

Wessex-HE

High Efficiency Pre-mix, Gas Fired Modular Boilers



BS EN ISO 9001:1994
Certificate No. FM 10082

HAMWORTHY
heating products

Wessex-HE

High Efficiency, Pre-Mix Gas Fired Modular Boilers

The Wessex-HE high efficiency pre-mix, gas fired boiler is available in base modules of either 50kW or 200kW, and can provide outputs from 50kW to 2000kW in a wide variety of modular configurations.

A floor standing boiler, the Wessex-HE is designed for the heating of Commercial and Industrial premises, and also to supply hot water via an indirect cylinder, such as Hamworthy's Powerstock calorifier.

Each Wessex-HE module has a cylindrical extended surface heat exchanger constructed from finned copper tubes. Sectioned end plates ensure an equal flow through each tube, giving an even and highly efficient gas to water heat transfer.

The efficient pre-mix combustion through individual combustion chambers allows total flexibility in the firing arrangement, and when used in conjunction with the Hamworthy Marshall-HE boiler sequence control system, can provide weekly rotation of the lead boiler.

The Wessex-HE boilers are fully Eurocertified and bear the CE mark, complying with the latest European Directives.

All Wessex-HE boilers are highly efficient with an operating efficiency up to 85% Gross, (94% Nett).

A particular advantage of the Wessex-HE is the ultra low NO_x emissions achieving European class 5 performance.

Options

- Volt free contacts (BEMS compatibility)
- High temperature version
- Marshall-HE boiler sequence control system
- Water flow/return headers*
- Gas manifolds*
- LPG - propane

*Wessex-HE 50 modules only

- Reduced Fuel Bills
- Ultra Low Standing Losses
- Environmentally Friendly
- Compact Space Saving Design
- Designed for Ease of Servicing
- Manoeuvrability for Easier Installation

BENEFITS

Modular systems provide a reliable, tried and tested approach, and as the largest manufacturer of modular boilers in the UK, Hamworthy offer complete solutions for commercial heating requirements, which are both flexible and efficient.

Wessex-HE

Compact 200



Ultra Low NO_x



Wessex-HE 50kW Modules

The flexibility of the modular approach enables the Wessex-HE 50kW range to offer 25 configurations giving outputs ranging from 50kW to 600kW. Using multiple module casings, the variants can be arranged horizontally, vertically or back-to-back.

Horizontal arrangements include the 1x50H, 2x50H and 3x50H models with outputs from 50kW to 150kW housed in single stainless steel casings. On two and three module boilers, flanged flow and return headers and gas manifolds are provided. Flue outlets are through a single connection.

Vertical arrangements are available in the Wessex-HE Compact series, which offer outputs from 50kW to 600kW, with modules fitted one above another in a single stainless steel casing. Each 100kW casing can be connected to complete an insulated external casing for the modular installation.



Wessex-HE,
3 x 50H Boiler

On 50kW module multiple boilers, flanged flow and return headers and gas manifolds are provided. A range of stainless steel flue headers with a single centre off take and draught stabiliser are also available. (Refer to page 12)

Back-to-back arrangements, the Wessex-HE Twinline, takes the advantages of the Compact series and further maximises space utilisation. The Twinline range uses the 50kW modules fitted to the internal casings in the normal way, and includes a frame assembly to connect casings into a multiple boiler unit with a single flue connection. Optional junction headers are available for water flow and return and gas to provide single point connections.

On all configurations of Wessex-HE 50kW module boilers it is possible to supply casings with modules blanked off. This enables initial installation to be completed with the capability to easily increase the kW output at some time in the future.

Wessex-HE 200kW Modules

Available as a single 200kW output boiler the Wessex-HE 200 offers effective use of space for the output provided.

Alternatively, the Wessex-HE County boiler provides 400kW output from two 200kW modules arranged vertically, one above the other in a single stainless steel casing.



Wessex-HE, 200kW Boiler

As with the Wessex-HE 50kW module boilers, it is possible to supply casings on the Wessex-HE County with a module blanked off. This enables initial installation to be completed with the capability to easily increase the kW output at some time in the future.

The Wessex-HE County achieves an output to water of 400kW from only 1m² footprint.

Wessex-HE 50kW and 200kW Modules

Each of the modules can be supplied with the following optional features.

Volt Free Contacts

Remote signalling is achieved via a set of volt free contacts which indicate boiler lockout, high limit lockout and normal run.

High Temperature Version

The maximum module flow temperature is 90°C using a standard safety temperature limiter.

A high temperature version is available enabling a maximum module flow temperature of 119°C.



Wessex-HE County, 400kW Output

Specification

All Wessex-HE boilers are fully automatic, and feature full separate pilot proving with individual combustion chambers which satisfy the five air change purge requirements of BS5978.

Heat Exchanger

Each module has a cylindrical heat exchanger constructed from finned copper tubes which are expanded at each end into cast iron tube plates. The tube plates are sealed on a machined face with closing plates which are sectioned to equalise the water flow through each tube. Stainless steel baffles are positioned across each pair of finned tubes to ensure a balanced gas flow and uniform heat transfer.

The Burner

The fan assisted pre-mix burner is a perforated stainless steel tube positioned along the central axis of the heat exchanger. A distribution cone fitted within the burner ensures an even flow of the air/gas mixture which is burnt around the burner circumference

producing an efficient and symmetrical flame. Hot combustion gases flow radially outwards from the burner across the baffled heat exchanger and are then discharged into an insulated stainless steel casing, with a single flue outlet.

Gas Train

Each Wessex-HE module is supplied with a gas train comprising a gas valve, appliance governor, two main solenoid valves and an orifice to control the volume of gas introduced into the fan inlet. A pressure switch monitors the flow of air/gas mixture to the burner.

High Flow Gas Valves

The 200kW module incorporates a unique patented flow sharing gas valve system. The flow sharing system enables a specified quantity of gas to be passed economically through small valves, whilst retaining the required degree of downstream pressure control. The new gas valve system also reduces noise levels in operation.

Water System

The Wessex-HE is designed to accommodate high rise applications and has a maximum working pressure of 6 bar. The boiler modules are designed as high efficiency, rapid response, low water content units.

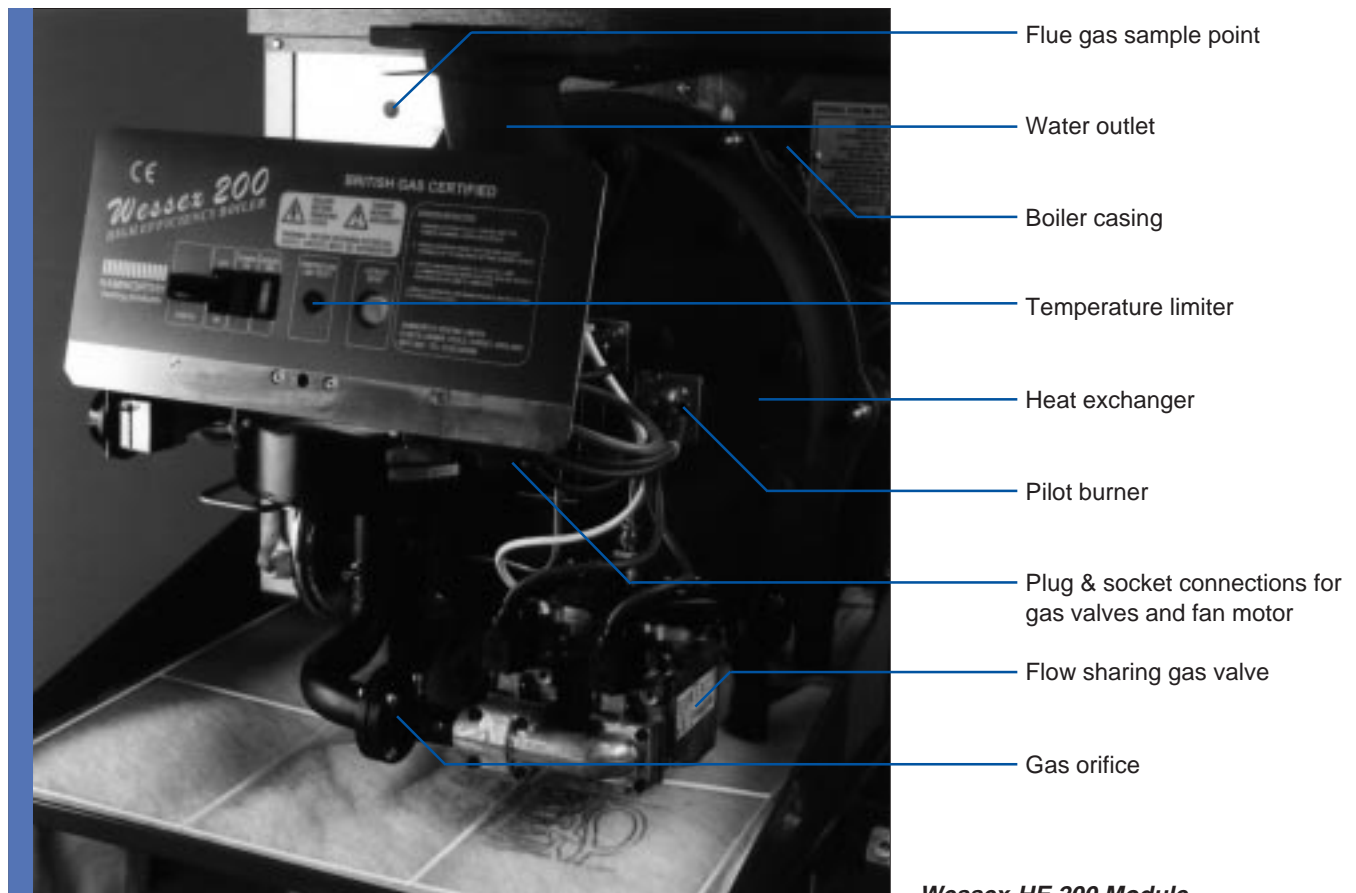
Wessex-HE boilers are suitable for use in open vented and pressurised systems.

Flow and return headers are available on all 50kW module multiple configurations.

Additional water manifold junction headers are available as an option for the Twinline series. Flow and return manifolds are equipped with instrument sockets and terminate with flanged connections.

Power Supply

230 volt, 50Hz, single phase. Each Wessex-HE module requires an independent isolator and fused electrical supply, enabling modules to be shut down without losing the entire boiler output.



Wessex-HE 200 Module

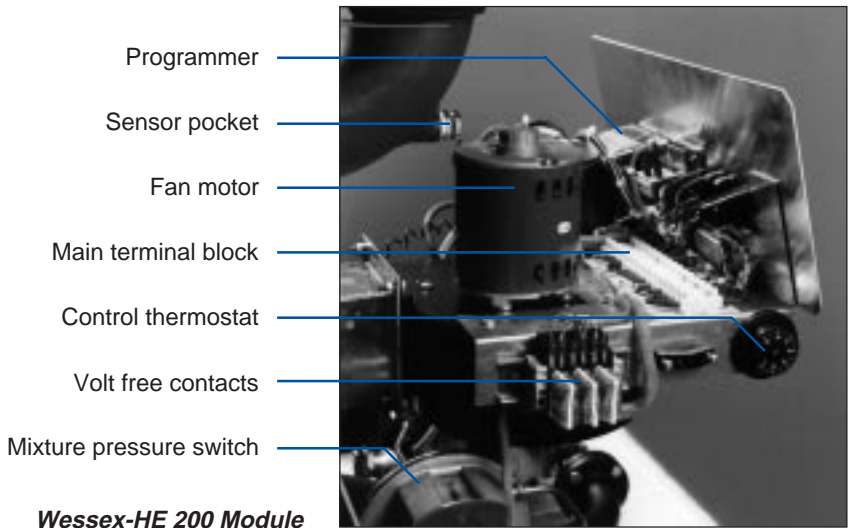


Controls

The controls supplied with each module include a fully automatic programmer with integral lockout lamp and reset push button switch, pilot burner assembly including ignition transformer, electrode, flame probe, pilot valve, control and limit thermostats, on/off switch, 'power on' and 'gas on' neon lamps.

The Wessex-HE incorporates a new plug and socket arrangement which allows components such as the fan motor and gas valves to be unplugged, simplifying routine maintenance and servicing.

A sequence control system should be used to achieve optimum efficiency from a modular installation. (see page 18)



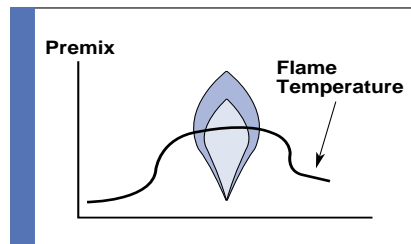
Low NOx

An area crucial to the success of reducing NOx emissions is the burner design and its ability to evenly distribute the excess air required during the combustion process.

In designing the burner, Hamworthy took consideration of the requirement for low NOx production, and any anticipated EC legislation.

Here the correct air/gas mixture is achieved before entering the burner

bar, and can effectively provide flames through the 360° of it's surface.



By pre-mixing the air and gas prior to ignition, the excess air required is evenly distributed achieving a more even temperature. This process results in low NOx production and is further assisted by the superior heat transfer qualities of the copper fins which keep the combustion chamber cool.

All Hamworthy Wessex-HE boiler NOx emissions are low, achieving European class 5 performance.

High Efficiency System

The central component to the Hamworthy design is a heat exchanger that can generate a highly efficient gas to water heat transfer, through a cylindrical extended surface heat exchanger constructed from finned copper tubes. To ensure an equal flow through each tube, sectioned end plates are incorporated into the design.

the removal of that heat requires an increase in the flow rate of water. This results in a smaller boiler with reduced water content. The combination of this low volume and high water velocity not only keeps solids in suspension, but increases the speed at which the boiler responds.

High Velocity/Reduced Risk of Blocking

When developing the heat exchanger, Hamworthy identified that tube diameters were to be an important feature of design.

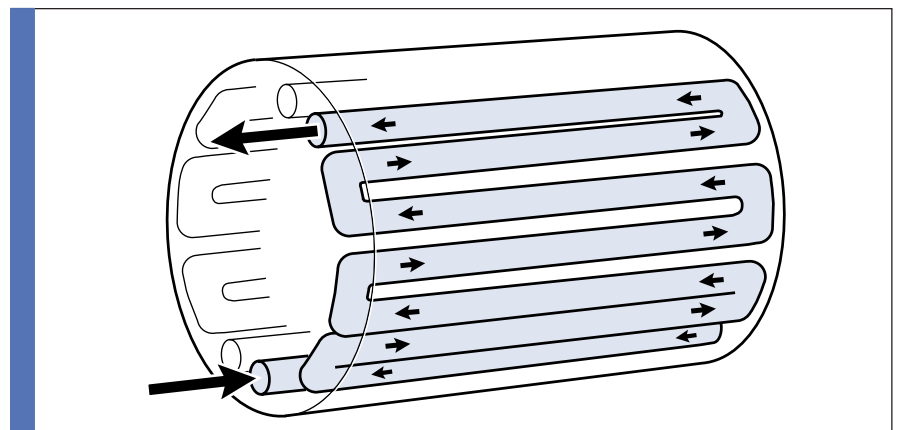
It was decided that the Wessex heat exchanger should have a 7/8" I/D tube as opposed to smaller I/D tube passes. With this in mind the Wessex-HE boiler can generate a high velocity of 1.4 m/s with the reduced risk of blocking in comparison to alternative smaller bore tubes.

Gas to Water Heat Transfer

The copper finned tubes of the Wessex-HE heat exchanger provide the perfect ratio of eight times more surface area on the gas side compared to the water side. In addition to this, copper is an ideal heat exchanger material being 8.5 times more conductive than cast iron or steel. It is also compatible with system water and offers resistance to flue gas corrosion.

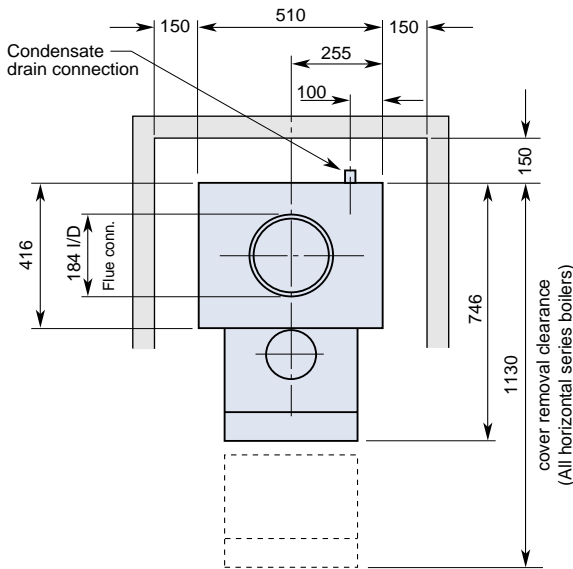
Rapid Response

The superior rate of heat transfer of the Wessex-HE boilers means that

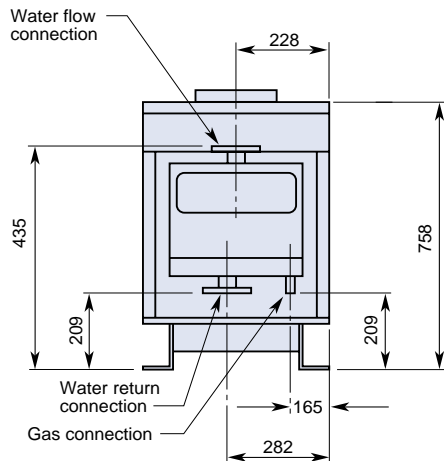


Dimensional Details

Wessex-HE 50 Horizontal Series

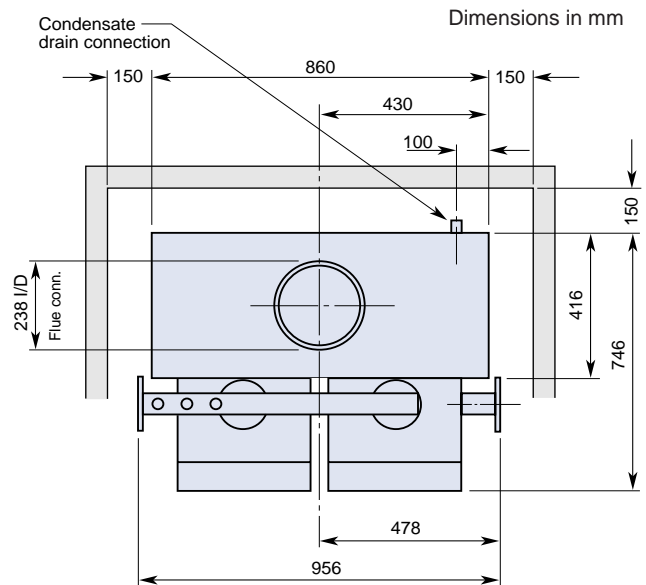


Plan View

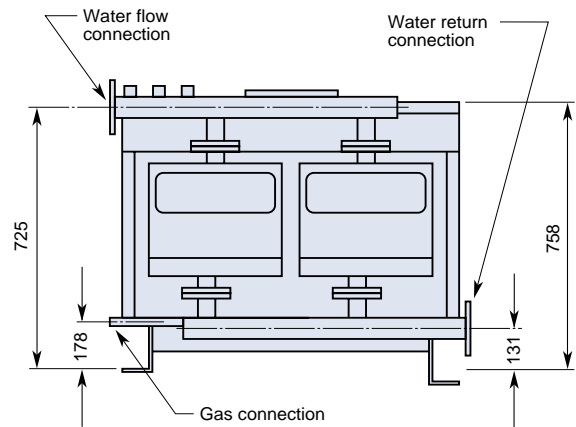


Front View

Wessex-HE 1 x 50H



Plan View



Front View

Wessex-HE 2 x 50H

Flue Condensate Drain

Each module casing is fitted with a 19mm OD (16mm ID) drain and will take a 3/4" OD tube compression fitting (Wade etc.)

The drain must be 15mm (1/2") ID minimum having a fall of at least 3° (approx. 5cm per metre) and consist of non-corrodible material leading to a gully via a waste trap.

Multiple Module Manifold Boilers

Double and triple 50kW module boilers are supplied with flanged water flow and return manifolds and a gas supply manifold.

The water manifolds are fitted with the following connections:

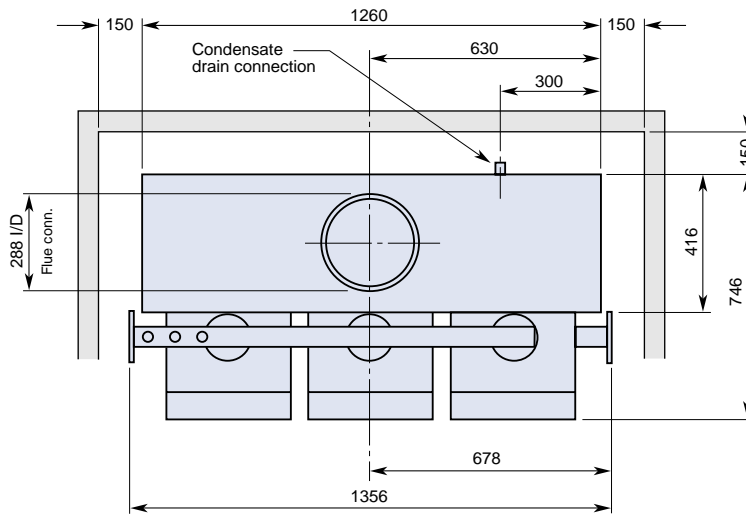
Rc 1/2" instrument sockets (2)

Rc 3/4" safety valve tapping

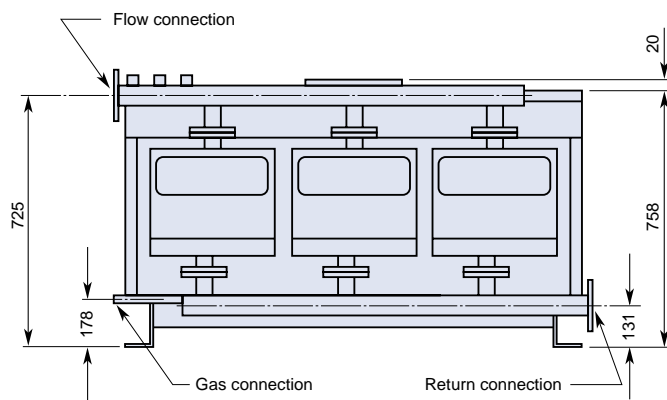
Rc 3/4" drain tapping



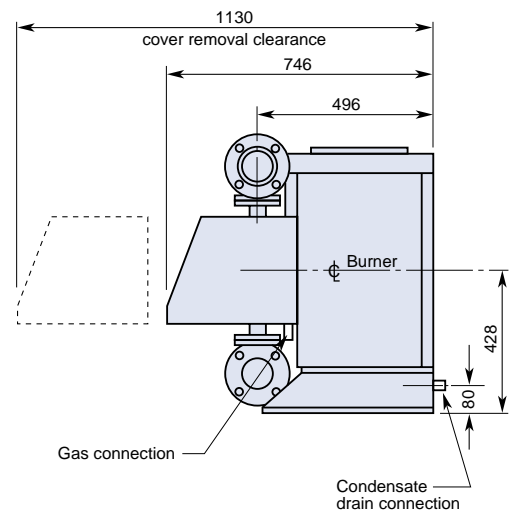
Dimensions in mm



Plan View



Front View



Side View

Wessex-HE 3 x 50H

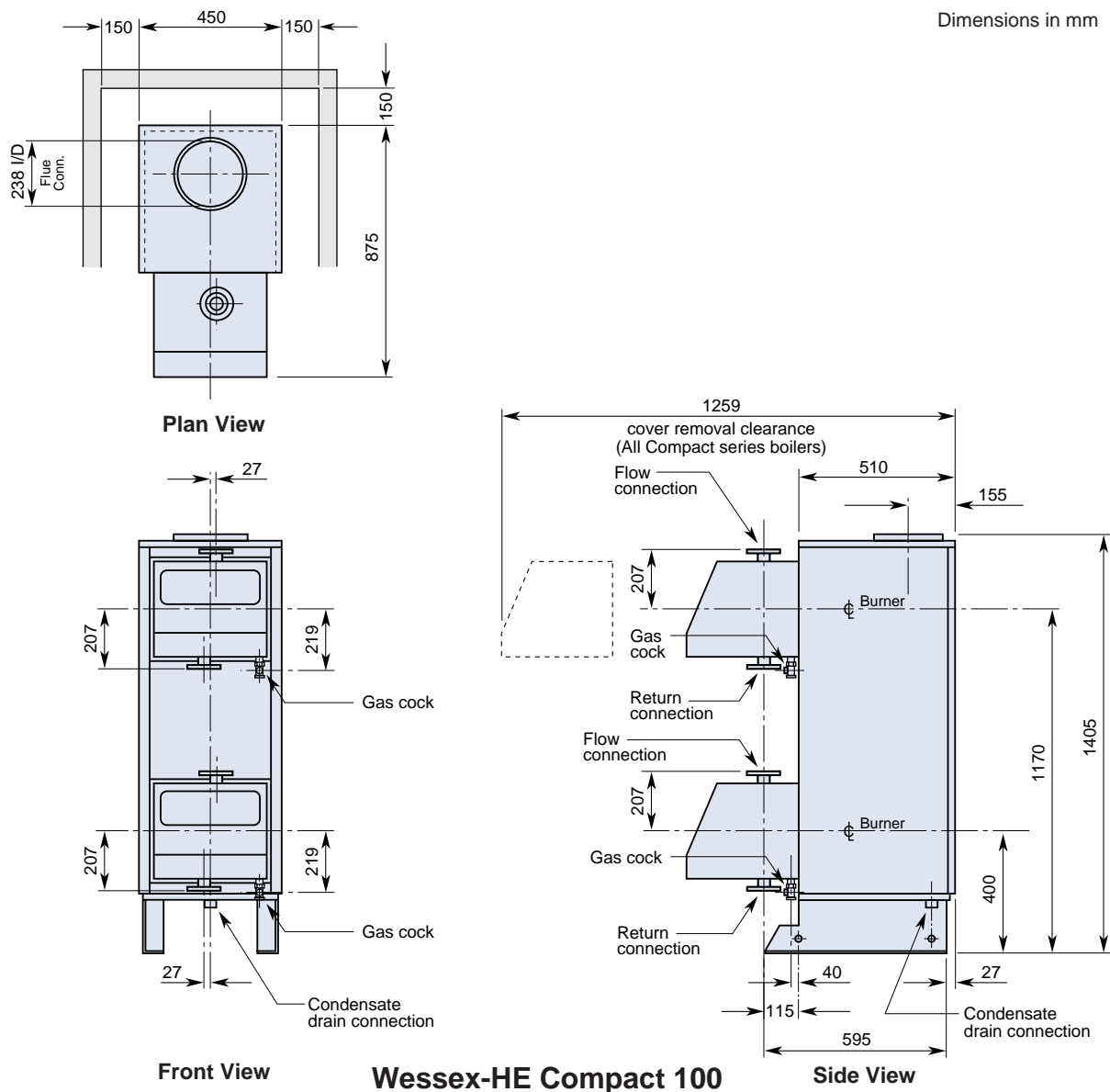
Boiler Model	No. of 50kW Modules	Output		Shipping Weight (kg) approx.	Flow & Return Flanged BS 4504 PN6	Gas Connection	Nominal Flue Bore
		kW	Btu/h x 1000				
1 x 50H	1	50	171	85	32	Rc ¹ / ₂ "	150
2 x 50H	2	100	341	165	50	R1"	200
3 x 50H	3	150	512	240	80	R1"	260

Installation Clearances

Wessex-HE 50 boilers should be positioned to allow a minimum clearance of 150mm from adjacent walls or equipment, to facilitate inspection. Access will be required to the rear of the boiler for connecting condensate drain pipework.

Dimensional Details

Wessex-HE 50 Compact Series



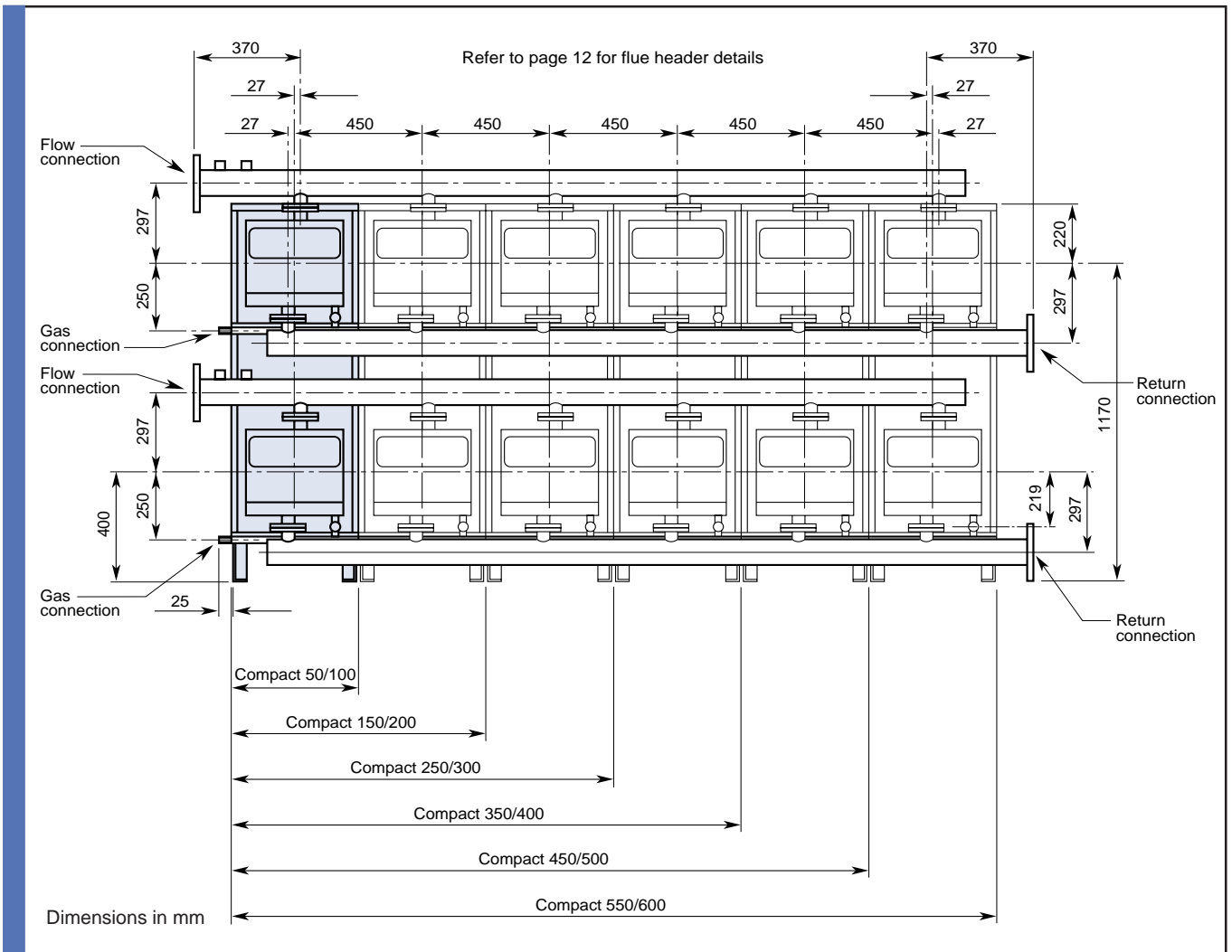
Flue Condensate Drain

Each module casing is fitted with an Rc $\frac{3}{4}$ " socket connection. The drain must be 15mm ($\frac{1}{2}$ " ID minimum having a fall of at least 3° (approx. 5cm per metre) and consist of non-corrodible material leading to a gully via a waste trap.

Multiple Module Boiler Manifolds

Multiple Compact boilers are supplied with flanged water flow and return manifolds and a gas supply manifold. The water manifolds are fitted with the following connections:

- Rc $\frac{1}{2}$ " instrument sockets (2)
- Rc 1" safety valve tapping
- Rc 1" drain tapping



Boiler Model	No. of 50kW Modules	Output		Shipping Weight (kg) approx.	Flow & Return Flanges BS 4504 PN6	Gas Connections	No. of Compact Casings
		kW	Btu/h x 1000				
Compact 50	1*	50	171	90	32	Rc1/2"	1
Compact 100	2	100	341	165	32	Rc1/2"	1
Compact 150	3*	150	512	255	50	R1"	2
Compact 200	4	200	682	330	50	R1"	2
Compact 250	5*	250	853	420	80	R1"	3
Compact 300	6	300	1024	495	80	R1"	3
Compact 350	7*	350	1195	585	80	R1 1/4"	4
Compact 400	8	400	1365	660	80	R1 1/4"	4
Compact 450	9*	450	1536	750	80	R1 1/4"	5
Compact 500	10	500	1706	825	80	R1 1/4"	5
Compact 550	11*	550	1876	915	80	R1 1/4"	6
Compact 600	12	600	2047	990	80	R1 1/4"	6

* Includes Compact 100 with one 50kW module blanked off. Multiple units are supplied with interlocking casings.

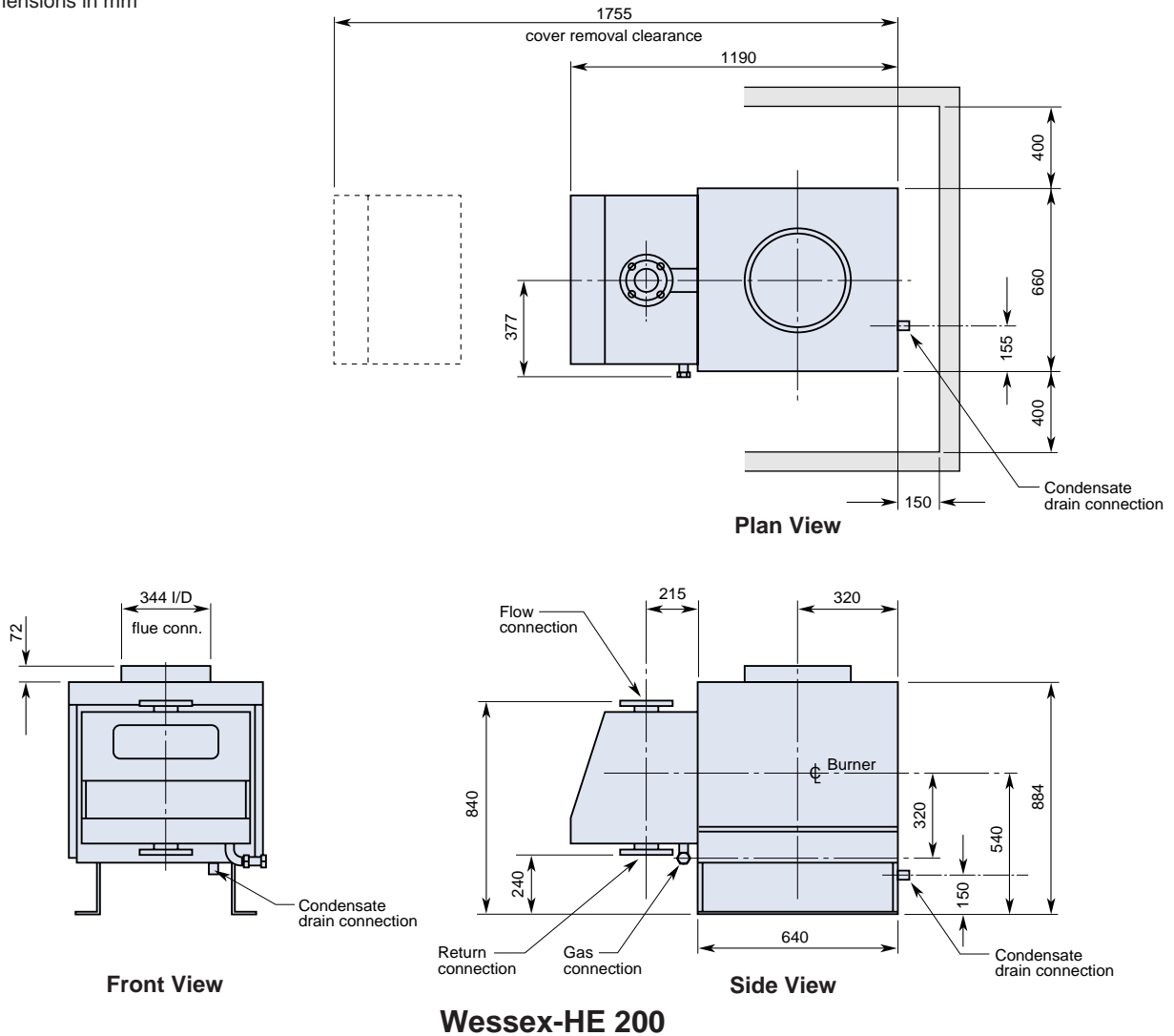
Installation Clearances

Wessex-HE 50 boilers should be positioned to allow a minimum clearance of 150mm from adjacent walls or equipment, to facilitate inspection. Access will be required to the rear of the boiler for connecting condensate drain pipework.

Dimensional Details

Wessex-HE 200

Dimensions in mm



Boiler Model	No. of 200kW Modules	Output		Shipping Weight (kg) approx.	Flow & Return Flanged BS 4504 PN6	Gas Connection	Nominal Flue Bore
		kW	Btu/h x 1000				
200	1	200	682	257	80	Rc1"	300

Flue Condensate Drain

Each module casing is fitted with a 19mm OD (16mm ID) drain and will take a 3/4" OD tube compression fitting (Wade etc.)

The drain must be 15mm (1/2") ID minimum having a fall of at least 3° (approx. 5cm per metre) and consist of non-corrodible material leading to a gully via a waste trap.

Installation Clearances

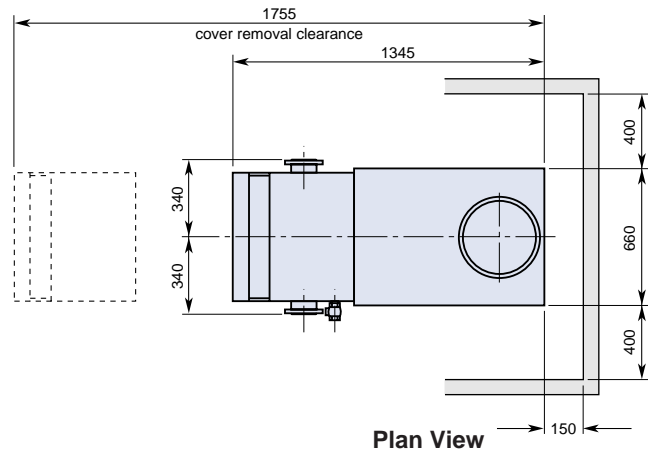
Wessex-HE 200 boilers should be positioned to allow minimum clearance of 150mm to rear and 400mm to each side, from adjacent walls or equipment, to facilitate inspection.

Access will be required to the rear of the boiler for connecting condensate drain pipework.

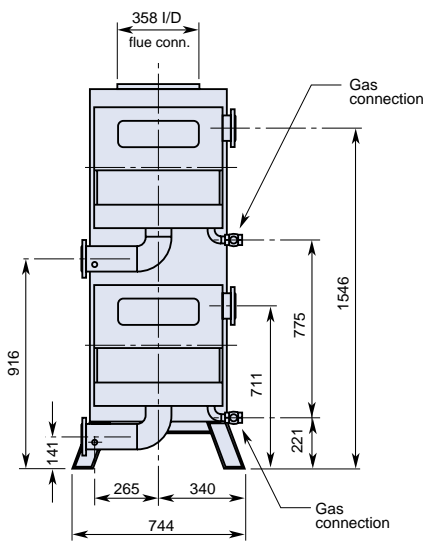
Dimensional Details

Wessex-HE County

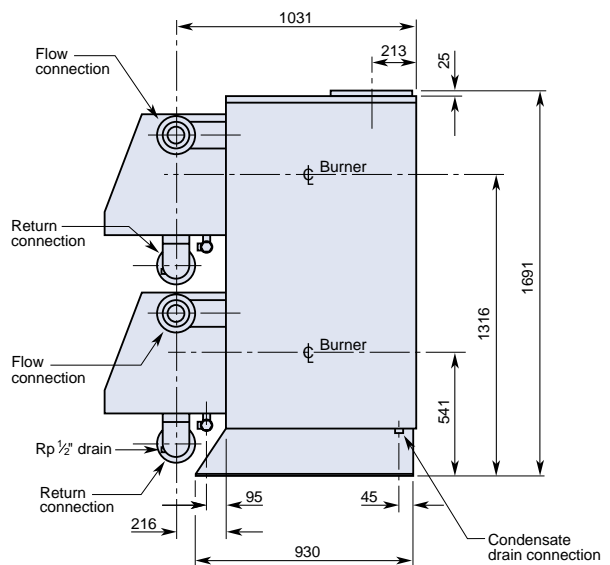
Dimensions in mm



Plan View



Front View



Side View

Wessex-HE County

Boiler Model	No. of 200kW Modules	Output		Shipping Weight (kg) approx.	Flow & Return Flanged BS 4504 PN6	Gas Connection	Nominal Flue Bore
		kW	Btu/h x 1000				
County 200	1*	200	682	315	80	Rc1"	350
County 400	2	400	1365	515	80	Rc1"	350

* County 400 with one 200kW module blanked off.

Flue Condensate Drain

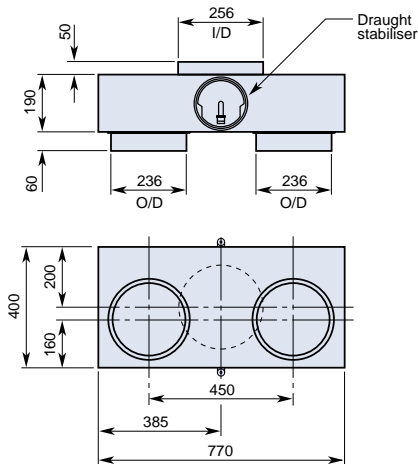
Each module casing is fitted with an Rc 3/4" socket connection. The drain must be 15mm (1/2") ID minimum having a fall of at least 3° (approx. 5cm per metre) and consist of non-corrodible material leading to a gully via a waste trap.

Installation Clearances

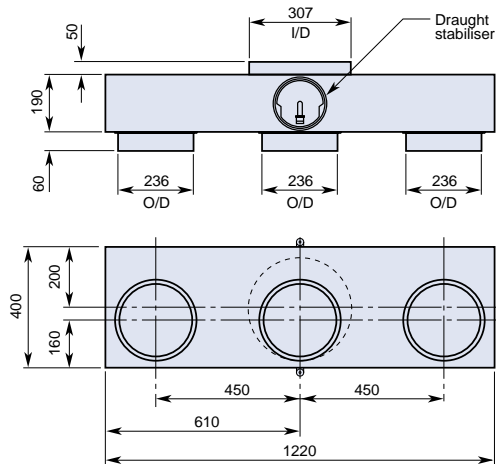
Wessex-HE County boilers should be positioned to allow minimum clearance of 150mm to rear and 400mm to each side, from adjacent walls or equipment, to facilitate inspection. Access will be required to the rear of the boiler for connecting condensate drain pipework.

Dimensional Details

Flue Headers for Compact Series



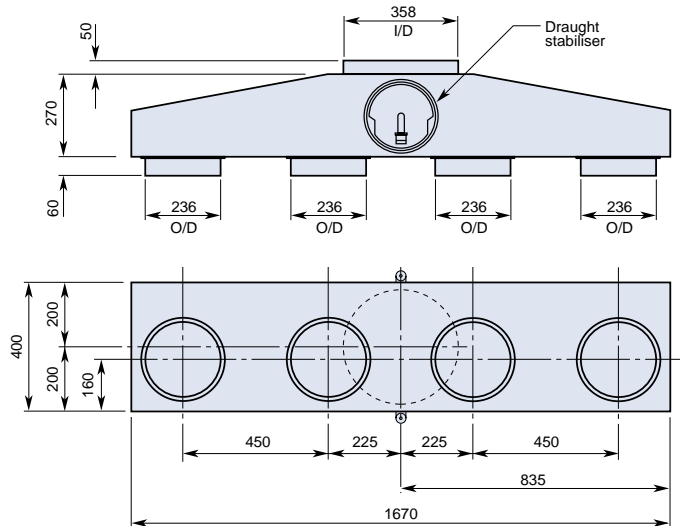
2 Boiler Flue Header



3 Boiler Flue Header

Construction

Stainless steel, 430 S17 BA, 18 SWG.
Spot welded fabrication sealed against condensation leakage.



4 Boiler Flue Header

Dimensions in mm

Wessex-HE 50kW & 200kW Modular Boilers

Electrical Supply

230 volt, 50Hz, single phase.

Independent supply required for each 50kW and 200kW module.

Features

Fully automatic pre-mix gas burner, with internal stainless steel casing and plastic coated steel outer insulating panels.

Control thermostat	- Range	0-120°C
Safety temperature limiter	- Range	90-110°C
Operating temperatures	- Range	65-90°C

High temperature version (optional)

Safety temperature limiter	- Range	95-130°C
Operating temperatures	- Range	90-119°C



Technical Data

Performance and General Data Information

		50kW Modules Horizontal Series			50kW Modules Compact Series							200kW Modules			
		1x50H	2x50H	3x50H	50	100	200	300	400	500	600	200	County		
Boiler Model		1	2	3	1*	2	4	6	8	10	12	1	2		
Number of Modules		1	2	3	1*	2	4	6	8	10	12	1	2		
Energy	Output	kW		50	100	150	50	100	200	300	400	500	600	200	400
		Btu/h x 1000		171	341	512	171	341	682	1024	1365	1706	2047	682	1365
	Boiler input (gross)	kW		59.5	119.0	178.5	59.5	119.0	238.0	357.0	476.0	595.0	714.0	238	476
	Btu/h x 1000		203	406	609	203	406	812	1218	1624	2030	2436	812	1624	
	Boiler input (nett)	kW		53.7	107.3	161.0	53.7	107.3	214.6	322.0	429.3	536.6	643.9	215	429
	Btu/h x 1000		183	366	549	183	366	732	1099	1467	1830	2197	732	1467	
Water	Water content (not including headers)	l		4	8	12	4	8	16	24	32	40	48	20	40
		UK gal		0.88	1.76	2.64	0.88	1.76	3.52	5.28	7.04	8.80	10.56	4.40	8.80
	System design flow rate @ 11°CΔt across module	l/s		1.07	2.13	3.20	1.07	2.13	4.27	6.40	8.53	10.67	12.80	4.27	8.53
		UK gal/min		14.2	28.4	42.6	14.2	28.4	56.8	85.2	113.6	142.0	170.4	56.8	113.6
	Minimum flow rate at any time @ 14°CΔt rise	l/s		0.83	1.67	2.50	0.83	1.67	3.33	5.00	6.67	8.33	10.00	3.33	6.67
		UK gal/min		11	22	33	11	22	44	66	88	110	132	44	88
	Waterside pressure loss @ 11°CΔt	mbar		116			116						103		
		ft head water		3.9			3.9						3.5		
	Maximum water pressure	bar		6			6						6		
		psig		87			87						87		
	Minimum water pressure modular application 82°C flow 11°CΔt	bar		0.2	0.42	0.42	0.2	0.42					0.2	0.42	
		psig		2.9	6.1	6.1	2.9	6.1					2.9	6.1	
Gas	Input rate natural gas (G20)	m³/h		5.7	11.3	17.0	5.7	11.3	22.7	34.0	45.4	56.7	68.0	22.7	45.4
		ft³/h		200	400	600	200	400	800	1200	1600	2000	2400	800	1600
	Nominal gas inlet pressure at boiler. natural gas (G20)	mbar		20			20						20		
		in wg		8			8						8		
	Min. gas inlet pressure at boiler natural gas (G20)	mbar		17			17						17		
		in wg		6.8			6.8						6.8		
	Maximum gas inlet pressure at boiler (G20)	mbar		25			25						25		
		in wg		10			10						10		
Flue	Approx flue gas volume @ 9% CO ₂ @ NTP	m³/h		72	144	216	72	144	288	432	576	720	864	288	576
		ft³/h		2540	5080	7630	2540	5080	10170	15250	20340	25400	30500	10170	20340
	Approx flue gas temp. nett	°C		125			125						125		
		°F		257			257						257		
Connection	Water flow/return connection flanges BS4504 PN6	32	50	80	32	32	50	80	80	80	80	80	80	80	
	Gas connection	Rc/R BSP	Rc ¹ / ₂ "	R1 1"	R1 1"	Rc ¹ / ₂ "	2xRc ¹ / ₂ "	2xR1 1"	2xR1 1"	2xR1 1"	2xR1 ¹ / ₄ "	2xR1 ¹ / ₄ "	2xR1 ¹ / ₄ "	Rc1 1"	2xRc1 1"
	Flue socket (ID)	mm	184	238	288	238 on each compact casing							344	358	
	Nominal flue bore	mm	150	200	250	1x200	1x200	2x200	3x200	4x200	5x200	6x200	300	350	
Electrics	Power requirements	W	125	250	375	125	250	500	750	1000	1250	1500	250	500	
	Electrical supply	230v AC 50Hz Single Phase													

* Compact 100 with one 50kW module blanked off

Application & System Data

The installation of all boilers MUST be in accordance with the relevant requirements of Gas Safety Regulations, I.E.E. Regulations and the bye-laws of the local water undertaking. It should also be in accordance with any relevant requirements of the local gas region, local authority and relevant recommendations of the following documents:

British Standards

BS 6891: Installation of low pressure gas pipework of up to 28mm in domestic premises.

BS 6644: Installation of gas fired hot water boilers - 60 kW to 2 mW.

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

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

BS 3456: Electrical Standards.

CP 342: Centralised hot water supply. Part 2: Buildings other than individual dwellings.

British Gas Publications

IM/2 Purging procedures for non domestic gas installations.

IM/5 Soundness testing procedures for industrial and commercial gas installations.

IM/11 Flues for commercial and industrial gas fired boilers and air heaters.

IM/16 Guidance notes on the installation of pipework.

Boiler Accessories

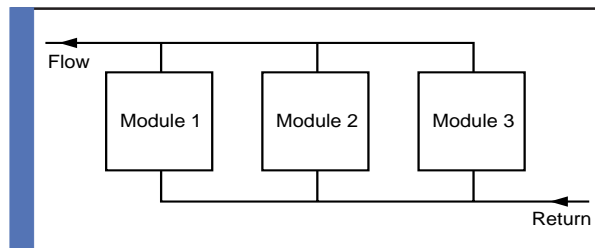
Wessex-HE boiler modules are supplied with control and high limit thermostats. The following items (not supplied) should be fitted to the boiler pipework system to satisfy British Standards. Each isolatable module or arrangement of modules, should have a drain cock at the lowest point, a pressure relief valve and an open vent, (or high/low pressure switches on closed systems). An altitude gauge and temperature gauge should be fitted to the flow manifold beyond the entry of the last module but before any branches to different circuits. If a sequence control panel is fitted, the flow temperature sensor should be fitted in a similar position.

Boiler base

Wessex-HE boilers should be positioned on a level non combustible surface that is capable of adequately supporting its weight (when filled with water) and any ancillary equipment. Adequate space for installation and servicing should be considered. Clearance details are provided on the dimensional details page for each model range.

Water systems - Modular installations

Wessex-HE modular boilers are suitable for installation in both open vented and closed systems. Irrespective of the type of system, the water 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 pressure loss across any number of boilers will never be greater than the head loss across one boiler plus local pipework losses. Flow and return headers are supplied with multiple 50kW module boilers as appropriate. Optional junction headers are available for Twinline boiler installations, to connect headers in back-to-back arrangements.



Wessex-HE modular boilers in "reverse return arrangement"

Adequate water flow

Hamworthy Wessex-HE modular boilers are designed as high efficiency, rapid response, low water content units. Care must be taken with initial system design and layout to ensure that there is adequate waterflow through each module, and that the influence of the system control does not adversely affect that flow at any time. A minimum flow rate equal to 80% of the quoted design flow must be maintained at all times when the burner is firing.

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 passages. Details of additives can be obtained from any specialist water treatment manufacturer or local water authority. When Wessex-HE units replace boilers in an existing system, it is important that the existing system is thoroughly flushed through to remove any accumulation of scale and sludge. If there is any doubt regarding the cleanliness of the system, a coarse filter should be installed in the return pipework to the modules. The filter should be fitted with isolating valves and inspected regularly after commissioning.

Open vent pipe and cold feed pipe

Boiler	Open vent size	Cold feed size
<60kW	25mm (1in)	19mm (3/4 in)
60kW-150kW	32mm (1 1/4 in)	25mm (1in)
150kW-300kW	38mm (1 1/2 in)	32mm (1 1/4 in)
300kW-600kW	50mm (2in)	38 (1 1/2 in)

Pressure relief valve

Each boiler, or in the case of a modular installation, each bank of boilers must be fitted with a pressure relief valve to BS759 or BS6759 Pt.1 and sized as shown in BS6644. BS6644 provides comprehensive information for the selection and location of safety valves and attention is drawn to the higher capacity requirements of safety valves for pressurised hot water systems.

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	95°C
Safety margin	17°C
Equivalent saturated steam temperature	————
	112°C

From steam tables corresponding gauge pressure - 0.50 bar (7.3 psi) - 5.1m (16.7ft) 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.

Required mixed flow temperature	82°C
Temperature rise across modules at minimum flow rate	11°C
Safety margin	17°C
Equivalent saturated steam temperature	————
	110°C

From steam tables corresponding gauge pressure 0.42 bar (6.1 psi) - 4.3m (14ft) head of water.

Electrical details

Supply 230V 50Hz, single phase.

Wiring external to the boiler must be installed in accordance with I.E.E. 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. An isolator correctly fused at 5 amps should be sited close to the boiler, for each module.

Thermostats

The control thermostat supplied as standard has a range of 0-120°C, and will be factory pre-set in the range 0-90°C. (The minimum module operating temperature setting should be 65°C). In a modular boiler system controlled by an external sequencer, the control stat would be typically some 10°C above the system set point. The temperature limiter that is supplied as standard has a range of 90-110°C. This will normally be factory pre-set at 100°C. If flow temperatures in excess of 90°C are required, a higher safety temperature limiter will be needed which has a range of 95-130°C. **This must be specified at the time of ordering, if required.**

The maximum module flow temperature is 119°C when using the higher safety temperature limiter.

Time clock control

Where boilers are operated from time clocks, to avoid overheating and progressive calcium deposition at zero flow conditions, provision should be made for a 5 minute circulating pump over run after the last boiler has ceased firing.

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 boiler modules, 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 boilerhouse 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:

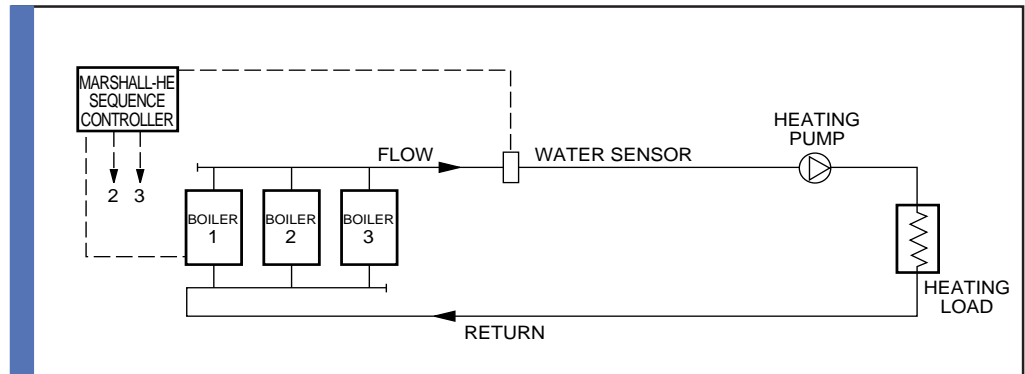
Low Level (Inlet)
540cm² plus 4.5 cm² per kW in excess of 60kW total rated input.

High Level (Outlet)
270cm² plus 2.25 cm² per kW in excess of 60kW total rated input.

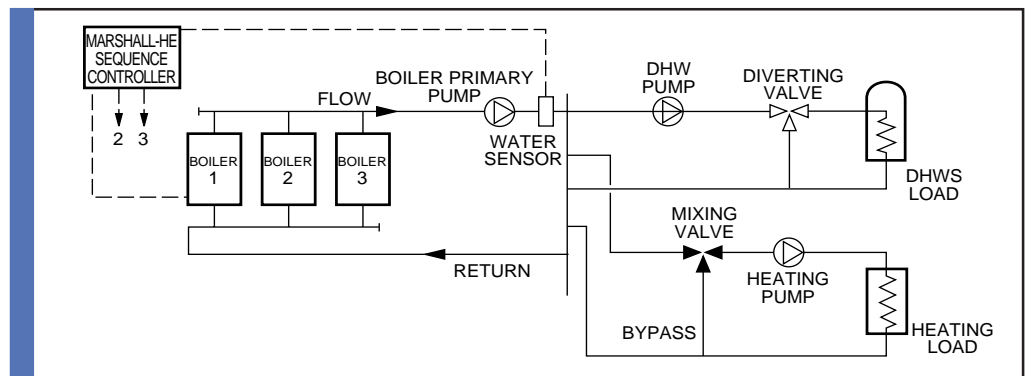
System Design

The installation of modular boilers in commercial and industrial heating and hot water systems offer a wide choice of design options and applications. The following systems shown are typical and should be considered for general guidance.

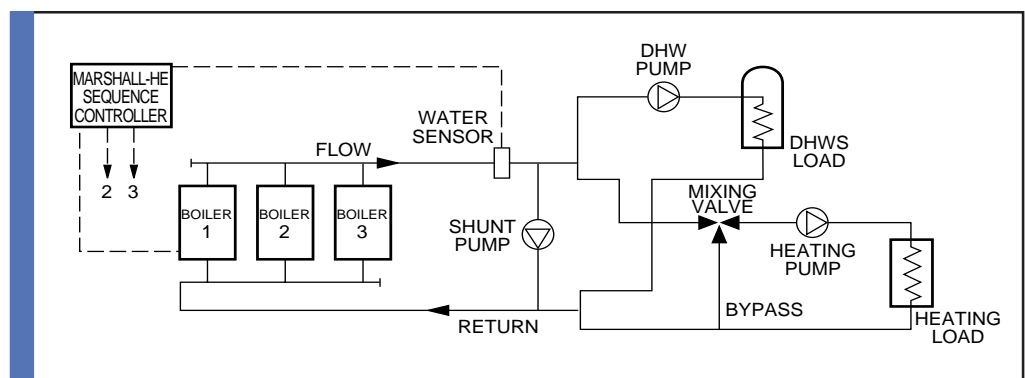
Example 1
Heating only.



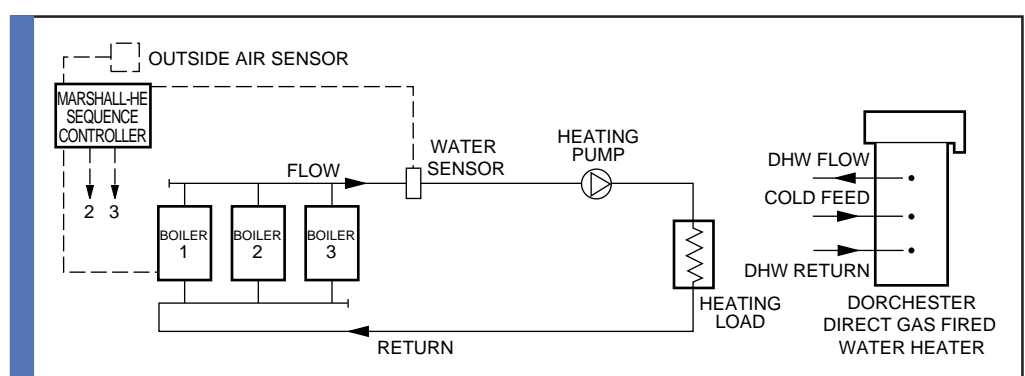
Example 2
Combined heating and domestic hot water with diverting valve on DHW and mixing valve on heating.



Example 3
Combined heating and domestic hot water with mixing valve on heating and shunt pump.



Example 4
Split system. Completely separate heating and DHW systems: Modular boilers under direct compensated control for heating and direct gas fired water heaters for DHW.

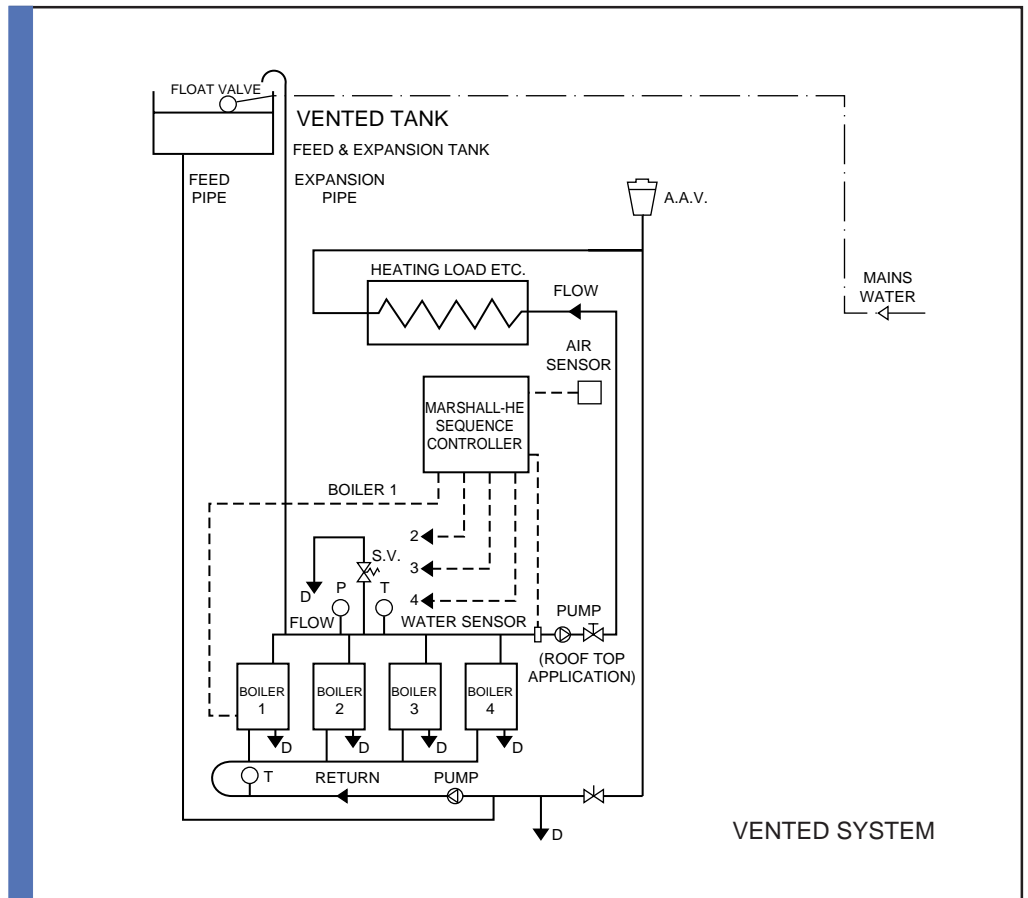


Legend

- D = Drain
- P = Pressure gauge
- T = Temperature gauge
- S.V. = Safety valve
- L.V. = Lockshield valve
- A.G.L. = Anti-gravity loop
- A.A.V. = Automatic air vent

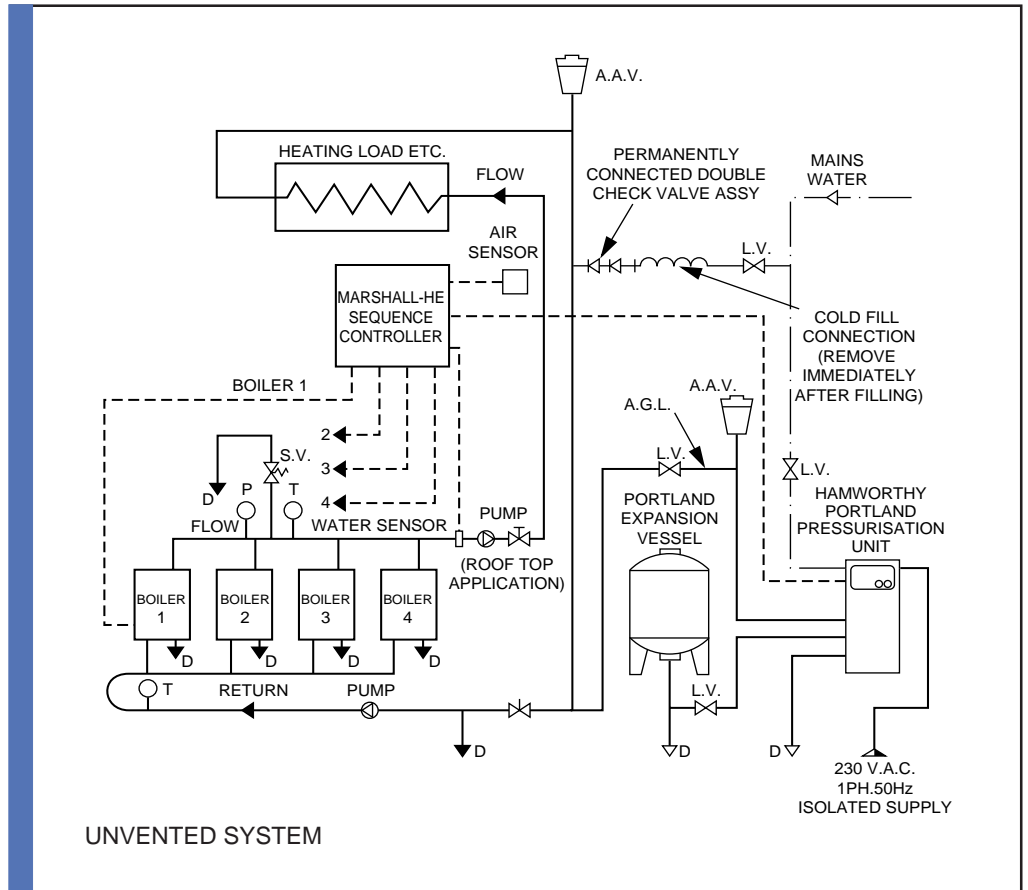
Example 5

Boiler installation (typical) vented system.



Example 6

Boiler installation (typical) unvented system.



General notes

In any single or modular system, it is important that the water flow rate through each firing boiler does not fall below the minimum required flow rate for that size of boiler (see table page 13).

In applications where the minimum flow rate will not be met a shunt pump should be installed, sized to provide the minimum stated flow rate per boiler at the equivalent boiler pressure drop plus pipework resistance.

Both heating and shunt pumps should be controlled to provide an overrun period to dissipate residual heat.

Gas Pipework

Supply pipes must be fitted in accordance with BS6891 or IM/16 as appropriate. Pipe work must be of adequate size. Pipes should not be of a smaller size than the boiler gas connections. The complete installation must be purged and tested for soundness as described in BS6891 or IM/2 and IM/5 as appropriate. Advice and guidance on the capacity of gas meters and available gas pressure can be obtained from local or regional British Gas offices.

The table opposite expresses pipe lengths from gas meter to appliance which will produce approx. 1 mbar pressure loss. This table **must** be used in conjunction with losses of various fittings shown in the table below.

Reductions for fittings (metres)

Type of fitting	Per elbow	Per tee	Per 90° bend
1/2" dia.	0.5	0.5	0.3
3/4" dia.	0.5	0.5	0.3
1" dia.	0.5	0.5	0.3
1 1/4" dia.	1.0	1.0	0.3
1 1/2" dia.	1.0	1.0	0.3
2" dia.	1.5	1.5	0.5
2 1/2" dia.	2.0	2.0	0.5
3" dia.	2.5	2.5	1.0
4" dia.	3.5	3.5	1.5

Delivery

All modules are supplied fully assembled and works tested, packed in shrink wrap protective covers. Casing insulation panels are supplied packed in separate cardboard containers.

Twinline units are supplied with the additional steel support frame, stainless steel connecting flue sections and junction pipework (if ordered) supplied as loose items. Installers guides are supplied with each contract.

The compact and lightweight structure of the Wessex-HE with ease of manoeuvrability makes it the ideal choice for the modern, compact plant room. Capable of operating at 6 bar water pressure, it is equally at home in the basement of high rise buildings, as at roof top level.

Gas flows in pipes

Wessex HE Boiler Power (output) kW	Maximum length of gas pipe (Metres)								
	1/2" dia	3/4" dia	1" dia	1 1/4" dia	1 1/2" dia	2" dia	2 1/2" dia	3" dia	4" dia
50	1.5	7.5	25	60	180	820	-	-	-
100	-	2	6	28	37	170	530	-	-
150	-	-	-	-	12	56	180	-	-
200	-	-	-	-	-	35	110	660	-
250	-	-	-	-	-	21	68	390	-
300	-	-	-	-	-	14	45	260	-
350	-	-	-	-	-	10	27	170	810
400	-	-	-	-	-	-	23	135	640
450	-	-	-	-	-	-	18	100	480
500	-	-	-	-	-	-	14	80	370
550	-	-	-	-	-	-	11	65	300
600	-	-	-	-	-	-	10	51	245

For example: Wessex-HE boilers with an output totalling 200kW being fed by 2 1/2" pipe with 6 elbows between gas meter and boiler manifold can have a maximum length of 110 - (6x2) = 98 metres run to achieve a 1mbar loss. Note: Information above is based on IM/16.

Commissioning

Hamworthy Heating Ltd strongly recommend that all boilers are commissioned by their service department or an approved burner specialist.

For more information on commissioning contact Hamworthy Heating Service Department: **01202 662555.**

Modular Boiler Control System

The Marshall-HE boiler sequence controller is the latest in the line of controllers from Hamworthy Heating, designed to achieve optimum efficiency from modular boiler installations.

Suitable for use with all Hamworthy boilers, the Marshall-HE utilises microprocessor technology to offer the most comprehensive package to date which is totally flexible, easy to use and at the same time provides system security against unauthorised tampering.

The control panel, housed within a smart, slim lightweight casing, is designed to be installed on the boilerhouse wall or alternatively can be located anywhere within the building.

Programming the controller is achieved through an easy to follow display with



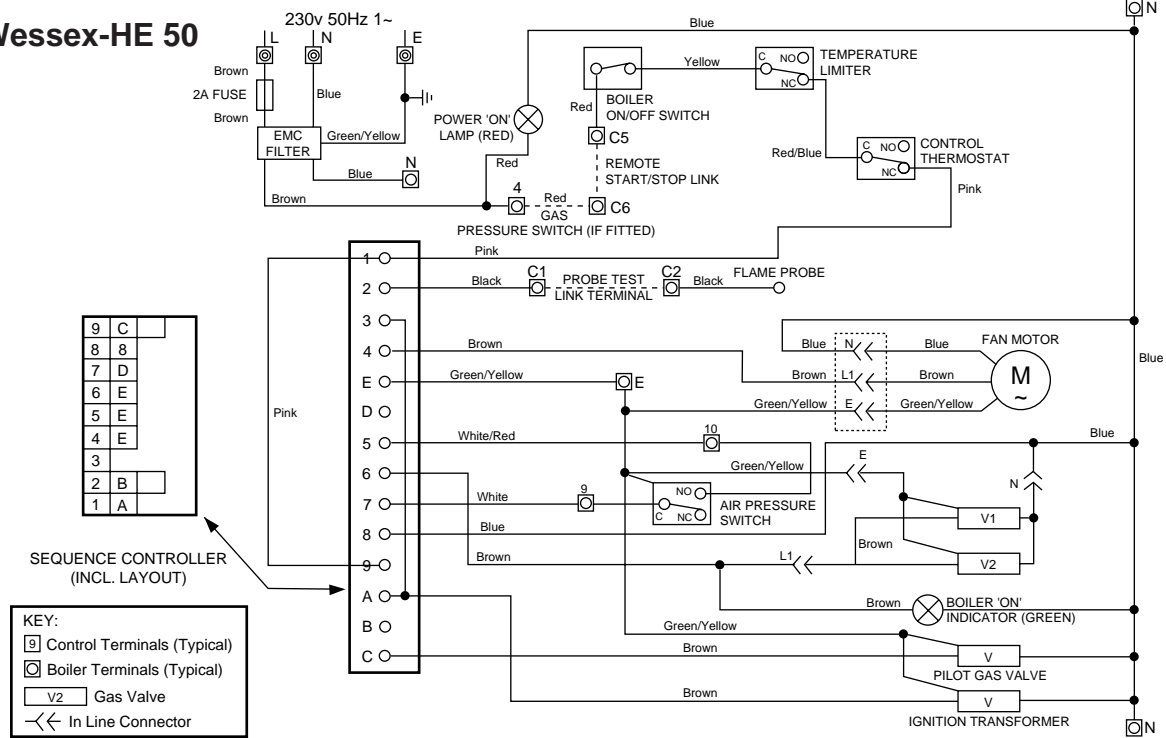
Marshall-HE Boiler Sequence Controller

settings entered using the numeric keypad. The entire system is protected and requires input of a security code to access the programming setup. A service mode is available to allow servicing of the boilers and override the control system.

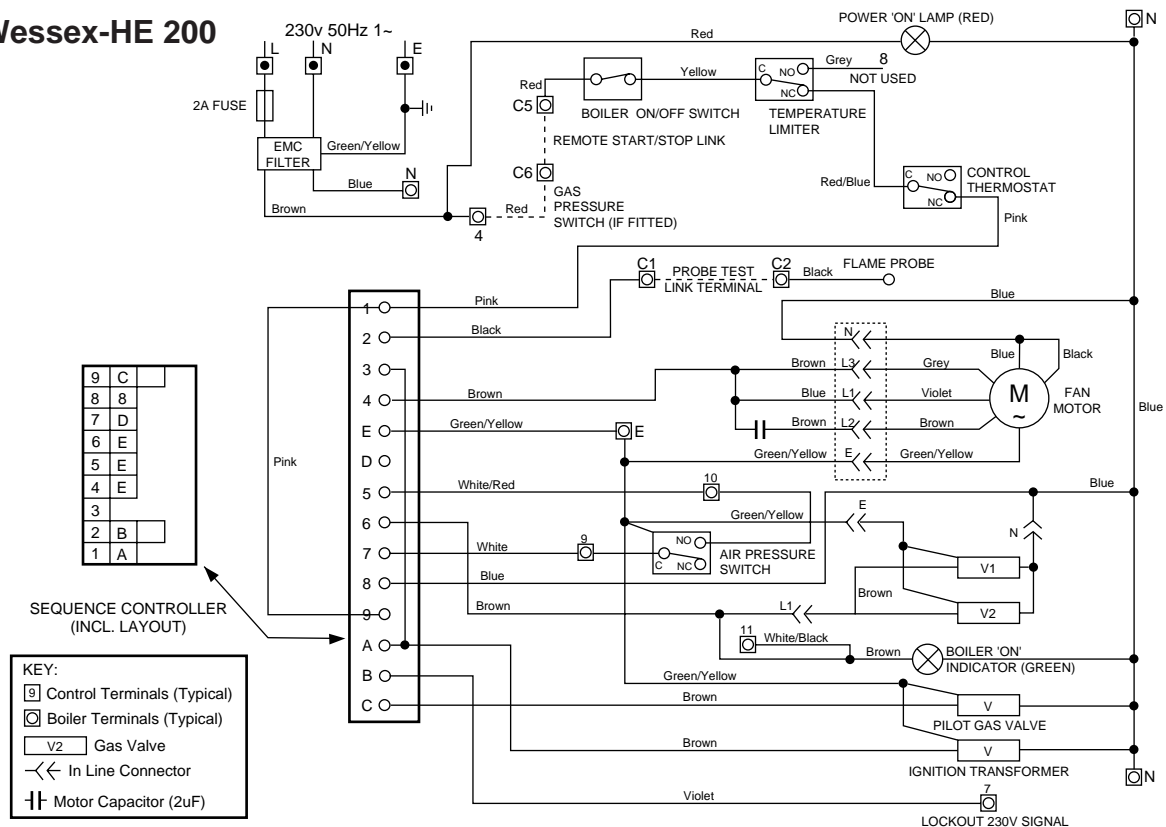
For further details on the Marshall-HE, refer to publication 500002136.

Wiring Diagrams

Wessex-HE 50



Wessex-HE 200



Flue Sizing Guide

Note:

Data is limited to twin walled circular ducts ranging from 152mm (6") to 610mm (24") ID having U values of 1.4 W/m² °C to 2.8W/m² °C.

General principles to be observed:

1. Position boiler as close as possible to the chimney to limit friction and heat loss.
2. Avoid short radius 90° bends.
3. Avoid abrupt section changes - use transition pieces.
4. Arrange header to chimney entries as swept bends or sloping tees of not less than 40° to the horizontal.

5. Avoid protrusion of the headers beyond the inner face of the chimney.
6. All joints should be installed to direct condensation towards the boiler without leakage.
7. Avoid long 'dead legs' under

header to chimney entry point because they can produce harmonic pulsation.

For further information refer to:
British Gas Publications - IM/11
'Flues for Commercial and Industrial Gas Fired Boilers and Air Heaters'

Wessex-HE Modules	Exhaust Gas Mass Flow (kg/sec.)	Exhaust Gas (Temp. °C)
1 x 50 kW	0.025	125°
2 x 50 kW	0.050	125°
3 x 50 kW	0.075	125°
200 kW	0.100	125°

Flue Heights for Wessex-HE Boilers

Nett Boiler Exhaust Temperature = 125°C
 Boiler House Ambient Temperature = 20°C
 Outside Ambient Temperature = 10°C
 Flue Gas Mass Flow (1 x 50kW) = 0.025 kg/sec
 Chimney U-Value = 1.4 W/m² °C
 Duct U-Value = 1.4 W/m² °C

Notes:

- (i) The diameter of the chimney and header are assumed to be the same.
- (ii) The chimney is fitted with a standard terminal.
- (iii) The outlet from the header is at the end, not the centre.
- (iv) The boilers are located as close as possible to the chimney on an upwardly inclined section of duct.

This table gives a guide to Chimney heights for combinations of Wessex-HE 50's and Wessex-HE 200's (NOT Twinlines). The representative flue system includes one capped tee, two bends, six metres of horizontal duct and an obtuse tee into the chimney. The primary flue from the unit furthest from the chimney should be 152mm diameter for a Wessex-HE 50 and 305mm diameter for a Wessex-HE 200.

No. of 50 kW's	Header Diameters (mm)										
	152	178	203	254	305	356	406	457	508	559	610
	Chimney Height (metres)										
1	3.0	2.0	1.5	1.5	1.5	-	-	-	-	-	-
2	9.0	4.5	3.0	2.0	1.5	-	-	-	-	-	-
3	23.0	9.0	5.0	2.5	1.5	-	-	-	-	-	-
4	-	17.0	8.5	3.5	2.0	1.5	-	-	-	-	-
5	-	-	14.0	5.5	3.0	2.0	1.5	-	-	-	-
6	-	-	22.0	7.0	3.5	2.5	2.0	1.5	-	-	-
7	-	-	-	9.5	4.5	3.0	2.0	1.5	-	-	-
8	-	-	-	13.0	6.0	3.5	2.5	2.0	1.5	-	-
9	-	-	-	16.5	7.5	4.0	3.0	2.0	1.5	-	-
10	-	-	-	-	9.0	5.0	3.0	2.5	2.0	1.5	-
11	-	-	-	-	10.5	5.5	3.5	2.5	2.0	1.5	-
12	NOTE: When using Hamworthy Wessex flue headers, the flue size should remain the same size as the header off-take throughout the system.			-	13.0	6.5	4.0	3.0	2.0	2.0	1.5
13				-	15.0	7.5	4.5	3.0	2.5	2.0	1.5
14				-	-	9.0	5.5	3.5	2.5	2.0	2.0
16				-	-	11.0	6.5	4.5	3.0	2.5	2.0
20				-	-	18.0	10.0	6.0	4.0	3.0	2.5
24				-	-	-	14.5	8.5	6.0	4.0	3.0
28	-	-	-	-	-	20.0	11.5	7.5	5.5	4.0	

Dimensions to nearest 0.5 metre.

NOTE: A 200 is equal to 4 x 50kW's for this table. e.g. for a system of 3 Wessex-HE 200's use the value 12 for the number of 50 kW's etc.

Flue System

General Requirements

The Wessex-HE is designed for direct connection to a flue system and flue outlets from more than one boiler may be connected to a single chimney, providing the relevant requirements of the current Building Regulations are adhered to.

The Wessex-HE has a low draught requirement and is therefore able to operate with a low chimney, improving the aesthetic appearance of the building exterior.

The flue system should be designed to maintain atmospheric pressure or a slight suction at the module flue connection at all times.

If at any time the suction is likely to exceed 0.1 mbar (0.04 in wg), it is recommended that a draught stabiliser be fitted to the flue system.

Because of their high operating efficiency 85% gross (94% nett), Wessex-HE modular boilers have a correspondingly low exhaust gas temperature (125°C - 130°C). The flue gas temperature provides the motive force in overcoming flue resistance, therefore this temperature must be maintained. It is recommended that twin walled or insulated flue ducts incorporating a stainless steel inner skin are used on all Wessex-HE installations.

NOTE: Where twin walled insulated flues are used, minimum draught condition at the furthest module will be obtained with all modules firing under summer ambient (20°C) temperature. Maximum draught condition will be obtained with one module firing under winter ambient (0°C). Both conditions should be checked and a controller(s) fitted if the draught exceeds 0.1 mbar (0.04 in wg).

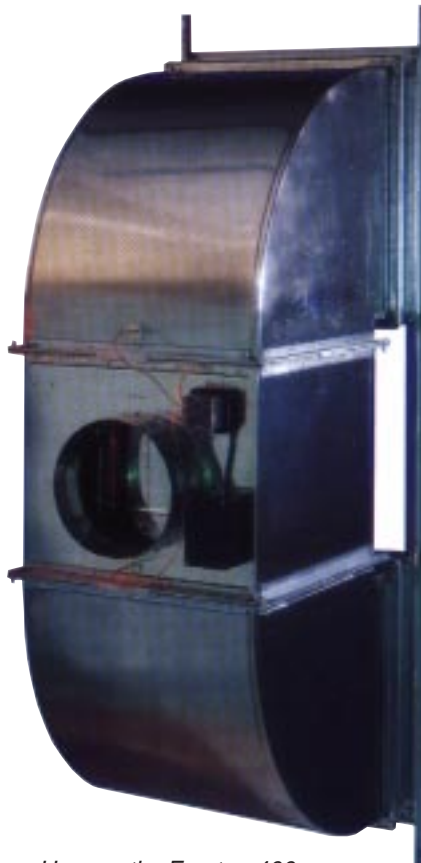
Wessex-HE boilers are suitable for connection to a fan diluted flue system, refer to British Gas publication IM/11 'Flues for commercial and industrial gas fired boilers and air heaters.'

Refer to Hamworthy Publication 500002095 for details of our Forston 400 fan dilution system.

Flue Condensation

As a result of the high thermal efficiency of Wessex-HE modules, the flue gas temperature is low (125°C) and condensation is likely to be produced within the flue system during start-up and low load conditions. Care should be taken to ensure that each flue is installed with a minimum slope of 2.5° in the direction of the condensate drain, and that all joints are shaped to direct condensation to a drain pipe. Longer lengths of flue should be provided with a separate drain connection.

Each boiler casing is fitted with a drain connection. The drain pipe must be 15mm (1/2") ID minimum, having a fall of at least 3 degrees (approx. 50mm per metre), and consist of non-corrodible material led to a gully via a waste trap.



Hamworthy Forston 400 Fan Dilution System



Hamworthy Flue Components

Boiler and flue packages

Hamworthy boiler flues are specifically designed to complement their extensive range of boilers and other industrial and commercial heating equipment.

Flue solutions can be engineered in natural draught, fan assisted or fan dilution applications, offering single skin, twin wall with an air gap or twin wall with an insulated gap construction.

Hamworthy offer a comprehensive range of flue equipment from stock for supply only contracts, or alternatively provide a full design and installation service incorporating sizing, site survey and drawings for approval, (where necessary) prior to manufacture.

Engineered flue solutions from Hamworthy may well result in a reduction in sizes providing an efficient system at lower cost.

Please refer to brochure 500002009 or contact Hamworthy Flue Products for further details.

For more information on
**Hamworthy Heating
Flue Products**

Contact:

0121 360 7000



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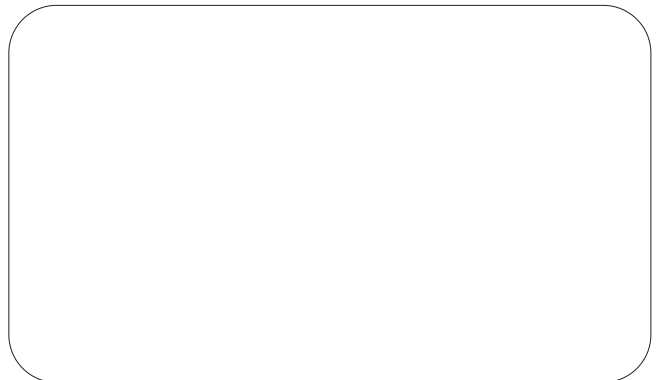
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