1.5	1.2
110/220he	180	85	2.9	2.2
110/330he	180	35	2.9	2.2
160/160he	150	43	2.4	1.8
160/320he	250	180	4.4	3.4
160/480he	250	72	4.4	3.4
220/220he	150	28	2.4	1.8
220/440he	250	110	4.6	3.5
220/660he	250	44	4.6	3.5

The table below provides a guide to the maximum flue length allowed for each **condensing** boiler.

Wessex ModuMax Condensing Boilers				
Boiler model	Flue diameter (mm)	Maximum flue length (m)	Equivalent length (m)	
			90° elbow	45° elbow
100/100c	100	15	1.5	1.2
100/200c	180	101	2.8	2.1
100/300c	180	41	2.8	2.1
120/120c	100	15	1.5	1.2
120/240c	180	85	2.9	2.2
120/360c	180	35	2.9	2.2
150/150c	150	43	2.4	1.8
150/300c	250	163	4.4	3.4
150/450c	250	69	4.4	3.4
200/200c	150	22	2.4	1.8
200/400c	250	94	4.4	3.4
200/600c	250	36	4.4	3.4
250/250c	150	28	2.4	1.8
250/500c	250	110	4.6	3.5
250/750c	250	44	4.6	3.5

Open Flue

Wessex ModuMax boilers are designed for Type B23 open flue systems.

Type B - An appliance intended to be connected to a flue that evacuates the products of combustion to the outside of the room containing the appliance. The combustion air is drawn directly from the room.

Type B2 - A type B appliance without a draught diverter

Type B23 A type B2 appliance incorporating a fan upstream of the combustion chamber/heat exchanger.

For details of the full range of classifications refer to BSI publication PD CR 1749:2001.

Equivalent Length Components

For single, or individually flued multiple boilers, it is possible to select components from the Hamworthy Masterflue MF range of components, and design a flue system that has an overall length within the specified limits.

The maximum flue length is the sum of all the vertical and horizontal sections (A + B + C) plus the equivalent lengths of all the 90 degree and 45 degree elbows.

The tables to the left provide details of the flue system maximum lengths, and the equivalent lengths for the elbows.

Flue System for Multiple Boilers

Multiple boilers may be installed using a common flue header. For multiple boiler flue applications or where an existing flue system is to be used, please consult with our flue technical team for further advice.

Tel: 0845 450 2867

Email: hamworthy@midtherm.co.uk

NOTES

1. The figures shown in these tables are calculated for Hamworthy Masterflue MF components. As the flue coupled to these boilers will be pressurised and the flue gases wet, leading to running condensation within the flue, it is important that the flue components used are fully sealed and resistant to the aggression of condensate. Masterflue MF components are manufactured from acid resistant stainless steel and incorporate a tri-lip seal at the joints to provide leak free performance.
2. 45° And 90° bend are based on Hamworthy Masterflue MF slow radius components. Alternative bends and components will have differing performance characteristics leading to a final performance that does not match the details in the chart.
3. If the flue system intended is not covered by the details in the charts then contact Hamworthy Heating for advice. Using different sizes and diameters will effect the equivalent length of flue that may be used.



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Hamworthy reserves the right to make changes and improvements which may necessitate alteration to the specification without prior notice.

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