

Wessex ModuMax mk3

- Floor standing
- Condensing modular boiler
- Compact & lightweight
- 90°C maximum flow temperature

UP TO
40°C
ΔT



15 MODELS, OUTPUTS 97 - 762KW

up to
95%
Gross Seasonal
Efficiency

Nat Gas
LPG

up to
15:1
Turndown

10 Yr
Heat Exchanger
Warranty

ErP
Part L
Compliant

BIM
Objects

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Built on tradition, designed for today

The latest generation Wessex ModuMax boiler builds on a long heritage of 'Wessex' boilers designed, tested and manufactured in the UK.

This stainless steel, compact, modular boiler now operates with enhanced controls, up to 40°C differential temperature (ΔT) and maximum 90°C flow temperature.



Strong and reliable, matched for heat networks and energy centres

Choose from single module boilers and pre-assembled two or three high modules, in up to 15 combinations with output power options from 97kW to 762kW. The largest 3-high boiler can fit through a standard doorway or be split into modules for accessing rooftop, basement, city centre and packaged plantrooms.

Featuring a stainless steel heat exchanger for reliability and corrosion-resistance, as well as a 10 bar rating, makes it compatible with buildings of all shapes and sizes, old and new. Each Wessex ModuMax mk3 boiler can operate continuously at up to 40°C differential temperature (ΔT) and a

maximum flow temperature of 90°C. This maximises condensing operation and has been designed in direct response to the increased use of wider delta T in commercial buildings and district heating systems.

Using a modular boiler offers the benefits of high turndown ratios and load matching for improved efficiencies – delivering the right amount of heat at the right time with little or no wastage.

Suitable for sealed and open vented systems, the hydraulic installation can be fast tracked using factory manufactured pipework kits.

Key benefits



Close load matching for improved efficiencies



Advanced sequence control for up to 16 boiler modules



Small footprint - over 750kW from 1m² footprint



Fits through a standard doorway



10 bar maximum operating pressure



Wide differential temperature

Key features:

- ⊗ Floor standing condensing modular boiler
- ⊗ 15 models: 97, 116, 147, 196 & 254kW output single modules
- ⊗ Single boiler modules can be stacked two or three high up to 762kW output
- ⊗ Natural gas and LPG
- ⊗ Up to 15:1 turndown ratio
- ⊗ Up to 95% Gross Seasonal Efficiency
- ⊗ Stainless steel heat exchanger

Pipework kits (Page 8)

- ⊗ Two sizes of factory assembled pipework kits:
 - DN100 (97/116kW)
 - DN150 (147/196/254kW)
 - DN200 (147/196/254kW) – *by special order only*
- ⊗ Isolating butterfly valves for water flow and return connections on each boiler module with locking plates to prevent accidental isolation
- ⊗ Flow and return flexible connectors and tees
- ⊗ Drain valves
- ⊗ Flow and return header pipe assembly
- ⊗ Gas manifold (supplied loose), can be fitted for top or bottom supply connection
- ⊗ Blanking flanges, gaskets and bolts for header ends
- ⊗ Adjustable levelling feet

Controls (Page 16)

- ⊗ Built in advanced Navistem (Siemens LMS) controls as standard
- ⊗ Boiler sequencing cascade controller
- ⊗ Room & outside temperature sensors
- ⊗ LPB bus communications modules
- ⊗ Zone control
- ⊗ DHW cylinder sensor kit

Flues (Page 20)

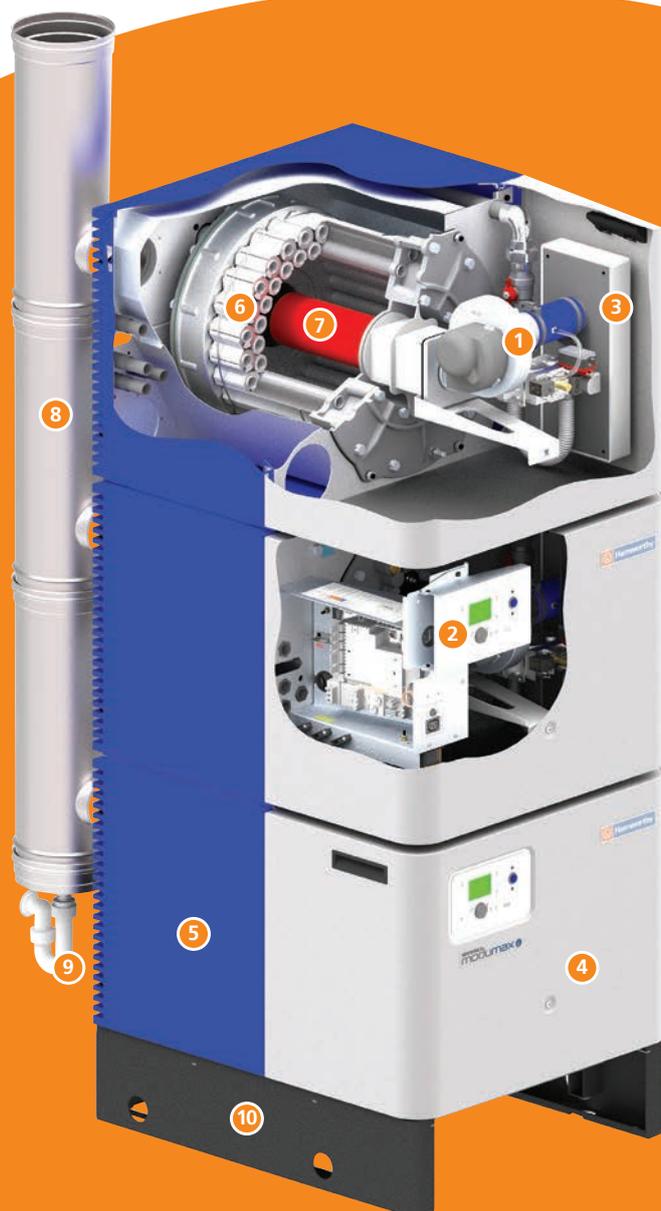
- ⊗ B23p open flue system

Service & Warranty (Page 30)

- ⊗ 10-year heat exchanger warranty
- ⊗ Range of service options
- ⊗ Commissioning

Anatomy of the Wessex ModuMax mk3

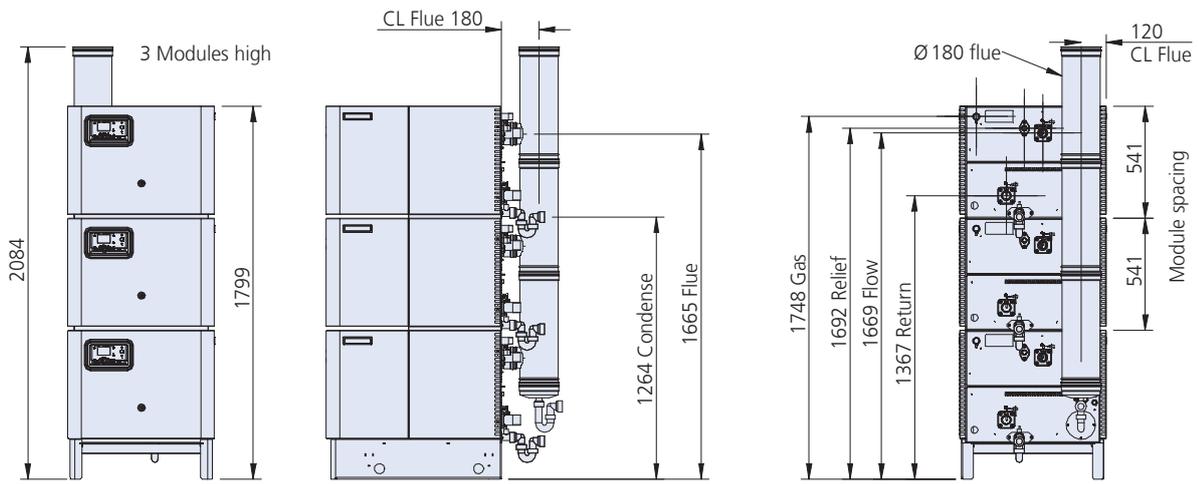
- ① Variable speed fan
- ② HMI inc. Siemens LMS Platform
- ③ Air intake filter
- ④ Removable front panel
- ⑤ Removable side panel
- ⑥ Stainless steel heat exchanger
- ⑦ Burner
- ⑧ Cascade flue
- ⑨ Flue condensate drain
- ⑩ Metal skid



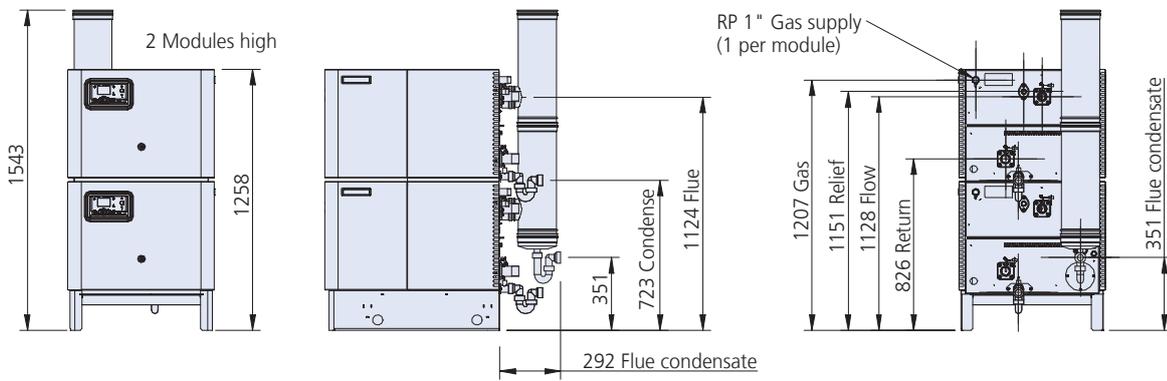
Technical data & dimensions

Models WM97/97H, WM 97/194V, WM97/291V, WM116/116H,
WM116/232V, WM116/348V
97 and 116kW modules

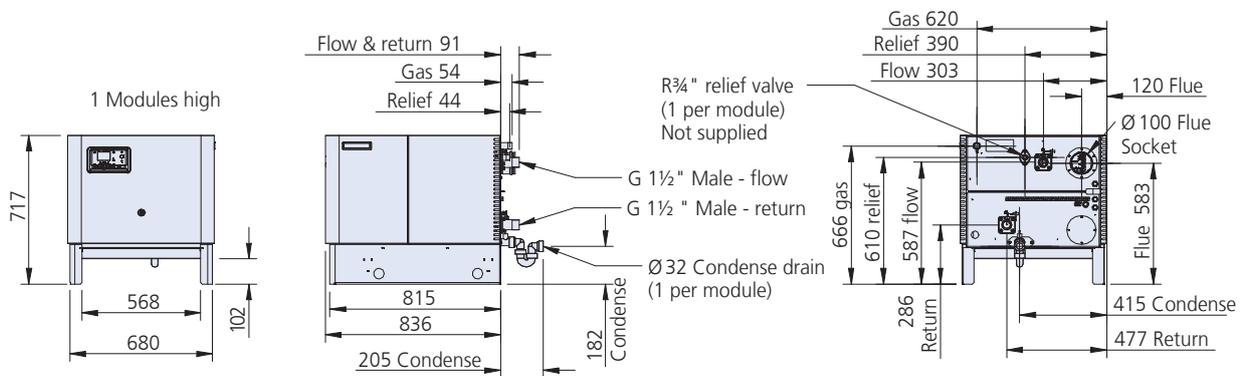
	Wessex ModuMax mk3 boiler model	Units	97/97H	97/194V	97/291V	116/116H	116/232V	116/348V
	No. of modules		1	2	3	1	2	3
Energy	Building regulations Part L seasonal efficiency	% gross	94.9	94.9	94.9	93.1	93.1	93.1
	BS EN 15502 seasonal efficiency	% gross	95.2	95.2	95.2	93.4	93.4	93.4
	Boiler output 80/60°C, NG & LPG	kW	95.7	191.4	287.1	115.2	230.4	345.6
	Boiler output 50/30°C, NG & LPG	kW	97.2	194.4	291.6	116.2	232.5	348.7
	Boiler input (gross) - maximum, NG	kW	109	218	327	133	266	399
	Boiler input (gross) - maximum, LPG	kW	106.7	213.4	320.1	130.2	260.4	390.5
	Boiler input (net) - maximum, NG & LPG	kW	98.2	196.4	294.6	119.8	239.6	359.4
	Boiler output - minimum 80/60°C, NG & LPG	kW	19.1	19.1	19.1	23.5	23.5	23.5
Water	Water content	litres	16	32	48	16	32	48
	System design flow rate @ 40°C ΔT rise	l/s	0.6	1.2	1.8	0.7	1.4	2.1
	Water side pressure loss @ 40°C ΔT rise	mbar	5	5	5	7	7	7
	System design flow rate @ 30°C ΔT rise	l/s	0.8	1.6	2.4	1	2	3
	Water side pressure loss @ 30°C ΔT rise	mbar	9	9	9	14	14	14
	System design flow rate @ 20°C ΔT rise	l/s	1.2	2.4	3.6	1.4	2.8	4.2
	Water side pressure loss @ 20°C ΔT rise	mbar	20	20	20	27	27	27
	System design flow rate @ 11°C ΔT rise	l/s	2.2	4.4	6.6	2.6	5.2	7.8
	Water side pressure loss @ 11°C ΔT rise	mbar	61	61	61	91	91	91
	Minimum water pressure	barg	Dependent on differential temperature – see page 25					
	Maximum water pressure	barg	10	10	10	10	10	10
Maximum flow temperature setting	°C	90	90	90	90	90	90	
Gas	Gas flow rate, NG (G20) - maximum	m³/hr	10.4	20.8	31.2	12.7	25.4	38.1
	Gas flow rate, LPG (G31) - maximum	m³/hr	4	8	12	5	10	15
	Nominal inlet pressure, NG (LPG) - maximum	mbar	20 (37)	20 (37)	20 (37)	20 (37)	20 (37)	20 (37)
	Maximum gas inlet pressure NG (LPG)	mbar	25 (45)	25 (45)	25 (45)	25 (45)	25 (45)	25 (45)
Flue	Approx. flue gas volume @ 15°C, 8.75-9.25% CO ₂	m³/hr	143	286	429	160	320	480
	Maximum flue gas temperature @ 80/60°C	°C	83	83	83	83	83	83
	Pressure at boiler flue connection	Pa	150	150	150	150	150	150
		mbar	1.5	1.5	1.5	1.5	1.5	1.5
Dry NOx emission (0% excess oxygen, dry air free) - NG	mg/kWh	39.8	39.8	39.8	34.3	34.3	34.3	
Dry NOx emission (0% excess oxygen, dry air free) - LPG	mg/kWh	42	42	42	57.3	57.3	57.3	
Connection	Water flow/return connections	inches	G1½" male	G1½" male	G1½" male	G1½" male	G1½" male	G1½" male
	Gas inlet connection pipe thread size	inches	R1" male	R1" male	R1" male	R1" male	R1" male	R1" male
	Nominal flue diameter (I/D)	mm	100	180	180	100	180	180
	Condensate trap connection(s) (O/D)	mm	32	32	32	32	32	32
Electrics	Electrical supply		230V 1Ph 50Hz	230V 1Ph 50Hz	230V 1Ph 50Hz	230V 1Ph 50Hz	230V 1Ph 50Hz	230V 1Ph 50Hz
	Power consumption - maximum boiler modulation	W	166	332	498	166	332	498
	Start current (per module)	Amp	1.2	1.2	1.2	1.2	1.2	1.2
	Run current (per module)	Amp	0.72	0.72	0.72	0.72	0.72	0.72
Approx shipping weight	kg	180	355	540	180	355	540	
Noise emission @1m @maximum modulation	Max dB (A)	60	60	60	60	60	60	
Noise emission @1m @minimum modulation	Min dB (A)	47	47	47	47	47	47	



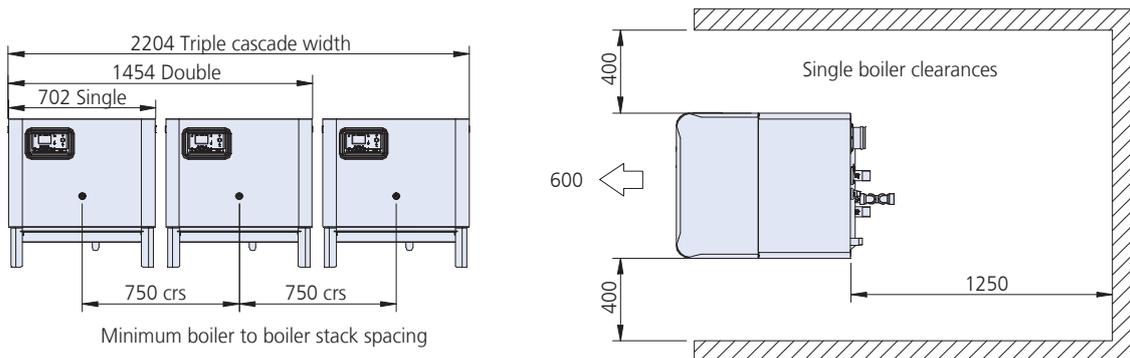
THREE HIGH MODEL



TWO HIGH MODEL



SINGLE MODULE



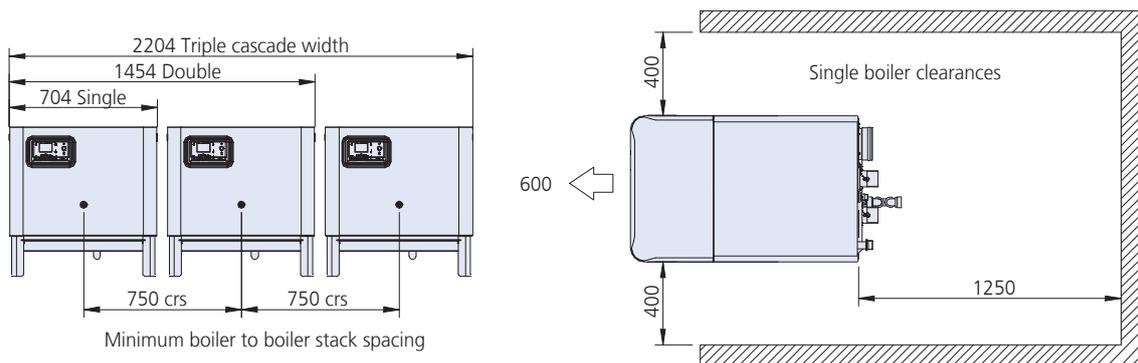
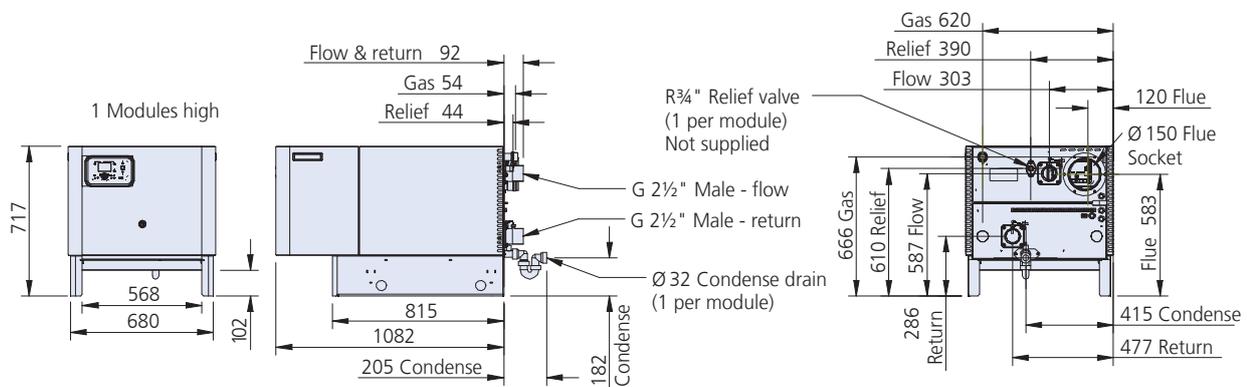
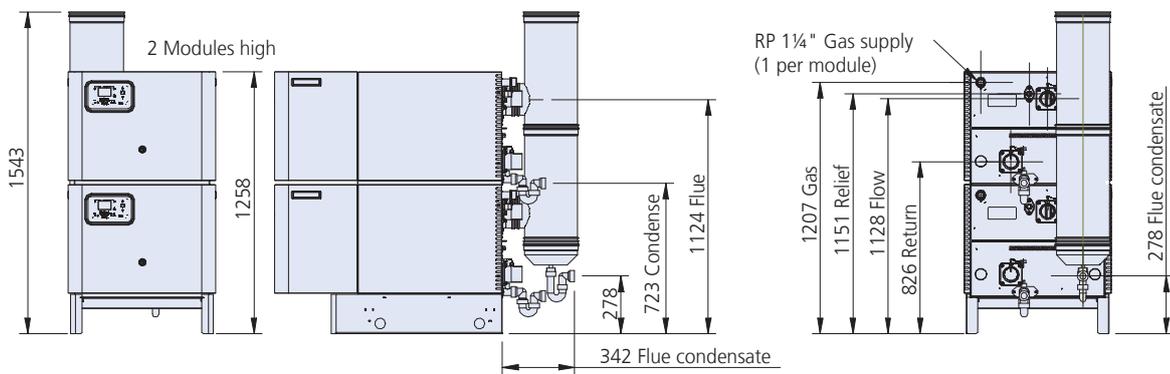
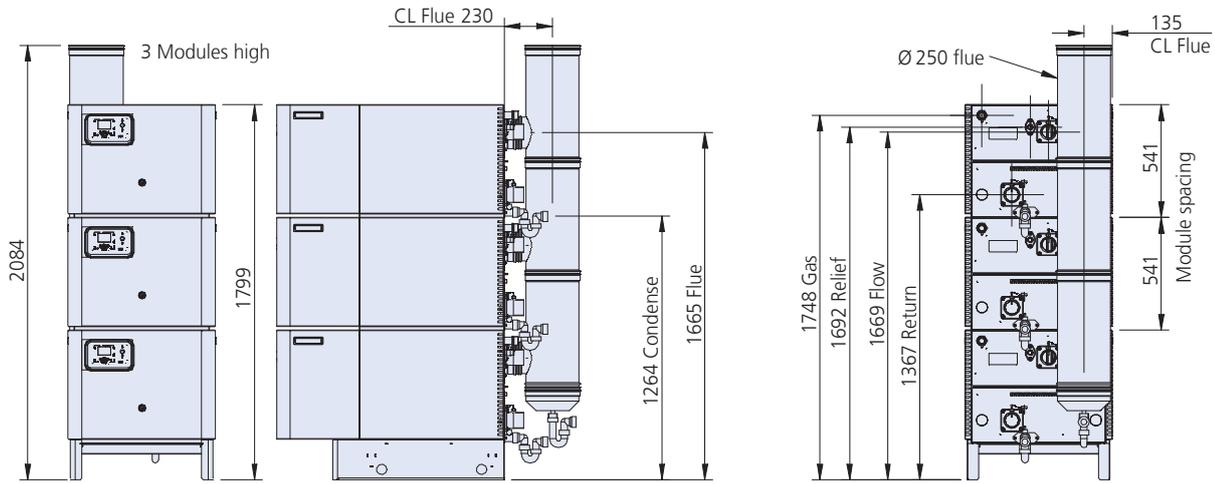
SPACING AND CLEARANCES

*Note: Rear clearance required when using Hamworthy pipe kits.
All dimensions in mm unless otherwise stated.

Technical data & dimensions

Models WM147/147H, WM147/294V, WM147/441V, WM196/196H, WM196/392V, WM196/588V, WM254/254H, WM254/508V, WM254/762V
147, 196 and 254kW modules

Wessex ModuMax mk3 boiler model		Units	147/147H	147/294V	147/441V	196/196H	196/392V	196/588V	254/254H	254/508V	254/762V	
No. of modules			1	2	3	1	2	3	1	2	3	
Energy	Building regulations Part L seasonal efficiency	% gross	94.8	94.8	94.8	93.9	93.9	93.9	95.0	95.0	95.0	
	BS EN 15502 seasonal efficiency	% gross	95.2	95.2	95.2	94.1	94.1	94.1	95.3	95.3	95.3	
	Boiler output 80/60°C, NG & LPG	kW	142.8	285.6	428.4	191.6	383.2	574.8	239.8	479.6	719.4	
	Boiler output 50/30°C, NG & LPG	kW	147.4	294.8	442.2	196.3	392.6	588.9	254.4	508.7	763.1	
	Boiler input (gross) - maximum, NG	kW	163	326	489	219	428.7	657	275	550	825	
	Boiler input (gross) - maximum, LPG	kW	159.5	319.1	478.6	214.4	428.7	643.1	269.2	538.3	807.5	
	Boiler input (nett) - maximum, NG & LPG	kW	146.8	293.6	440.3	197.2	394.4	591.6	247.6	495.3	742.9	
	Boiler output - minimum 80/60°C, NG & LPG	kW	28.7	28.7	28.7	38.6	38.6	38.6	48.4	48.4	48.4	
Water	Water content	litres	22	44	66	22	44	66	22	44	66	
	System design flow rate @ 40°C ΔT rise	l/s	0.9	1.8	2.7	1.2	2.4	3.6	1.5	3	4.5	
	Water side pressure loss @ 40°C ΔT rise	mbar	36	36	36	62	62	62	100	100	100	
	System design flow rate @ 30°C ΔT rise	l/s	1.2	2.4	3.6	1.6	3.2	4.8	2	4	6	
	Water side pressure loss @ 30°C ΔT rise	mbar	60	60	60	120	120	120	180	180	180	
	System design flow rate @ 20°C ΔT rise	l/s	1.8	3.6	5.4	2.4	4.8	7.2	3	6	9	
	Water side pressure loss @ 20°C ΔT rise	mbar	145	145	145	246	246	246	395	395	395	
	System design flow rate @ 11°C ΔT rise	l/s	3.3	6.6	9.9	4.3	8.6	12.9	5.4	10.8	16.2	
	Water side pressure loss @ 11°C ΔT rise	mbar	500	500	500	850	850	850	1300	1300	1300	
	Minimum water pressure	barg	Dependent on differential temperature – see page 25									
	Maximum water pressure	barg	10	10	10	10	10	10	10	10	10	
	Maximum flow temperature setting	°C	90	90	90	90	90	90	90	90	90	
Gas	Gas flow rate, NG (G20) - maximum	m ³ /hr	15.5	31	46.5	20.9	41.8	62.7	26.2	52.4	78.6	
	Gas flow rate, LPG (G31) - maximum	m ³ /hr	6	12	18	8.1	16.2	24.3	10.1	20.2	30.3	
	Nominal inlet pressure, NG (LPG) - maximum	mbar	20 (37)	20 (37)	20 (37)	20 (37)	20 (37)	20 (37)	20 (37)	20 (37)	20 (37)	
	Maximum gas inlet pressure NG (LPG)	mbar	25 (45)	25 (45)	25 (45)	25 (45)	25 (45)	25 (45)	25 (45)	25 (45)	25 (45)	
Flue	Approx. flue gas volume @ 15°C, 8.75-9.25% CO ₂	m ³ /hr	214	428	642	279	558	837	354	708	1062	
	Maximum flue gas temperature @ 80/60°C	°C	78	78	78	83	83	83	82	82	82	
	Pressure at boiler flue connection	Pa mbar	150 1.5	150 1.5	150 1.5	150 1.5	150 1.5	150 1.5	150 1.5	150 1.5	150 1.5	
	Dry NO _x emission (0% excess oxygen, dry air free) - NG	mg/kWh	37.7	37.7	37.7	39.9	39.9	39.9	38.8	38.8	38.8	
	Dry NO _x emission (0% excess oxygen, dry air free) - LPG	mg/kWh	69.3	69.3	69.3	68.6	68.6	68.6	39.9	39.9	39.9	
Connection	Water flow/return connections	inches	G2½" male	G2½" male	G2½" male	G2½" male	G2½" male	G2½" male	G2½" male	G2½" male	G2½" male	
	Gas inlet connection pipe thread size	inches	R1¼" male	R1¼" male	R1¼" male	R1¼" male	R1¼" male	R1¼" male	R1¼" male	R1¼" male	R1¼" male	
	Nominal flue diameter (I/D)	mm	150	250	250	150	250	250	150	250	250	
	Condensate trap connection(s) (O/D)	mm	32	32	32	32	32	32	32	32	32	
Electrics	Electrical supply		230V 1Ph 50Hz	230V 1Ph 50Hz	230V 1Ph 50Hz	230V 1Ph 50Hz	230V 1Ph 50Hz	230V 1Ph 50Hz	230V 1Ph 50Hz	230V 1Ph 50Hz	230V 1Ph 50Hz	
	Power consumption - maximum boiler modulation	W	240	480	720	240	480	720	240	480	720	
	Start current (per module)	Amp	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	
	Run current (per module)	Amp	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	
	Approx shipping weight	kg	226	452	678	226	452	678	226	452	678	
Noise emission @1m @maximum modulation	Max dB (A)	65	65	65	65	65	65	65	65	65		
Noise emission @1m @minimum modulation	Min dB (A)	47	47	47	47	47	47	47	47	47		



*Note: Rear clearance required when using Hamworthy pipe kits.
All dimensions in mm unless otherwise stated.

Pipe kit details & dimensions

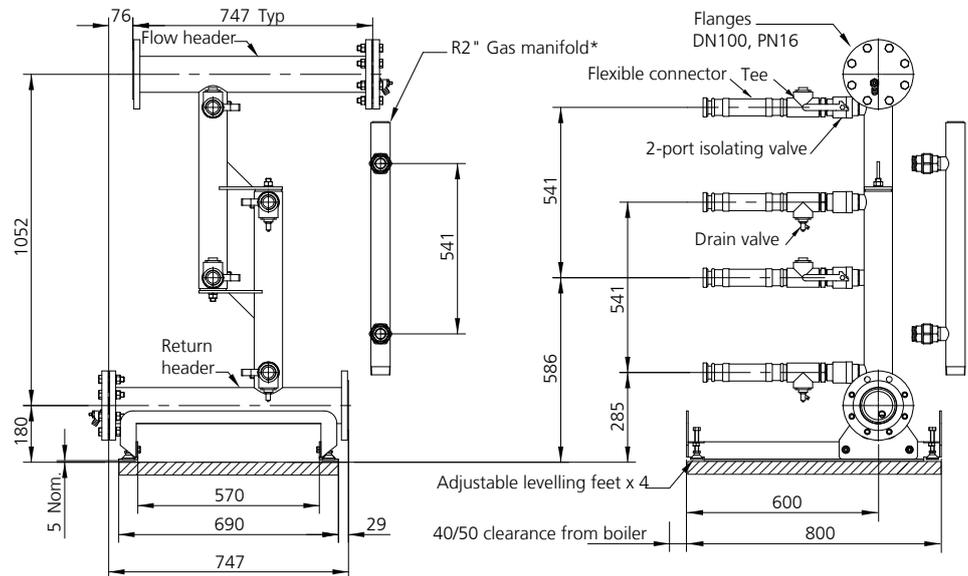
Models - WM97/194V, WM116/232V, WM97/291V, WM116/348V
100mm dia. headers for 2 and 3 high stacked **97 or 116kW modules**.
For max number of modules on a header see page 10.

Designed to save time and simplify procurement, optional pipe kits are available for the Wessex ModuMax mk3. The kits enable multiple boilers to be connected in configurations of 2 and 3 modules. The pipe kits are factory tested and supplied part assembled for ease of installation.

Wessex ModuMax mk3 boiler model	No of modules	Pipe kit weight approx (kg)
WM97/194V	2	116
WM116/232V	2	116
WM97/291V	3	160
WM116/348V	3	160

2-High Pipe Kits with 100mm dia. headers for Wessex ModuMax mk3 models:
-WM97/194V
-WM116/232V

Note: All dimensions in mm unless otherwise stated.



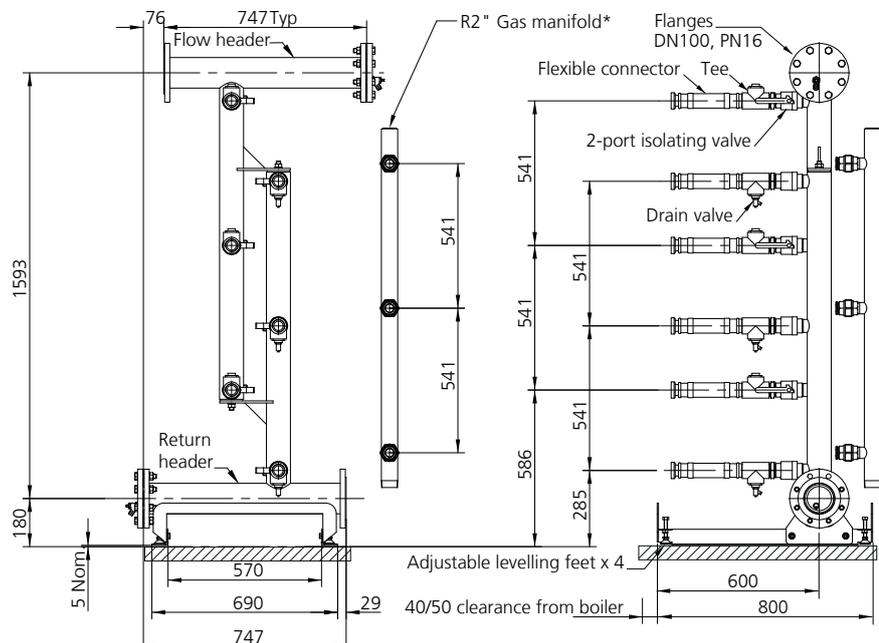
Pre-assembled pipe kits include:

- ⊗ Isolating quarter-turn ball valves with operating handles for water flow and return connections on each boiler module
- ⊗ Flow and return flexible connectors and tees
- ⊗ Drain valves
- ⊗ Flow and return header pipe assembly
- ⊗ Gas manifold (supplied loose) can be fitted for top or bottom supply connection
- ⊗ Blanking flanges, gaskets and bolts for header ends
- ⊗ Adjustable levelling feet

3-High Pipe Kits with 100mm dia. headers for Wessex ModuMax mk3 models:
-WM97/291V
-WM116/348V

Note: All dimensions in mm unless otherwise stated.

*Gas manifolds supplied loose. Supply can be connected to the top or bottom of the manifold.



Pipe kit details & dimensions

Models - WM147/294V, WM196/392V, WM254/508V, WM147/441V, WM196/588V, WM254/762V

150mm dia. headers for 2 and 3 high stacked **147, 196 or 254kW modules**.
For max number of modules on a header see page 10.

Wessex ModuMax mk3 boiler model	No of modules	Pipe kit weight approx (kg)
WM147/348V	2	192
WM196/392V	2	192
WM254/508V	2	192
WM147/441V	3	233
WM196/588V	3	233
WM254/762V	3	233

Note: 200mm dia. header pipe kits also available for 147kW, 196kW or 254kW modules (special order—dimensions and details on request).

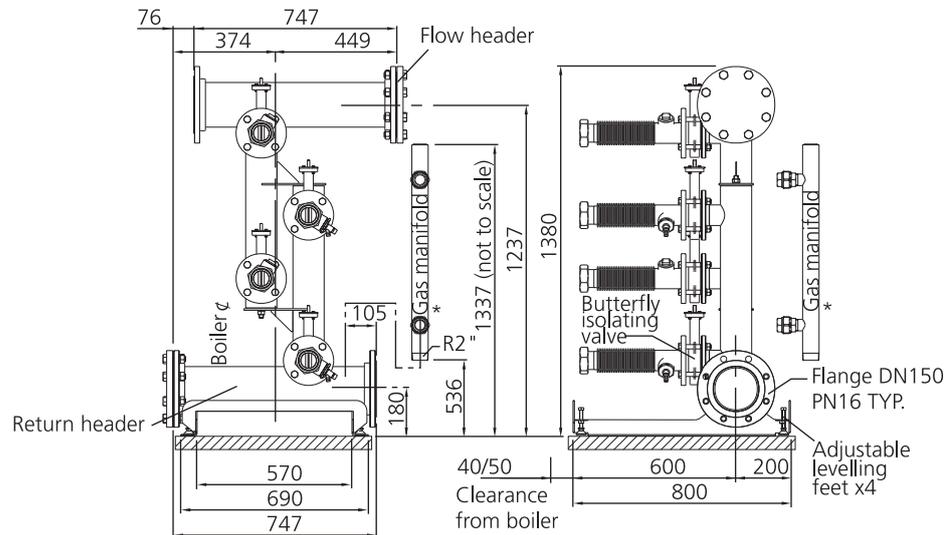
2-High Pipe Kits with 150mm dia. headers for Wessex ModuMax mk3 models:

WM147/294V

WM196/392V

WM254/508V

Note: All dimensions in mm unless otherwise stated.



Pre-assembled pipe kits include:

- ⊗ Isolating butterfly valves for water flow and return connections on each boiler module with locking plates to prevent accidental isolation
- ⊗ Flow and return flexible connectors and tees
- ⊗ Drain valves
- ⊗ Flow and return header pipe assembly
- ⊗ Gas manifold (supplied loose) can be fitted for top or bottom supply connection
- ⊗ Blanking flanges, gaskets and bolts for header ends
- ⊗ Adjustable levelling feet

3-High Pipe Kits with 150mm dia. headers for Wessex ModuMax mk3 models:

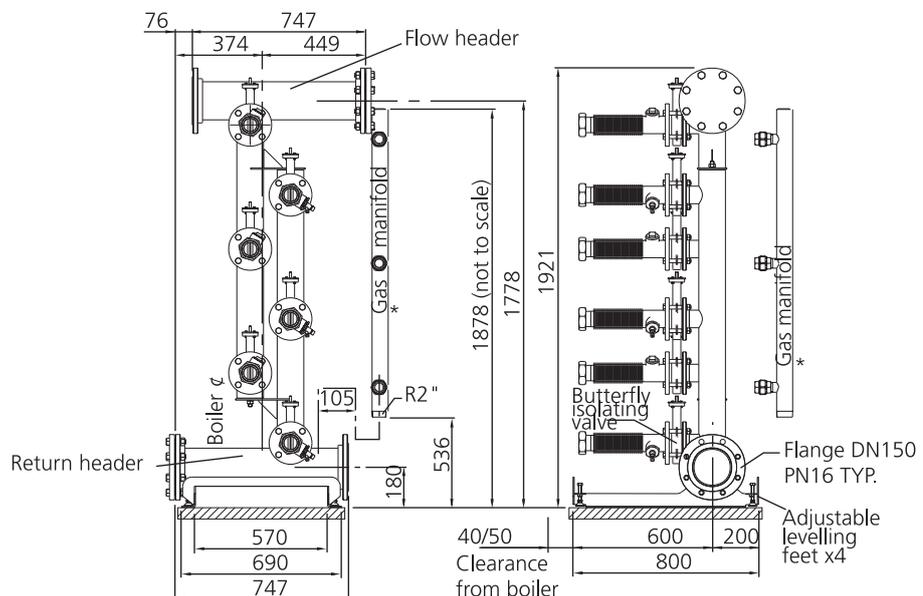
WM147/441V

WM196/588V

WM254/762V

Note: All dimensions in mm unless otherwise stated.

*Gas manifolds supplied loose. Supply can be connected to the top or bottom of the manifold.



Pipe kits

Maximum number of boiler modules on a single hydraulic header

There is a limit to the number of boiler modules that can be combined on a single hydraulic header, as this is the function of the hydraulic header diameter and design temperature rise across the boiler.

Pipe kit header diameter (mm)	Module output (kW)	Maximum number of boiler modules at			
		11°C ΔT	20°C ΔT	30°C ΔT	40°C ΔT
100	97	7	13	20	26
	116	6	11	17	21
150	147	11	20	31	38
	196	8	15	23	28
200	254	6	12	18	22
	147	19	35	53	66
	196	14	26	40	50
	254	11	21	32	38



Electrical connections

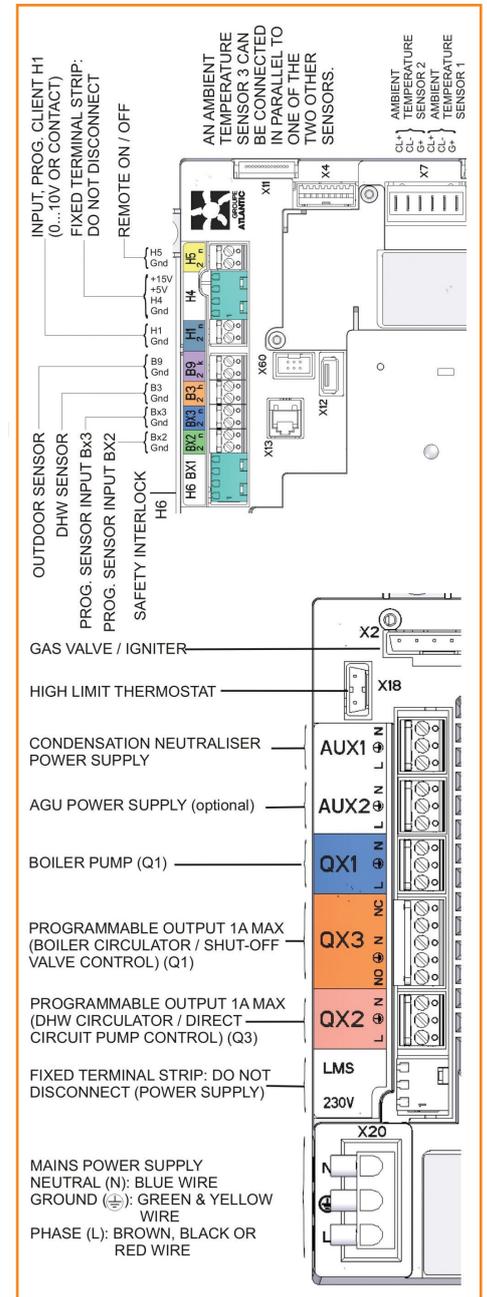
Connections to boiler

Low voltage connections

Terminal reference	Function	Electrical	Max load
H5	Remote On/Off (vfc switch)	24V DC	
H4	Not for customer use		
H1	Programmable input for: 1. 0-10V analogue signal 2. Remote enable switch/time clock (vfc switch)	0-10V 24V DC	
B9	Input for outside air temperature sensor	Resistance input	
B3	Programmable input for DHW temperature: 1. QAZ36 DHW sensor kit input 2. Mechanical thermostat input (vfc switch)	Resistance input 24V DC	
BX3	Programmable input - spare		
BX2	Programmable input for: 1. Common flow sensor for master/slave sequence control (Master boiler only)	Resistance input	
BX1	Not for customer use		
H6	Safety interlock	5V DC	

High voltage connections

Terminal reference	Function	Electrical	Max load
AUX1	Power supply to condensate neutraliser where fitted	230v 50Hz 1Ph	1 Amp
AUX2	Power supply to optional controls kit for: 1. Optional volt free contacts (run and fault signal) 2. Optional heating circuit control kits	230v 50Hz 1Ph	
QX1	Programmable power supply for either: 1. Alarm - common fault 2. Non-Hamworthy boiler shunt pump/circulator	230v 50Hz 1Ph	1 Amp
QX3	Programmable power supply for either: 1. Boiler shut off valve 2. Non-Hamworthy boiler shunt pump/circulator 3. Direct uncompensated heating circuit pump	230v 50Hz 1Ph	
QX2	Programmable power supply for either: 1. DHW pump/circulator 2. Direct uncompensated heating circuit pump	230v 50Hz 1Ph	
LMS 230V	Not for customer use		
L N E	Main power supply	230v 50Hz 1Ph	6.3 Amp



Electrical connections

There are three dedicated electrical conduit connections at the rear left hand side of each boiler module to accept cables for power supply and controls. These conduits are routed through the casing to the control panel located at the front of the boiler. Cables carrying mains voltage (230V 50Hz 1Ph) for electrical supply and pump outputs should be routed via a separate conduit to low voltage cables serving sensors and enable circuits.

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

Specification

Heat exchanger (1)

All Wessex ModuMax mk3 boilers have a highly efficient cylindrical heat exchanger. The heat exchanger is a multi-pass finned tube arrangement in which the tubes run parallel to the axis of the cylindrical burner. The finned tubes are made of high quality stainless steel to withstand the corrosive nature of the condensate.

The tubes are expanded at each end into cast iron tube plates, finished with a corrosion-resistant coating, impervious to condensate. These plates divert the flow of the boiler return water smoothly from one tube set to the next, so that the water effectively passes along the length of the burner several times before being output from the boiler.

The relatively large 22 mm 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. This makes the Wessex ModuMax mk3 ideal for refurbishment projects, being tolerant of existing heating systems.

Burner (2)

A cylindrical burner is positioned centrally within the primary heat exchanger and is constructed using a 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 NO_x emissions.

A test point is provided for measuring burner pressure to assist in servicing.

Differential temperature supervision

Wessex ModuMax mk3 boilers are suitable for installation within heating systems operating with differential temperatures up to 40°C. Actual differential temperature across the boiler is dependent on flow rate, higher flow rates result in lower differential temperature.

Differential temperature supervision, supplied as standard, protects the boiler from operating should the flow rate become too low. Site conditions such as pump failures, blocked strainers or malfunctioning motorised valves can result in poor flow rates.

Using integral flow and return temperature sensors, the boiler control monitors differential temperature and reacts by reducing burner modulation and then turning off as the boiler exceeds 40°C differential temperature.

For systems, designed to operate at lower differential temperature, e.g. 20°C, a higher initial flow rate will exist.

Poor flow conditions are subject to the same differential temperature control regime ensuring the boiler does not operate outside of specification.

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 mk3 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.

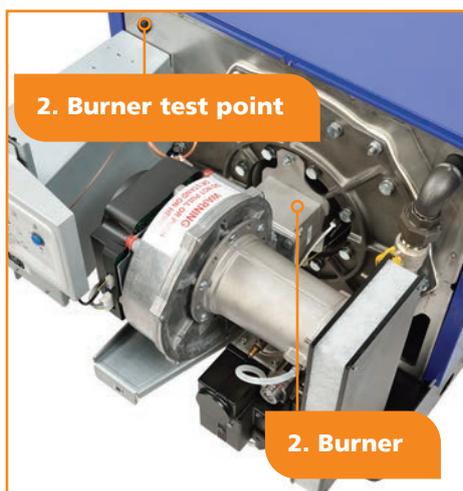
The gas train

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.

Safety features include a low gas pressure switch and an air pressure switch. These switch off the boiler and raise a blockage alarm in the event of a gas or air supply pressure fault.

Air inlet filter (3)

Combustion air drawn from the plantroom passes through an air inlet filter ensuring particle free clean combustion. The trapped dirt is highly visible allowing fast assessment of whether maintenance is required and the filter is far easier to clean than if dirt was allowed to clog the burner.



Water system

The Wessex ModuMax mk3 is designed for a maximum working pressure of 10 bar. Each module is supplied with a connection for fitting a safety pressure 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.

Low water content

The low water content enables the Wessex ModuMax mk3 range of boilers to provide rapid response to demand for heat, whilst the modulation responds to closely match the load. This saves energy and reduces the number of firing operations, which saves wear and tear on the boiler.

Remote signalling

Optional volt free contacts are available to indicate common fault and normal run. The contacts are BMS compatible and allow remote monitoring of boiler operating status.

One volt free contact kit must be specified per boiler module, e.g. for a Wessex ModuMax mk3, 3-high stacked boiler, 3 volt free contact kits should be specified.

Temperature control (4)

Wessex ModuMax mk3 boilers can operate independently using their integral temperature control. Flow temperature is monitored using an electronic flow temperature sensor with a corresponding maximum set point of 90°C. The boiler control will modulate the burner set point back as the temperature set point is approached for near continuous operation with minimum cycling.

The boiler control can also be configured to receive a 0-10 volt analogue BMS signal to define either the temperature set point up to the maximum 90°C, or the burner load setting up to the maximum 100% output.

Each boiler is additionally fitted with a manual reset high limit thermostat factory set to 95°C but which can be set up to a maximum of 110°C dependent on application.

When setting the boilers to operate above 83°C, it is important to ensure adequate system pressure.

Condensate discharge (5)

Due to the high thermal efficiency of all Wessex ModuMax mk3 boilers, condensation will occur within the boiler casing during firing from start-up and in low load conditions, as well as 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, and to the base of the boiler flue riser supplied with each two modules high, or three modules high, boiler stack.

Refer to pages 20 and 25 for condensate drain piping details.

Open flue system (6)

Each boiler module combination is designed for direct connection to a flue system. The two-module and three-module boiler stacks are supplied with a separate close-coupled vertical flue header to connect each module's flue spigot to a common outlet, and includes a condensate trap at the lowest point in the header.

The outlets from more than one boiler or boiler stack 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.

Refer to pages 20-21 for further details on the flue system.

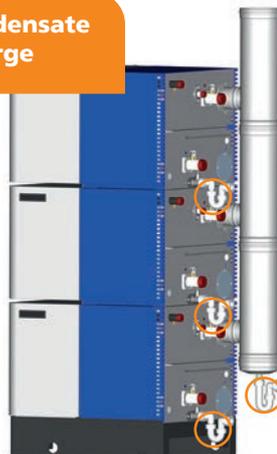
Flue gas non return valves

An integrated flue gas non return valve is located between the burner and fan. This is to prevent any possibility of flue gas recirculating through non firing modules in a multiple boiler configuration, making it easier to install with common flue headers whilst reducing height requirements above the boiler.

4. Temperature controls



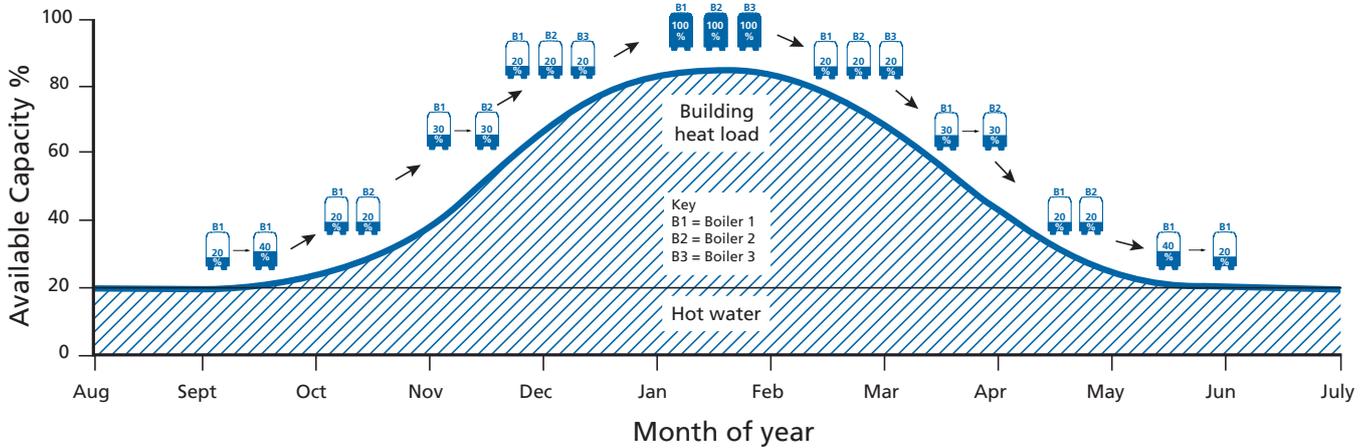
5. Condensate discharge



6. Flue header



Energy and load matching



The overall efficiency of a multiple boiler plant depends on how close its total output can be controlled to match the load profile of the building. Therefore, it is a really important aspect of product selection.

Why match plant output to load?

Matching the building's heat load enables you to deliver the right amount of heat at the right time with little or no wastage. A commercial heating system is designed to match the peak load to heat a building up to full temperature within a short period of time. This requires a large load from the heat source; the boilers. However, most of the time the boilers will be working at much lower loads. The trick is to match both, peak loads and low loads without oversizing the boiler and wasting energy. And to do this, you need a system with a large turndown ratio.

Turning it down

Let's look at turndown ratios. Turndown ratio refers to the width of the operational range of the boiler and is defined as the ratio of the maximum capacity to minimum capacity.

In a typical modular boiler system, each module could have a turndown ratio of 5 to 1. So, a vertical stack of 3 modules will have 15 to 1 turndown. This gives you a substantial range of outputs.

Wessex ModuMax mk3 – turndown

- ⤷ A Wessex WM254H module has a 5:1 turndown ratio & can deliver energy from 48kW to 254kW.
- ⤷ A 3-high stack Wessex WM254/762V has a 15:1 turndown & can deliver energy from 48kW to 762kW.

up to
15:1
Turndown

It's about how you drive it

Just like your car, a boiler needs to be driven correctly to achieve high operating efficiencies and close load matching. A good boiler sequence controller will help control the boilers in the most efficient way. The Wessex ModuMax mk3 boiler has one built in, but for larger sites the Merley sequence controller can be used (see pages 16-19 for control options).



Saving fuel, money and the environment

Accurate load matching ensures you only use the fuel you need. This saves you money and reduces carbon emissions. And depending on the size of the project, these savings can be quite considerable.

Large vs small

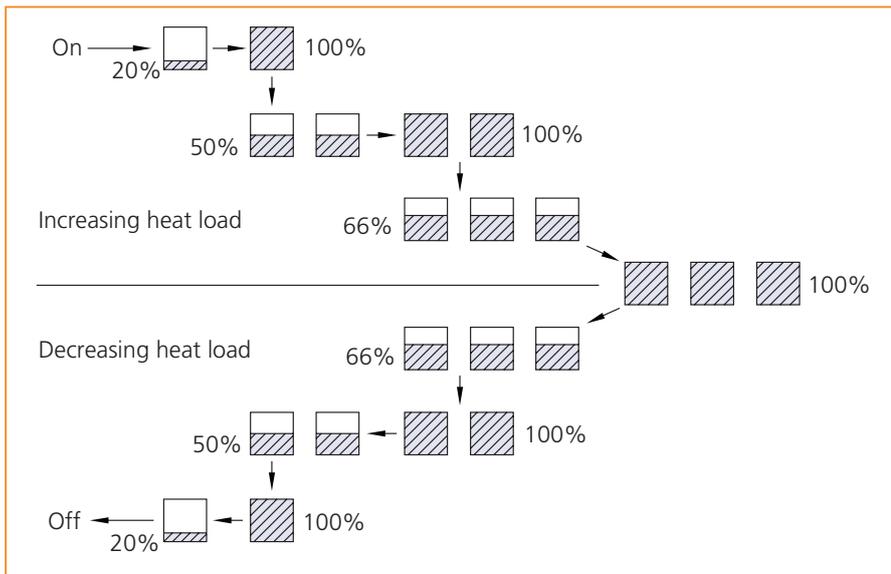
But have you also considered the impact of replacing one large output single boiler with multiple smaller output modular boilers? The differences in gas use for the right application can be huge.

A large boiler will have to fully heat up regardless of how much heat is actually needed by the system. Whereas smaller modules can be setup to come on at low modulation, or only one module out of the system may need to fire up to meet the demand. Plus, smaller modules will get to temperature quicker than a large boiler due to a lower water content.

Boiler sequence control strategies

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. Maintains the lowest number of boiler modules in operation for a given heat load.



Option 1 is to install a dedicated primary circuit pump (not HHL supply) serving the flow requirements of all boilers with flow being present through both firing and non-firing boiler modules. Controlled from the Master boiler via a suitable contactor (not HHL supply) the primary circuit pump should be set for constant flow ensuring correct flow for each module. The primary pump will operate for the full duration of heat demand across all boilers and is provided with a 5 minute overrun period. Reverse return flow and return pipework is required with this arrangement.

This arrangement is beneficial when there is insufficient space to install dedicated boiler module shunt pumps and where an existing pump might be suitable for re-use.

Option 2 is to install dedicated boiler shunt pumps (not HHL supply, unless using Hamworthy pipework kits) in the return connection to each boiler module to isolate flow when the boiler module is not firing. Individual boiler pumps are wired to and controlled from their respective boiler module and provided with a 5 minute overrun period. A suitable pump contactor (not HHL supply) should be fitted between the individual boiler module and its pump. Reverse return flow and return pipework is not necessary with this arrangement.

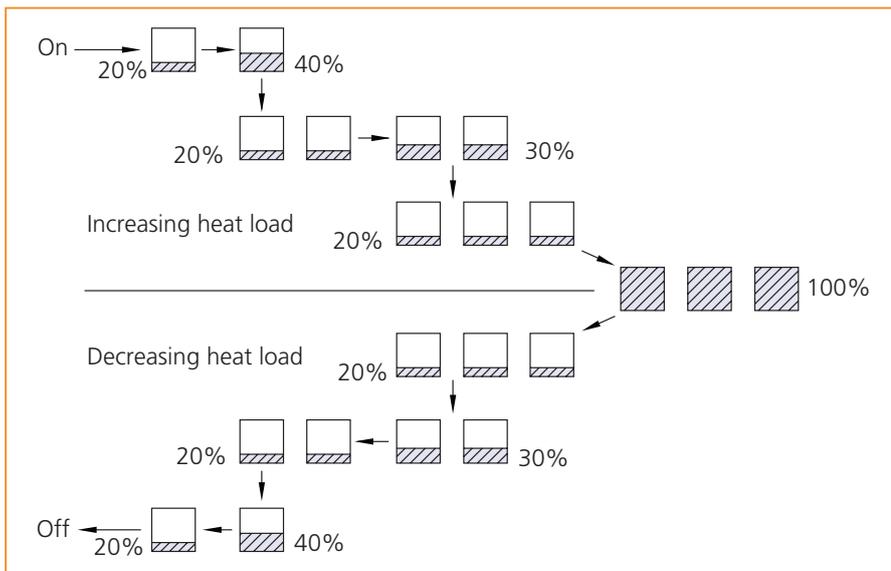
This arrangement offers the benefit of reduced energy consumption for pumping as well as increased standby capacity should one pump fail. There will be increased requirements for electrical supplies and controls wiring with this arrangement.

Option 3 is to install a motorised isolation valve in the return connection to each boiler module to isolate flow when the boiler module is not firing. Individual motorised valves are wired to and controlled from their respective boiler module and provided with a 5 minute overrun period. Motorised valves can be motor open, motor close, or motor open, spring return.

This arrangement requires reverse return flow and return pipework and a dedicated primary circuit pump set for constant pressure allowing the pump to modulate according to the number of boiler modules on line at any time contributing to energy savings. There will be increased requirements for electrical supplies and controls wiring with this arrangement.

Unison control

Steps each boiler module on at its lowest rate until all boiler modules are firing and then modulates all boilers 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 efficiency of the boiler at lower firing rates.



Pump and motorised isolating valve control

Wessex ModuMax mk3 boilers can be installed using pumping solutions that best match the system design requirements. It is recommended to install the boilers within a dedicated primary circuit having a low loss header to ensure adequate boiler flow regardless of flow conditions within the secondary circuits.

Controls for single boilers

Single boilers may be used in a variety of situations, often smaller premises without sophisticated controls such as Building Management Systems. Wessex ModuMax mk3 is perfectly suited to such installations having a control system that's expandable from very basic integral time clock control with fixed temperature operation all the way up to controlling multiple zone systems with full inside/outside temperature compensation and optimised time programming. Control functions available as standard (no optional extras):

- ⊗ Time control with 3 programs per day
- ⊗ Fixed flow temperature control
- ⊗ Boiler shunt pump control (pump contactor required to suit electrical load of pump – not HHL supply)
- ⊗ 5 minute over run for shunt pump
- ⊗ Pump kick for shunt pump to help prevent seizure
- ⊗ Frost protection based on water temperature, 5°C fixed set point

Optional heating circuit control kit

Up to 3 independent heating circuits incorporating mixing valves is possible with each circuit operating with a different flow and room temperature requirement to the other circuits. The boiler generates flow water to the highest zone temperature requirement whilst the other zones use mixing valve control to reduce flow temperature into their respective circuits. This allows heating to be maintained throughout any demand and domestic hot water requirement.

An optional heating circuit kit must be fitted to the boiler comprising a clip in controls module AGU2.550A109 which the circuit flow temperature sensor, mixing valve and pump are all wired to. Pumps must be connected via a suitably rated contactor – (not HHL supply).

Optional heating circuit control kits:

- Single heating circuit - Part number 563605668
- Two heating circuits - Part number 563605669
- Three heating circuits - Part number 563605670

Boiler capacity for optional clip in controls

Each boiler only has the capacity for three optional clip in control kits. If remote fault and run signalling using the optional volt free contact kit is required this will use up one of the optional clip in kit locations. In such instances only 2 optional heating circuit control kits may be fitted.

- ① Navistem control panel
- ② Navistem controller
- ③ Optional AGU2.5 clip-in extension modules
- ④ Location for optional OCI 345 LPB bus interface unit
- ⑤ Additional location for an AGU2.5 clip-in extension module

Optional outside air temperature sensor - QAC34

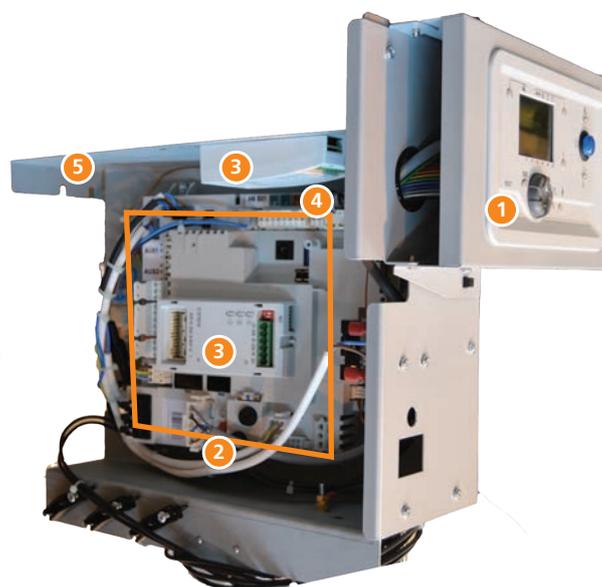
It is always recommended to fit an outside air temperature sensor allowing enhanced frost protection for protection of both the building infrastructure and the boiler plant. The sensor should be located on a north facing wall. Control functions available with outside air temperature sensor fitted:

- ⊗ **2 Stage frost protection** – based on water temperature and outside air temperature.
- ⊗ **Stage 1** – Air temperature: starts circulation pumps to move heat around the circuit from within the building protecting the plantroom.
- ⊗ **Stage 2** – Water temperature: starts the boiler to prevent water within the system freezing.
- ⊗ **Summer shutdown** - Stops boiler operation when outside temperature reaches a predetermined set-point.
- ⊗ **Adaptable weather compensation** - Matches boiler flow temperature to building thermal dynamics as outside air temperature fluctuates up and down.

Part number 533901457

Optional room temperature sensors

Each heating circuit can be equipped with an independent room temperature sensor. There are two types of room sensor, a fully **programmable room sensor QAA75**, and an **offset adjustable room sensor QAA55**. When a room temperature sensor is fitted enhanced control of the heating circuits can be achieved based on both internal and outside air temperatures. This could for instance compensate for an unexpected higher internal air temperature allowing the heating system to start later and at a lower flow temperature saving energy.



Optional programmable room sensor - QAA75

This communicates with the boiler and allows full adjustment of the room temperature, time clock, holiday periods and frost protection settings. The unit also displays fault codes from the boiler plant.

- ⊗ 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

Part number 533901587



Optional offset adjustable room sensor - QAA55

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

- ⊗ Setting the operating mode between automatic operation, continuous operation comfort or night setback temperature, off with frost protection active
- ⊗ Setting a temporary off condition during an un-programmed non occupancy period that will reset automatically according to following program settings
- ⊗ Programmable lock to prevent tampering.

Part number 533901589

Optional domestic hot water control

A single domestic hot water cylinder (calorifier) may be controlled from the boiler. Energy loading of the cylinder is achieved by starting and stopping the pump to the cylinder coil. Internal temperature sensing for the stored domestic hot water is achieved by either fitting the cylinder with an optional domestic hot water kit (temperature sensor QAZ36 and pocket) or the boiler can be configured to receive a Normally Open/Normally Closed signal from a standard cylinder thermostat. The high limit thermostat for the cylinder must also be wired to ensure the boiler energy supply is isolated from the cylinder in the event of the high limit thermostat setting being reached.

Controls option	Part number
Outside air temperature - QAC34	533901457
Domestic hot water sensor kit (sensor and pocket) - QAZ36	563605674
Volt free contact kit for remote signalling status - AGU2.55A109	563605666
Mixing valve heating circuit control kit (clip in module, temperature sensor and pocket) for 1 zone	563605668
Mixing valve heating circuit control kit (clip in module, temperature sensor and pocket) for 2 zones	563605669
Mixing valve heating circuit control kit (clip in module, temperature sensor and pocket) for 3 zones	563605670
Note: Cannot be used in conjunction with volt free contact kit	
Programmable room sensor QAA75	533901587
Offset adjustable room sensor QAA55	533901589

Remote start stop

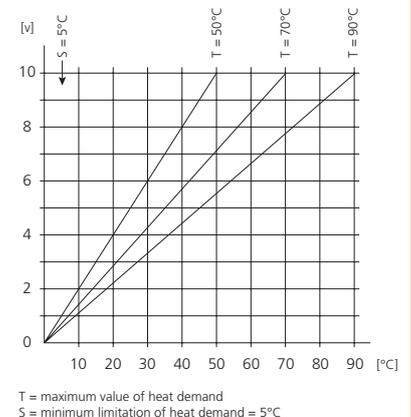
Each boiler is equipped with a remote start stop circuit. On receiving a start signal from, for instance, an outside time clock the boiler will operate according to its internal temperature management program. This level of control simply overrides the boilers internal time clock program. The boiler may still be equipped with optional controls including an outside air temperature sensor, room temperature sensors and individual heating zone controls whilst controlling also domestic hot water cylinder using the control options detailed above.

BMS control

All Wessex ModuMax mk3 boilers may be controlled with more sophisticated controls such as Building Management Systems (BMS) using the 0-10 volt analogue input which can be configured for temperature or load control. Where a BMS exists it is recommended that heating circuit and domestic hot water control is managed by this system.

For full details concerning control set up refer to Manual Navistem B3000 ref 500001310.

0-10 volt analogue temperature input chart



Controls for multiple boilers

Multiple boilers are likely to be installed within larger buildings where the controls requirements can be expected to be more complex. Often larger buildings are equipped with Building Management Systems and where this is the case it is recommended to take advantage of the powerful control capability of these systems to not only manage the various heating circuits within the building but also to control the operation of the boilers.

Where Building Management Systems are not present, or independent control of the boilers is required there are two alternative options available from Hamworthy:

1. Sequencing of up to 15 additional boiler modules using integral Master/Slave feature of control.

2. Sequencing of up to 15 boiler modules using the Hamworthy Merley boiler sequence controller for mounting remote to the boiler or within clients own control panel.

Key features of both methods of control:

- ⊗ Choice of control inputs including:
 - External enable signals
 - 0-10V analogue heat demand signal
 - Built-in time clock settings
- ⊗ Choice of cascade or unison sequencing strategies
- ⊗ Lead boiler rotation
- ⊗ 7 Day integral time clock – 3 programmable periods per day
- ⊗ Optimised start and stop based on outside and room air temperatures
- ⊗ Holiday periods
- ⊗ Frost protection
- ⊗ Constant or variable flow temperature based on outside and room air temperatures
- ⊗ 2 stage frost protection based on outside and room air temperature
 - Stage 1 – Air temperature: starts circulation pumps to move heat around the circuit from within the building protecting the plantroom
 - Stage 2 – Water temperature: starts the boiler to prevent water within the system freezing
- ⊗ Summer shutdown
- ⊗ Reduced temperature/night set back for non-occupancy hours
- ⊗ Pump kick for connected pumps

Master/Slave boiler sequence controller

When using Master/Slave sequencing it is important to select which boiler module is going to be the Master. All site wiring associated with the sequence control function must be routed to this boiler and connected to the boiler controller. Programming of the sequence control will also be completed via the interface on this boiler module.

LPB bus communication kit – OCI345

Up to 16 boiler modules may be sequence controlled and communication between boiler modules is facilitated via an LPB bus. Each boiler module must be equipped with an optional LPB bus communications kit.

Part number 563605667

Outside air temperature sensor – QAC34

It is always recommended to fit an outside air temperature sensor allowing enhanced frost protection for protection of both the building infrastructure and the boiler plant. The sensor should be located on a north facing wall. Control functions available with outside air temperature sensor fitted:

- ⊗ 2 Stage frost protection – based on water temperature and outside air temperature
 - Stage 1 – Air temperature: starts circulation pumps to move heat around the circuit from within the building protecting the plantroom
 - Stage 2 – Water temperature: starts the boiler to prevent water within the system freezing
- ⊗ Summer shutdown to prevent boiler operation when outside temperature reaches a pre-determined set-point
- ⊗ Adaptable weather compensation to match boiler flow temperature to building thermal dynamics as the outside air temperature fluctuates up and down.

Part number 533901457

Common flow temperature sensor – QAZ36

A flow temperature sensor must be located in the common primary flow leaving the boilers and before the low loss header. The sequence controller responds to signals from this sensor, comparing temperature set-point with actual flow temperature, then manages the number of boilers in operation and modulation rate of each boiler to achieve and maintain the desired flow temperature. A dedicated sensor kit including immersion pocket is available. The number of boiler modules released to fire is selected according to the programmed sequence control strategy.

Part number 563605673

Controls for multiple boilers

Time control

A 7 day time clock with 3 adjustable time periods per day is a standard feature of the sequence controller.

Optimised start and stop

The optimiser uses a combination of the actual room temperature and outside air temperature to calculate the exact time at which the heating will be started or stopped to ensure comfort levels at the correct occupancy times. A self-learning function monitors discrepancies in room temperatures at the pre-defined times allowing the optimiser to fine tune to the building thermal performance.

Manual over-ride

Continuous on or off operation can be set during which the time program is overridden until the over-ride function is manually de-activated. Frost protection and summer shutdown controls remain active.

Remote enable

Continuous on or off operation can be set during which the time program is overridden until the over-ride function is manually de-activated. Frost protection and summer shutdown controls remain active.

Summer shutdown

Whenever the outside air temperature exceeds the adjustable programmed setting the heating is turned off.

Using BMS 0-10 volt signals

The sequence controller can be configured to accept a BMS analogue input to initiate heat generation. NOTE: When using a BMS to initiate cascade control via a 0-10 volt analogue signal, the internal time clock and remote enable circuit functions are disabled.

Input signals to the sequence controller 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 during commissioning. 10 Volts corresponds with the upper limit with a maximum 85°C setting.

Optional controls kits for multiple boilers

Controls options	Part number
Outside air temperature sensor QAC34	533901457
Volt free contact kit for remote status signalling AGU2.550A109	563605666
Heating circuit sensor kit (sensor & pocket) QAZ36	563605673
Merley boiler sequence controller, wall mounted	563605672
Merley boiler sequence controller, loose kit for panel mounting	563605671
LPB Bus communications module OCI345, one required per boiler module	563605667
Programmable room sensor QAA75	563605695



Navistem (Siemens LMS) control panel.

Flue systems

Wessex ModuMax mk3 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.
- ⊗ The boilers may be flued individually. *Details of flue sizes and length of flue runs are shown on page 21.*
- ⊗ The flue components should be fully welded and CE marked for positive pressure application.
- ⊗ Draught conditions: the flue must be designed to limit the maximum suction at the flue connection to the boiler to be no greater than 0.3 mbar negative (boilers cold), and with all boilers firing no greater than 1.5 mbar positive. If the flue system generates suction when hot, the maximum suction is 1.0 mbar.
- ⊗ 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 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 forms 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 mk3 boilers are suitable for installation in a balanced compartment in accordance with the requirements of BS 6644.
- ⊗ Due to low flue gas temperatures, around 80°C, condensation will occur in the flue, therefore, flue materials must be impervious to acidic condensate pH 3.5 and use fully sealing joints.
- ⊗ Twin-walled flue construction is recommended with adequate facilities provided for draining the flue condensate.

Boiler and flue condensate discharge

32 mm diameter drain trap connections and drain traps are provided on each Wessex ModuMax mk3 boiler module, and also on the flue risers supplied with two-high and three-high stacked boiler configurations. These are for connection to a condensate drain system (not HH supply) in standard plastic waste piping, so that boiler condensate can be safely drained away. The pipework should be a suitable PVC plastic system with sealed joints to prevent the escape of condensate.

The condensate drains should be designed in line with BS 6644, incorporating drain traps and an open tundish, with a minimum fall of 2.5 degrees (approximately 50 mm per metre). See "Typical Boiler and Flue Condensate Drain Installation" figure on page 28 for details.

Notes

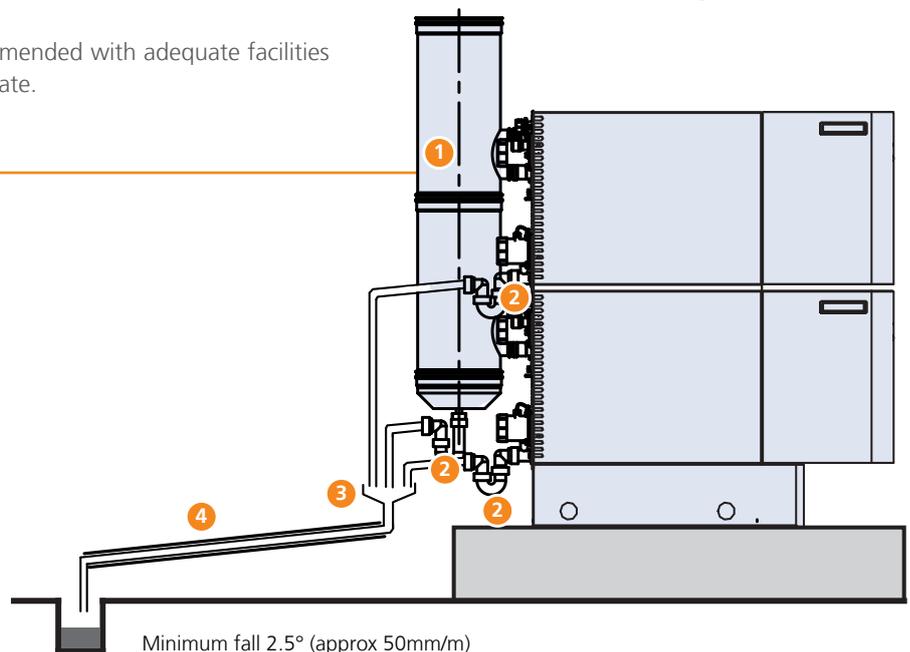
1. Single module Wessex ModuMax mk3 boilers are not supplied with a flue riser and flue riser condense trap. Therefore any flue system used with these boilers should have adequate provision for draining flue condensate.

2. Where multiple Wessex ModuMax mk3 boilers are used with common flue headers feeding a single riser, additional condensate drainage lines may also be required. For more details see pages 29 and 30.

Condensate Information

- ⊗ Typically 3.5 pH
- ⊗ Slightly acidic, but less so than vinegar
- ⊗ The volume of condensate is related to the system water temperature and the firing rate of the boiler

- ① Boiler flue
- ② Condensate "U" traps
- ③ Open tundish
- ④ Metal sheath to protect plastic pipe



Flue guide

Maximum flue lengths

The table below provides a guide to the maximum flue length allowed for each boiler (individual module and stacked module boilers).

Wessex ModuMax mk3 condensing boilers				
Boiler model	Flue diameter (mm)	Maximum flue length (m)	Equivalent length (m)	
			90° Elbow	45° Elbow
97/97H	100	15	1.5	1.2
97/194V	180	101	2.8	2.1
97/291V	180	41	2.8	2.1
116/116H	100	15	1.5	1.2
116/232V	180	85	2.9	2.2
116/348V	180	35	2.9	2.2
147/147H	150	43	2.4	1.8
147/294V	250	163	4.4	3.4
147/441V	250	69	4.4	3.4
196/196H	150	28	2.4	1.8
196/392V	250	94	4.4	3.4
196/588V	250	36	4.4	3.4
254/254H	150	22	2.4	1.8
254/508V	250	110	4.6	3.5
254/762V	250	44	4.6	3.5

Notes

1. 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.
2. 45° and 90° bends are based on 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 charts.
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.

Flue data for each boiler including approximate flue gas volumes, flue gas temperatures, pressure at flue spigot under full load and dry NO_x emissions can be found in the technical data tables on pages 8 and 9.

Open flue

Wessex ModuMax mk3 boilers are designed for Type B23 open flue systems.

Type B23 - A type 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.

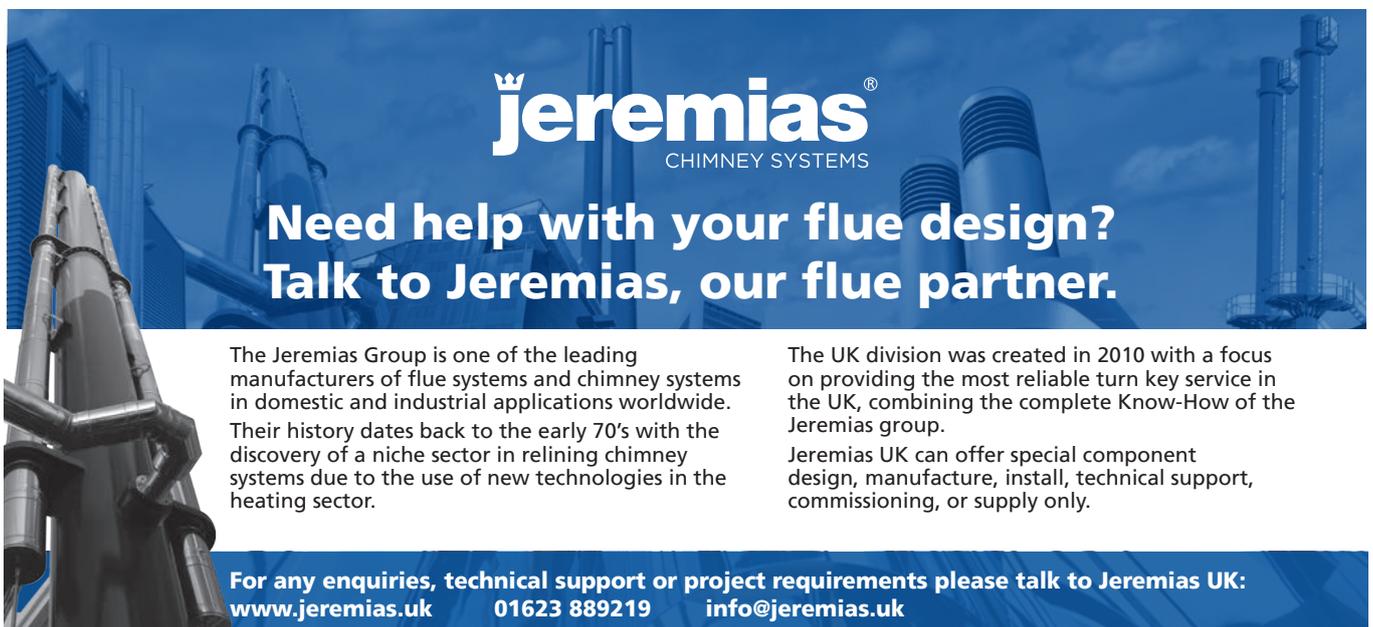
Equivalent length components

For single, or individually flued multiple boilers, it is possible to 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 plus the equivalent lengths of all the 90 degree and 45 degree elbows.

Flue system for multiple boilers

Multiple boilers may be installed using a common flue header. For more information see page 22.



jeremias
CHIMNEY SYSTEMS

**Need help with your flue design?
Talk to Jeremias, our flue partner.**

The Jeremias Group is one of the leading manufacturers of flue systems and chimney systems in domestic and industrial applications worldwide. Their history dates back to the early 70's with the discovery of a niche sector in relining chimney systems due to the use of new technologies in the heating sector.

The UK division was created in 2010 with a focus on providing the most reliable turn key service in the UK, combining the complete Know-How of the Jeremias group. Jeremias UK can offer special component design, manufacture, install, technical support, commissioning, or supply only.

For any enquiries, technical support or project requirements please talk to Jeremias UK:
www.jeremias.uk 01623 889219 info@jeremias.uk

Flue systems

Multiple boilers - same appliance type

The use of swept connections from appliances into a common flue is recommended to assist the flow of gases into the common flue in the intended direction of flow.

The combustion circuit within Wessex ModuMax mk3 boilers is equipped with a back flow prevention device to prevent flue gases spilling through non-firing appliances.

Flue liners

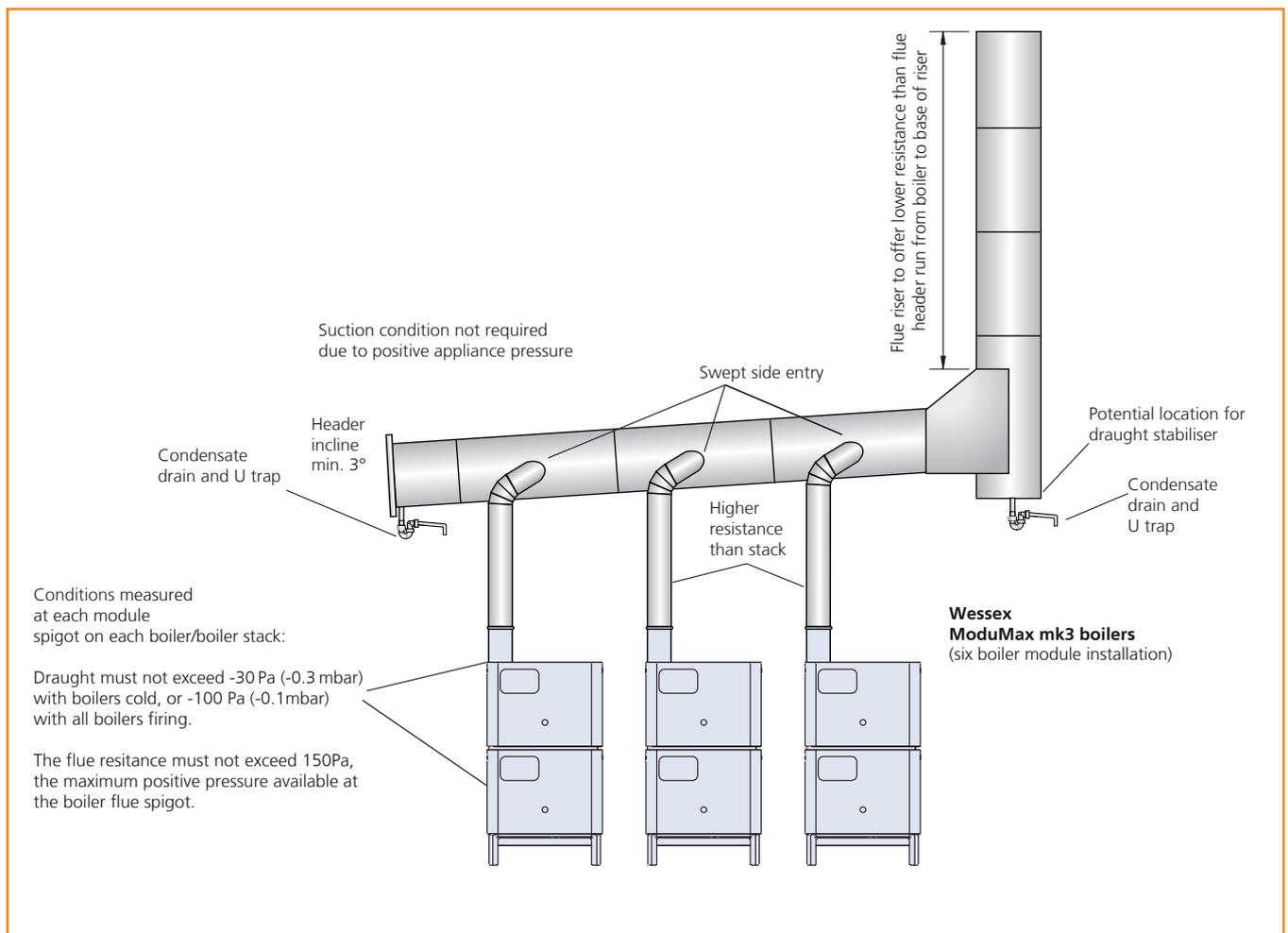
When replacing atmospheric boilers and appliances, it may be possible to install a continuous stainless steel flue liner within the existing flue riser as atmospheric appliances typically have larger diameter flue systems than modern fan-assisted pre-mix appliances. At the base of any such flue riser, the flue header is likely to require replacement using fully sealed and pressure tight components that have been sized for the installed appliances.

Flue system condensate discharge

In addition to the boiler condensate discharge, it is important that the flue header and riser used with multiple appliance systems is drained independently to avoid flue condensate draining back through the boiler or other appliance. Condensate traps should be used to prevent flue gas discharge through condensate drains.

Draught generated by flue risers

- 2 Pa (0.02 mbar) per metre height @80°C
- 0 Pa (0.00 mbar) per metre height @40°C



Want to improve your industry knowledge?

We're accredited with CIBSE to deliver approved Continuing Professional Development (CPD) courses.

It's our opportunity to share our knowledge with you. More than 3,000 people have attended our CPD seminars and 95% rated them as good or excellent.

Hamworthy CPD seminars are free to attend and our flexible approach means that we are able to tailor our training to suit your business. Lots of our customers choose to run these online at lunchtime or at their own premises so that there is minimal disruption to the working day.

“Very good session with lots of very detailed and relevant information. Would highly recommend!”



Book a free CIBSE-accredited CPD seminar for you and your colleagues today:
hamworthy-heating.com/cpd

CPD courses available:

- **New Boilers on Old Heating Systems: Hydraulic Design - A Story of Separation**
- **Best Practice Heating & Hot Water Plant Refurbishment**
- **Energy Saving in Commercial Heating and Hot Water - Could you save a £million?**
- **Best Practice in Domestic Hot Water (DHW) - 3 modules**



Product Training

Get hands-on training with Hamworthy's commercial boilers.

We can provide training onsite, online, or you can attend a course at one of our training centres. Delivered by Groupe Atlantic engineers with years of product knowledge and industry experience. By attending our training you'll be more confident in running our equipment.

The course will guide you through the servicing and fault finding of Hamworthy products to ensure they are operating at their maximum efficiencies.

Hamworthy's training centres are conveniently located across the UK.

Each training centre has live firing boilers as well as a display of boilers, water heaters and additional system equipment.

See the latest training dates and book your place online:
hamworthy-heating.com/training

Training courses available:

- **Purewell Variheat mk2 boiler**
- **Stratton mk2 wall hung boiler**
- **Wessex ModuMax mk3 boiler**
- **Upton boiler**



Application and water system

Installation

The installation of the boiler must be in accordance with the relevant requirements of the Gas Safety Regulations, Building Regulations, IET 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.

Water systems

Wessex ModuMax mk3 boilers are suitable for both open vented or sealed pressurised systems. For safe operation (formerly a requirement of the Health and Safety Document PM5; now withdrawn), Hamworthy recommends sealed systems to have a fuel supply cut off in the event of low and high-pressure conditions. Hamworthy also recommends for sealed systems to use a Chesil pressurisation unit with correctly sized Burstock expansion vessels.

It is advisable to thoroughly flush both new as well as existing systems to remove loose debris before connecting the new boilers. For badly contaminated systems it may be necessary to use a proprietary system cleaner to remove stubborn deposits. Once flushing and cleaning is complete, suitable corrosion inhibitors should be added to the system and their concentration levels maintained throughout the life of the boiler installation.

The primary circuit should be fitted with a suitable strainer in the common return pipe to the boilers to filter out water born debris. Cleaning strainers should be part of a regular site maintenance schedule.

Additional use of a Clenston dirt and air separator in the primary circuit will help filter out smaller suspended particles as well as micro air bubbles. Reducing air in the system is a major contributor to protection against corrosion, noise and inefficiency.

System feed water quality

If boiler feed water has a high degree of hardness (>180mg CaCO₃/litre), it is strongly recommended that the water be treated to prevent the build-up of sludge and scale. Any make up water introduced to the system will dilute water treatment. It is therefore recommended to fit a water meter in the make-up water supply to monitor the volume of water entering the system, so that appropriate action can be taken regarding the maintenance of corrosion inhibitor concentration. Metering the make-up water supply will also assist in identifying system leaks which might otherwise go unnoticed, e.g. underground pipe ruptures. For further guidance, please refer to ICOM'S 'Water treatment and conditioning of commercial heating systems' document.

Open vent pipe size and cold feed

Boiler	Open Vent Size	Cold Feed Size
61kW - 150kW	32mm (1¼in)	25mm (1in)
151kW - 300kW	38mm (1½in)	32mm (1¼in)
301kW - 600kW	50mm (2in)	38mm (1½in)
601kW - 800kW	65mm (2½in)	50mm (2in)
801kW - 1200kW	80mm (3in)	50mm (2in)

Location

The location chosen for the boiler must permit the provision of a satisfactory flue system and an adequate air supply. Adequate space should be allowed for installation, servicing and air circulation around each unit. This includes any electrical trunking, laid along the floor and to the appliance. Refer to dimensional drawings on pages 5 and 7 for more details on clearances. 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 mk3 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 water flow / primary circuit design

The Wessex ModuMax mk3 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 mk3 boilers are installed using the primary circuit design including low loss header 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.

All Wessex ModuMax mk3 boilers can operate up to 40°C differential temperature making them suitable for installation in traditional systems operating at 82°C/71°C flow and return temperature up to modern district heating system designs working at 90°C/50°C.

Application and water system

Gas supply pipes

Supply pipes must be fitted in accordance with BS 6891 or IGE/UP/2 as appropriate. Pipework must be of adequate diameter for the length of run, and must not be of a smaller diameter than the boiler's gas connections. For gas pipe sizing calculations refer to Chartered Institute of Building Services Engineers (CIBSE) Guide C. The complete installations must be purged and tested for soundness as described in BS 6891 or IGE/UP/1 and IGE/UP/1A as appropriate.

LPG propane option

Where natural gas supplies are not available, the Wessex ModuMax mk3 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.

Safety relief valves

On both sealed systems and open vented systems, each boiler module must be served by a safety relief valve to BS EN ISO 4126-1. In accordance with BS6644, the pressure setting of the safety relief valve should be a minimum of 0.7 bar above the system hot working pressure.

All Wessex ModuMax mk3 boiler modules are provided with a dedicated safety relief valve connection at the rear. This is the most suitable location for the safety relief valve ensuring that system isolating valves cannot be fitted between the boiler and the safety relief valve.

Full details regarding the selection and sizing of safety relief valves for both open vented and sealed systems are provided in BS6644.

System head guidance

This information is based on PM5 from the Health & Safety Executive. Although PM5 has now been withdrawn, Hamworthy still recommends this guidance as sound engineering practice.

PM5 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 predetermined 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 dependent 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.

In an open-vented system, the highest point of the circulation system above the boiler should never be less than 2 m (6.5 ft).

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 $\Delta T^{\circ}\text{C}$	11°C	20°C	30°C	40°C
Mixed flow temperature	82°C	80°C	85°C	85°C
Safety margin	17°C	17°C	17°C	17°C
Equivalent saturated steam temperature	110°C	117°C	132°C	142°C
Minimum gauge pressure (head of water)	0.5bar	1.0bar	1.88bar	2.81bar

Condensate discharge & ventilation

Condensate discharge

Natural gas boilers typically produce condensate at a rate of 13 litres per hour per 100kW input energy when operating in condensing mode. Although the condensate produced is mildly acidic (typical pH~3.5), normally it can be disposed of through the drainage system. If in any doubt about local regulations, check with the local water authority.

The Wessex ModuMax mk3 boilers are equipped with a polypropylene syphon drain connection to which plastic polypropylene piping, with O rings should be connected to dispose of the condensate. All condensate traps have floats to remove the risk of water and gases entering the boiler should there be a dry trap.

The condensate discharge pipe should have a minimum fall of 2.5° to drain, and should discharge via tundish arrangement. To prevent any risk of freezing in winter, the condensate pipe should be insulated and/or routed internal to the building where possible.

General ventilation requirements

An adequate supply of fresh air for combustion and ventilation must be provided in accordance with BS 6644 for boiler installations greater than 70kW nett rated input.

Boiler house temperatures

Additional requirement of BS 6644 for multiple boiler installations requires that the air supplied for boiler house ventilation shall be such that the maximum temperatures within the boiler house do not exceed:

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

Ventilation grille openings

High and low level ventilation grilles shall be positioned as high and as low as practicably possible. Low level grilles will be located within 1metre of floor level for Natural Gas. High level grilles are recommended to be positioned within 15% of the boiler room height from the ceiling. High and low ventilation grilles shall communicate with the same room or internal space where compartment ventilation is used. Where ventilation grilles communicate directly with outside air, they shall be positioned on the same wall.

Air supply

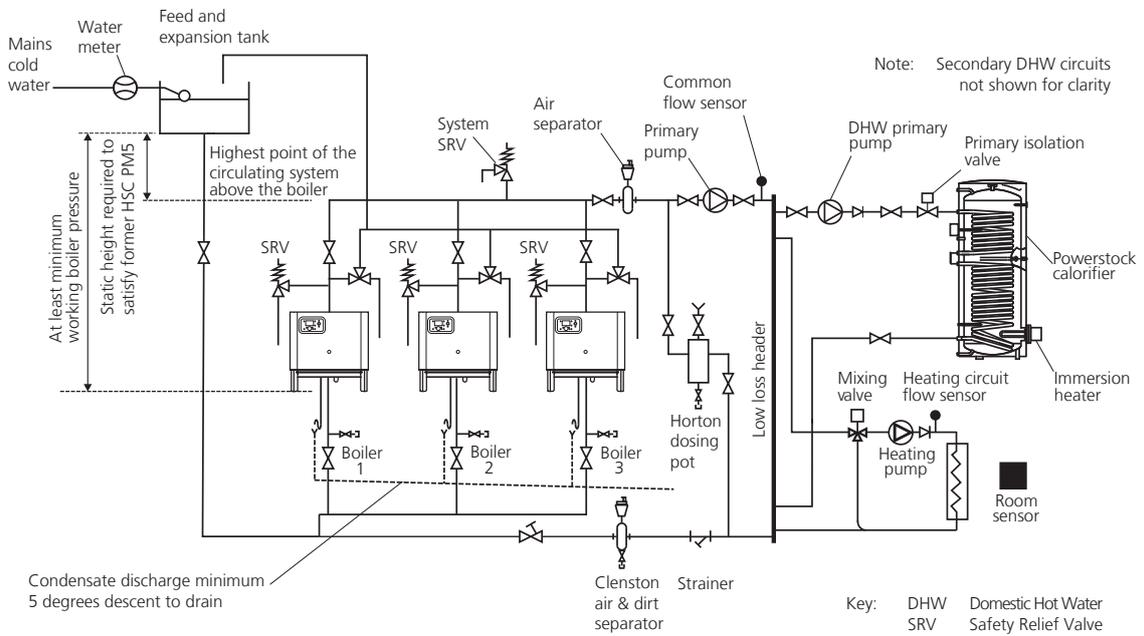
The air supply should be free from contamination such as building dust and insulation fibres from lagging. To avoid unnecessary cleaning and servicing of the boiler modules, the boilers should not be fired whilst building work is being undertaken. Where a boiler installation is to operate throughout 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 BS 6644 for more information.



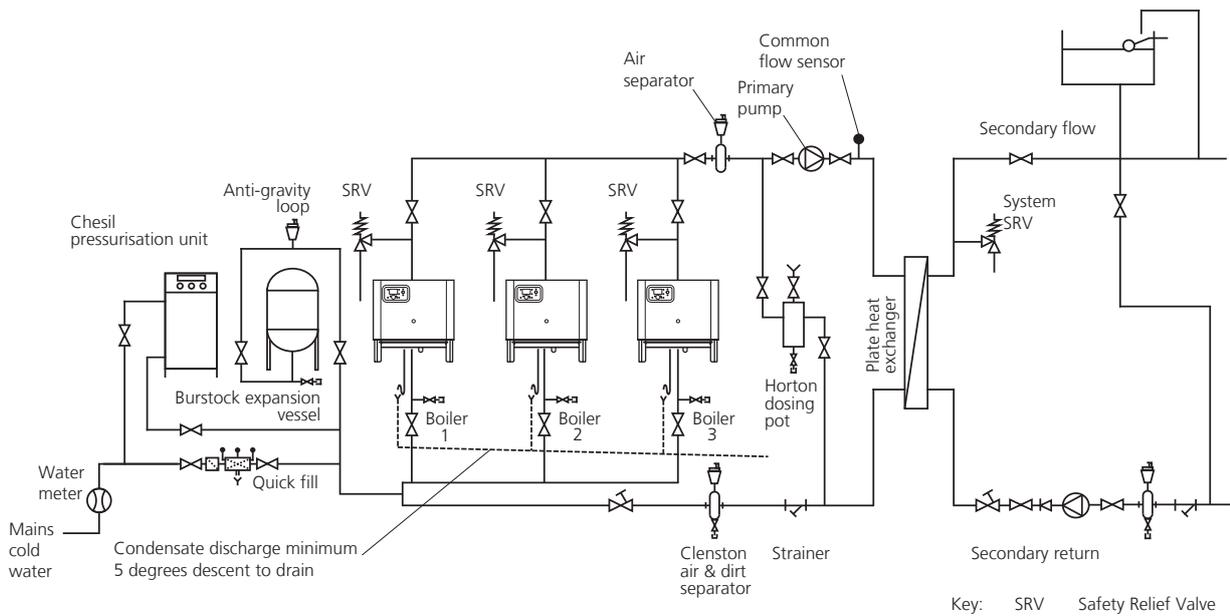
Typical boiler house ventilation.

Hydraulic schemes

Scheme 1: Open vented system with low loss header



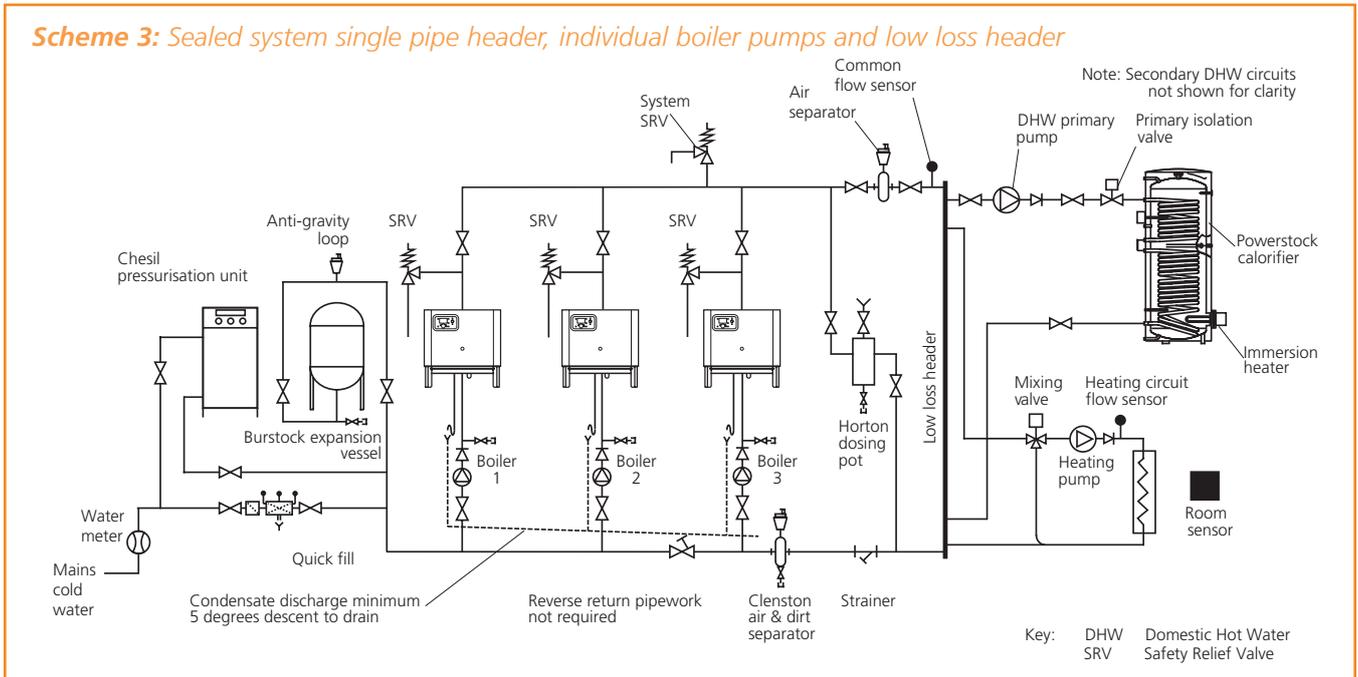
Scheme 2: Sealed primary and open vented secondary system with plate heat exchanger separation



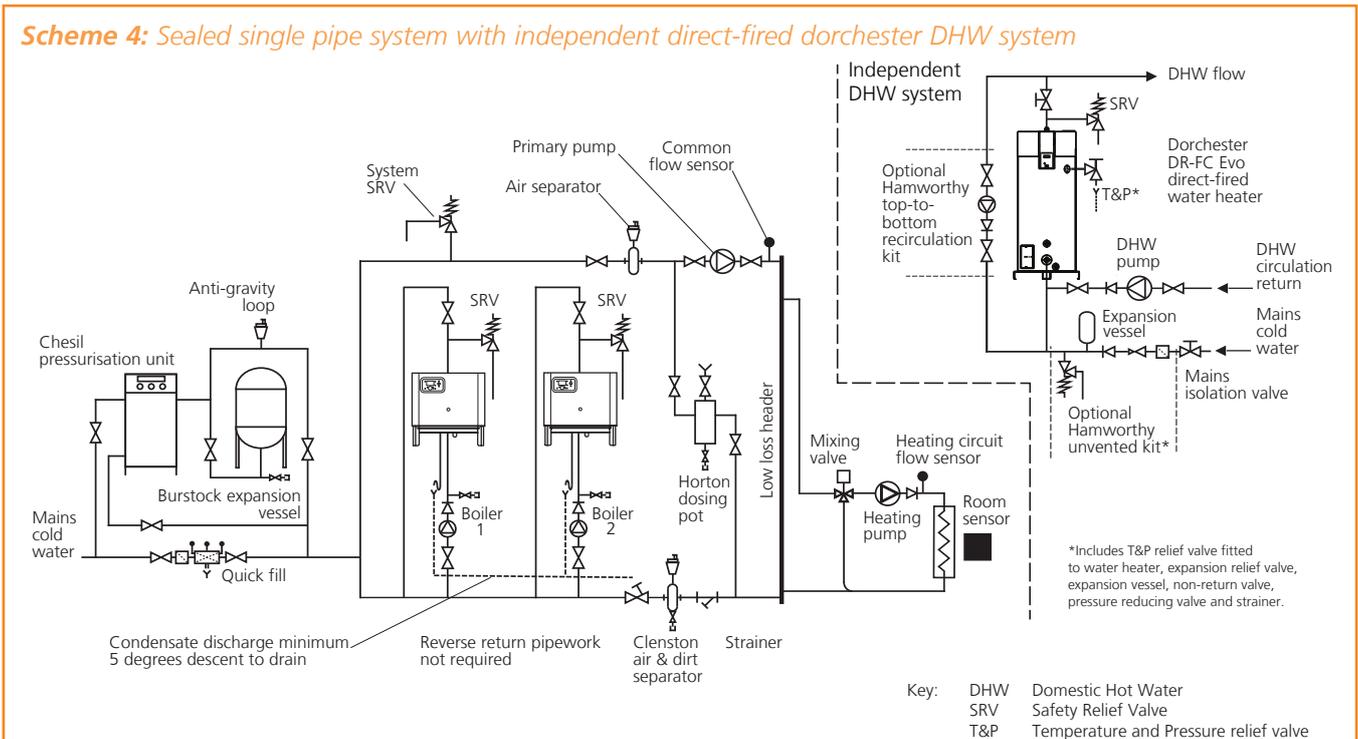
Note: These schemes have been provided for reference only.

Hydraulic schemes

Scheme 3: Sealed system single pipe header, individual boiler pumps and low loss header



Scheme 4: Sealed single pipe system with independent direct-fired dorchester DHW system



Note: These schemes have been provided for reference only.

Case study

St. Paul's Cathedral, London

Project

- Grade 1 listed building refurbishment

Products

- Wessex ModuMax mk3 condensing boilers
- Powerstock calorifiers

Results

- 40% reduction in gas consumption
- Improved speed of heat up

The challenge:

The cathedral's existing heating system, consisted of three steel shell boilers, fitted in the 1960s which received a burner upgrade in the 1980s. Problems on the equipment occurred and were fixed until the boilers finally started leaking and could not be repaired anymore.

At this point, Robin Bunton from Bunton M&E Services advised replacement boilers were necessary. Together with Mike Crouch, Hamworthy's agent for the area, and Nick Coates from Blue Print Building Services Design, worked on the specification for the cathedral's heating and hot water refurbishment project with Clerk of Works Martin Fletcher.

The solution:

The cathedral was seeking reliable and energy efficient boilers to meet its high heating and hot water demand while keeping the running costs down. To avoid changing the flues, they initially planned to replace the older system with pressure jet steel shell boilers. Robin, however, recommended Hamworthy's Wessex ModuMax mk3 condensing modular boilers as replacements to meet the reliability and energy efficiency requirements, as well as compliance with current legislation to eliminate inefficient boilers.



Two Wessex ModuMax mk3 WM254/508V boilers now heat the whole cathedral up within one day, compared to a week by the previous boilers.



St. Pauls Cathedral

Two Wessex ModuMax mk3 WM254/508V modular condensing boilers were chosen. This combination consists of two stacks with two boiler modules in each, delivering a total output of up to 1,016kW and a turndown ratio of 20:1.

Robin commented:

"We have used the Wessex boilers since they were introduced and we know they are a very reliable product. They are space saving, great in refurbishment projects and buildings where you can't change the building fabric, such as St Paul's. Hamworthy also has an excellent after sales and spares service, with their own engineers, which is why I prefer working with them."



Two Powerstock PS500 calorifiers provide DHW for the cathedral.

Due to the popularity of St Paul's Cathedral, the summer months are a challenge in terms of an extremely high peak demand for domestic hot water. Two Hamworthy Powerstock PS500 glass-lined calorifiers, with a capacity of 500 litres each, and a recovery time of 18 minutes were chosen to meet the requirements. The heat to the indirect-fired water heaters is supplied by the Wessex ModuMax mk3 condensing modular boilers.

Robin added:

"The speed of heat up has greatly improved. Previously it would take a week to heat the cathedral up from cold, but now it only takes one day, the heating runs 24/7 on weather compensation."

Services and warranty



Commissioning

We strongly recommend that all boilers are commissioned by our service department, and some specifications state that it must be carried out by the manufacturer. As well as ensuring your product is set up correctly for maximum efficiencies, you will receive extra benefits on warranty (see below). On completion, you will get a report with details of the initial operating settings.

Service

The Wessex ModuMax mk3 boiler has been designed with ease of service in mind. The combustion analysis and drain point are at the front of the boiler and there is a mains power outlet making it easier for service engineers in plant rooms with no power outlets. The cover and sides are easily removable for access to all the components. An air inlet filter for clean combustion air and fast assessment of maintenance requirement is fitted to all Wessex ModuMax mk3 boilers.

To maintain your boilers, we have a range of servicing options that can be tailored to your requirements. For more information on commissioning and service please contact Hamworthy Heating service department.



Warranty

The Wessex ModuMax mk3 boiler comes with a 10-year warranty on the heat exchanger. All other parts carry Hamworthy's standard two years' warranty (except for consumables in line with our Terms and Conditions). Where the product is commissioned by Hamworthy service engineers within 6 months of delivery date, then the two-year warranty covers parts and labour from date of commissioning. We offer tailored packages to suit individual customer requirements, many of which include extended warranty benefits. Full details of warranty terms and conditions are available on request.



Spares

Essential to any maintenance and service regime is the availability of quality spare parts.

By coming to us, the Original Equipment Manufacturer (OEM), you can be assured of genuine spare parts and may also benefit from technological improvements. We have a long-term commitment to spare parts for our products.

Delivery

Each boiler is despatched fully assembled and factory tested with the casing and control panel fitted. Wessex ModuMax mk3 modular boilers are delivered to site secured to a pallet to ensure safe manoeuvrability. Standard delivery for all Hamworthy products is free of charge.

Deliveries are closely co-ordinated with the customer, to suit the site construction programme. Products are delivered to ground level and it is the responsibility of the customer to arrange movement of products from here to the required location on site.

To enquire about special delivery services including FORS and time critical deliveries (additional charges apply), please contact our customer services team.

Service

Tel: **01202 662555**

Email: **service@hamworthy-heating.com**

Spares

Tel: **01202 662525** Fax: **01202 662551**

Email: **spares@hamworthy-heating.com**

Complete your system

As well as energy efficient commercial boilers, we supply direct and indirect fired water heaters plus equipment to enhance the efficiency and longevity of your heating system.

From dosing pots and air & dirt separators for system cleanliness to pressurisation units and expansions vessels for sealed systems, Hamworthy can offer the support equipment needed for your system installation.



Burstock expansion vessel

Chesil pressurisation units

System equipment

Chesil pressurisation unit

Wall hung and floor standing pressurisation units for sealed systems. Available in 5 models with single and twin pump options.

Burstock expansion vessel

Floor standing expansions vessels for use with sealed heating and hot water systems. Available in 10 models from 25 to 1000 litres.

Clenston air and dirt separator

For the removal of dissolved gas and air particles from heating systems. Available in 7 models to suit pipe sizes from DN50 to DN200.

Horton dosing pots

Chemical dosing pots for introducing chemicals into a sealed heating system. Available in 4 models from 3.5 to 15 litres capacity.

Hot water

Powerstock calorifiers and storage tanks

Glass lined calorifier for indirect domestic hot water production with single and twin coil options. Available in 7 models with continuous outputs from 569 to 1,858 litres per hour.

Glass lined storage tanks for domestic hot water available in 4 models with storage capacities of 300 to 990 litres.

Halstock calorifier

Stainless steel calorifiers for domestic hot water production with a single coil and vented and unvented options. Available in 5 models with continuous outputs from 344 to 1,055 litres per hour.



Dorchester direct fired water heaters

5 ranges of condensing and non-condensing direct fired water heaters with glass lined and stainless steel options to choose from. Available in over 22 models with continuous outputs from 228 to 2,400 litres per hour.

Trigon solar thermal system

A complete solar hot water system including solar collectors, transfer stations, and controllers that can be combined with a solar water heater.

About Hamworthy

Hamworthy Heating is a leading British commercial boiler manufacturer. Our energy efficient heating, hot water and renewable solutions are used in buildings across the UK.

The Hamworthy difference

British engineering excellence

Here in the UK, we design, test, manufacture and source market-leading products. We know our products inside out, back to front and from start to finish. You can trust that we know what we're talking about.

Lifetime support

From design and specification, through to commissioning, training and maintenance, as well as commitment to spares availability. We provide long term support for businesses with their commercial heating and hot water needs.

People first

It's not just our products that set us apart, it's our people. Truly excellent customer service, great technical knowledge and being easy to deal with.

That's the Hamworthy difference.



Everyone's got history, we've got heritage

Our roots date back to 1914 when two brothers in Poole set up Hamworthy Engineering. Decades of experience go in to every nut, screw and bolt. Every phone call, text and email. Since 2008, we've been part of Groupe Atlantic, a company with a similar ethos to us. Groupe Atlantic was founded in 1968 by two engineers and is now one of the market leaders in the European heating and hot water industry. We're now part of their growing UK, ROI and North America Divisions.



Our associations

We are an active member of trade associations and professional bodies supporting the industries we work in.

Our accreditations

International Organisation for Standardisation (ISO) is the world's largest developer of voluntary International Standards. We are proud to have been awarded the following ISO accreditations:

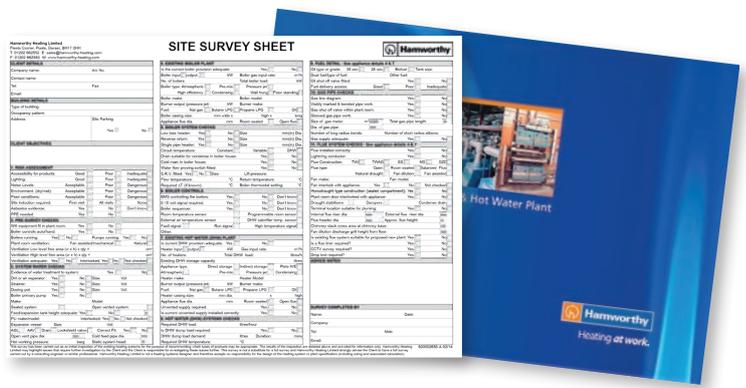
- ISO 9001 Quality Management System
- ISO 14001 Environmental Management System
- ISO 45001 Health and Safety Management System

When you deal with Hamworthy, have confidence that we're working within a defined set of standards that are internationally recognised.



Book a free site survey

hamworthy-heating.com/site-survey

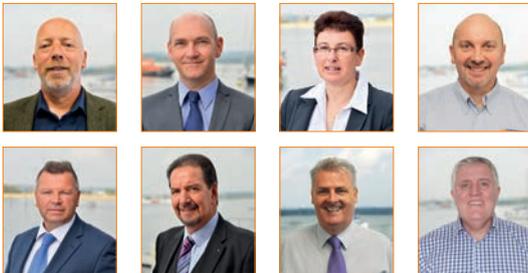


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hamworthy-heating.com/find-your-local-sales-manager

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Contact our in-house technical support team on

01202 662505

Your local contact is:

Placeholder for local contact information, indicated by four corner brackets.

**British engineering excellence from Hamworthy Heating;
the commercial heating and hot water specialists.**



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**SUPPORT BRITISH
MANUFACTURING**

Hamworthy Heating Accreditations

ISO 9001 Quality Management System
ISO 14001 Environmental Management System
ISO 45001 Health & Safety Management System



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