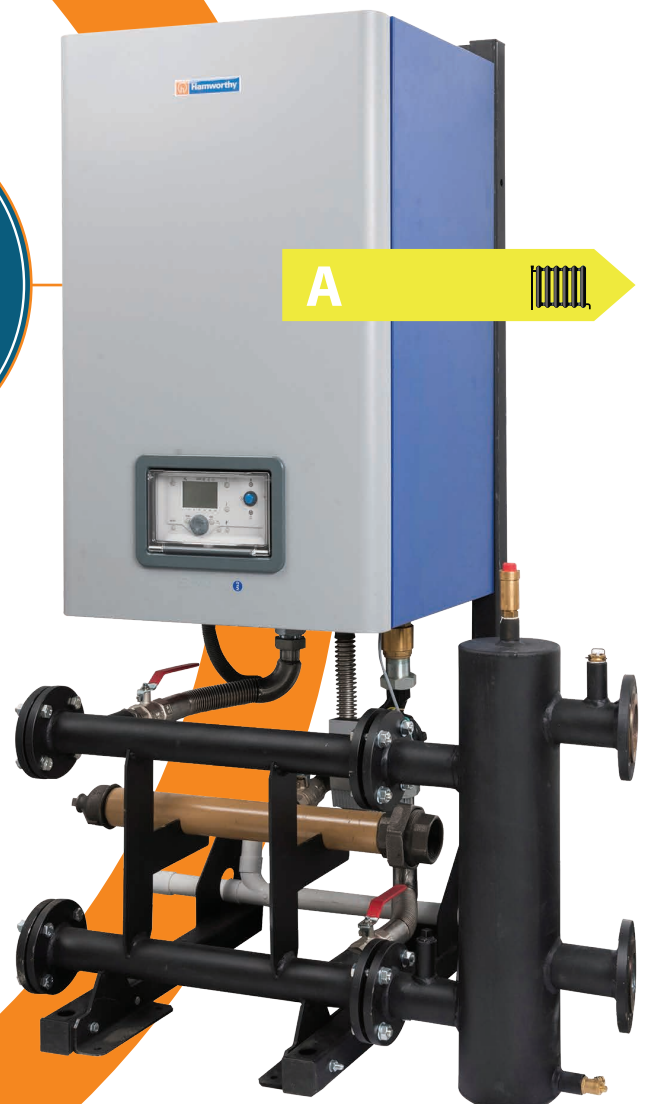


Stratton mk2

- Wall hung
- Condensing boiler
- Low height, low noise



7 MODELS, OUTPUTS 43 - 146kW

up to
96%
Gross Seasonal
Efficiency

Nat Gas
LPG

up to
5:1
Turndown

5 Yr
Heat Exchanger
Warranty

ErP
Part L
Compliant

BIM
Objects

CONTENTS

- Introduction & features 2
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Small and durable, fits in the tightest plantrooms

The Stratton mk2 wall hung condensing boiler offers exceptional system tolerance with a highly durable stainless steel heat exchanger at the heart.

Particularly suited to low height plantrooms, the boiler is less than 2.2 metres from ground to flue header when mounted on our low height pipe kit.



High efficiency combines with easy installation

An extensive product range of 7 models with outputs from 43kW to 146kW enables you to choose the most appropriate boiler to meet the building heat load.

Outstanding efficiency in excess of 108% nett keeps operating costs to a minimum, and the pre-mix burner technology gives clean operation with ErP Class 6 NOx emissions

The high efficiency levels are backed up by inclusion on the Government's Energy Technology List (ETL) offering financial advantages to purchasers through the Enhanced Capital Allowances (ECA) scheme.

Designed for sealed and pressurised systems only, the hydraulic installation can be fast tracked using factory manufactured frame and header kits that include boiler pumps for up to 4 boilers.

A flue gas non-return valve within the boiler combustion circuit removes the need for an external non-return valve resulting in a compact flue header arrangement above the boiler.

Key benefits



Advanced sequence control for up to 16 boiler modules



Low height for tight plantrooms



Low noise for installation close to occupants



Easy access for service and system cleaning



Close load matching for improved efficiencies



Connections in recess at base of boiler

Key features:

- ⊗ Wall hung condensing boiler
- ⊗ 7 models: 43, 61, 76, 87, 104, 129 & 146kW output models
- ⊗ Single boilers can be installed side by side
- ⊗ Natural gas and LPG
- ⊗ Sealed systems only
- ⊗ Up to 5:1 turndown ratio
- ⊗ Up to 96% Gross Seasonal Efficiency
- ⊗ Stainless steel heat exchanger

Pipework kits (Page 6)

- ⊗ Three types of factory assembled pipework kits:
 - Single boiler pipe kit with integrated low loss header
 - Single or multiple low height pipe kit:
 - DN50 for boiler models S2-40, S2-60, S2-70 & S2-80
 - DN80 for boiler models S2-100, S2-120 & S2-150

Low height pipe kit includes:

- ⊗ Fully welded boiler mounting frames
- ⊗ Simple hook arrangement for fast mounting
- ⊗ Matched boiler pumps
- ⊗ Boiler isolating valves
- ⊗ Safety relief valve
- ⊗ Blanking flanges
- ⊗ Optional low loss header
- ⊗ Optional 3 port manifold

Controls (Page 15)

- ⊗ 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)

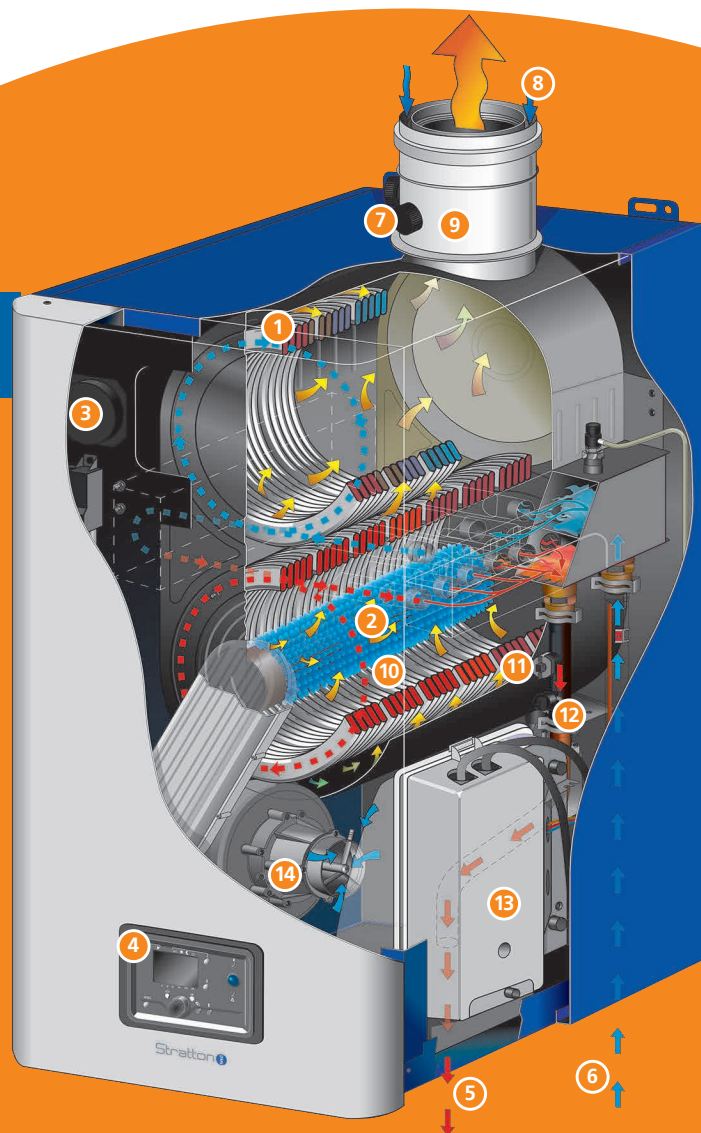
- ⊗ B23p open flue system (Page 20)
- ⊗ C13 room sealed flue system (Page 22)
- ⊗ C33 room sealed flue system (Page 23)
- ⊗ C53 Room sealed flue systems (Page 24)

Service & Warranty (Page 29)

- ⊗ 5-year heat exchanger warranty
- ⊗ Range of service options
- ⊗ Commissioning

Anatomy of the Stratton mk2

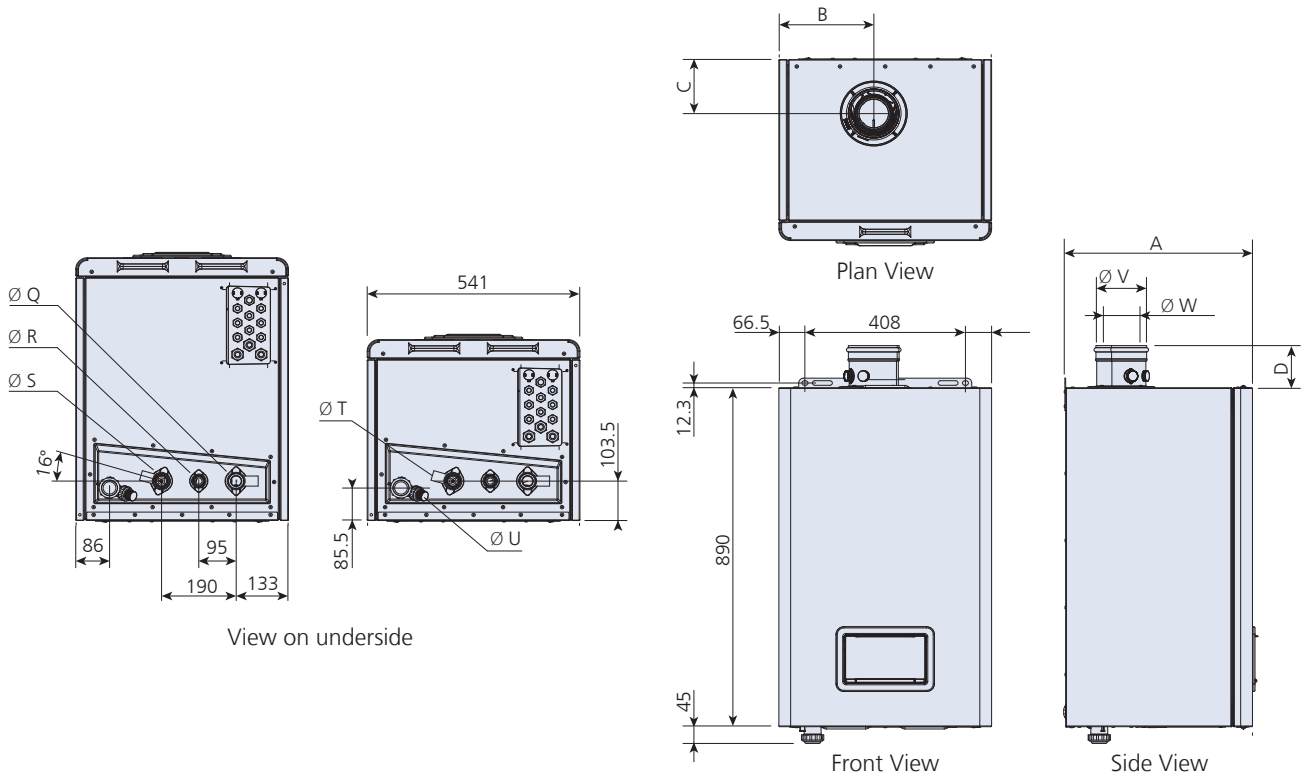
- ① Stainless steel condensing heat exchanger
- ② Cylindrical modulating premix burner
- ③ Air pressure switch
- ④ Control panel with protective cover
- ⑤ Hot water flow to heating circuit
- ⑥ Return from heating circuit
- ⑦ Flue gas test point
- ⑧ Fan-drawn combustion air inlet
- ⑨ Flue gas exhaust
- ⑩ Coiled stainless steel combustion heat exchanger
- ⑪ Water flow switch
- ⑫ Water pressure switch
- ⑬ Controls housing
- ⑭ Fan



Technical data & dimensions

All models

	Stratton mk2 boiler model	Units	S2-40	S2-60	S2-70	S2-80	S2-100	S2-120	S2-150
Energy	Building regulations Part L seasonal efficiency	% gross	95.75	96.13	95.5	95.5	96.02	95.95	95.75
	SAP 2009 Annual efficiency	%	89	89.2	88.8	88.8	89.1	89.1	89
	ErP efficiency rating (modules ≤ 70kW only)		A	A	A	N/A	N/A	N/A	N/A
	Boiler output - maximum 80/60°C, NG & LPG. (S2-120 & S2-150 models Nat Gas only.)	kW	40	56.4	69.9	79.8	95.7	119.5	134
	Boiler output - maximum 50/30°C, NG & LPG. (S2-120 & S2-150 models Nat Gas only.)	kW	43	61	76.8	87.5	104.5	129.5	146
	Boiler output - minimum 80/60°C, Nat Gas.	kW	8.3	11.5	17.1	17.1	19	23.9	26.8
	Boiler output - minimum 80/60°C, LPG	kW	8.3	11.5	31.9	31.9	33.5	N/A	N/A
	Boiler input (gross) - maximum, NG & LPG. (S2-120 & S2-150 models Nat Gas only.)	kW	45.7	64.4	80	91.3	109.3	136.5	151.6
	Boiler input (nett) - maximum, NG & LPG. (S2-120 & S2-150 models Nat Gas only.)	kW	41.2	58	72.1	82.3	98.5	123	137.9
	Standby losses	W	42	51	87	87	94	104	117
Water	Water content	litres	3.6	5	9	9	10.2	12.8	15.3
	System design flow rate @ 25°C ΔT rise	l/s	0.4	0.5	0.7	0.8	0.9	1.1	1.3
	Water side pressure loss @ 25°C ΔT rise	mbar	205	224	176	205	246	314	380
	System design flow rate @ 20°C ΔT rise	l/s	0.5	0.7	0.8	0.9	1.1	1.4	1.6
	Water side pressure loss @ 20°C ΔT rise	mbar	320	350	275	320	385	490	580
	System design flow rate @ 11°C ΔT rise	l/s	0.9	1.2	1.5	1.7	2.1	2.6	2.9
	Water side pressure loss @ 11°C ΔT rise	mbar	1058	1157	909	1058	1273	1620	1700
	Minimum water pressure	barg	1	1	1	1	1	1	1
	Maximum water pressure	barg	4	4	4	4	4	4	4
	Maximum flow temperature setting	°C	85	85	85	85	85	85	85
Gas	Gas flow rate, NG (G20) - maximum	m³/hr	4.4	6.1	7.6	8.7	10.4	13	14.6
	Maximum gas inlet pressure, Nat Gas	mbar	25	25	25	25	25	25	25
	Nominal gas inlet pressure, Nat Gas	mbar	20	20	20	20	20	20	20
	Minimum gas inlet pressure, Nat Gas	mbar	17	17	17	17	17	17	17
	Gas flow rate, LPG (G31) - maximum	m³/hr	1.7	2.4	3	3.4	4	N/A	N/A
	Nominal gas inlet pressure, LPG	mbar	37.5	37.5	37.5	37.5	37.5	N/A	N/A
Flue	Approx. flue gas volume Nat Gas @ 15°C, 9.1–9.3% CO ₂ @ N.T.P	m³/hr	57	79	98	112	135	168	189
	Maximum flue gas temperature @ 80/60°C Nat Gas	°C	80	76	70	74	76	70	70
	Pressure at boiler flue spigot @ 80/60°C Nat Gas	Pa	156	200	123	179	187	200	200
	Approx. flue gas volume LPG @ 15°C, 10.3–10.5% CO ₂ @ N.T.P	m³/hr	55	77	96	109	128	N/A	N/A
	Maximum flue gas temperature @ 80/60°C LPG	°C	81	78	69	73	75	N/A	N/A
	Pressure at boiler flue spigot @ 80/60°C LPG	Pa	126	200	105	150	138	N/A	N/A
Electrics	Dry NOx emission (0% excess oxygen, mg/kWh dry air free)	mg/kWh	36	35	35	35	34	36	35
	Electrical supply		230 V 1 Ph 50 Hz	230 V 1 Ph 50 Hz	230 V 1 Ph 50 Hz	230 V 1 Ph 50 Hz	230 V 1 Ph 50 Hz	230 V 1 Ph 50 Hz	230 V 1 Ph 50 Hz
	Power consumption - maximum boiler modulation	W	68	138	96	141	160	206	263
	Start current (per module)	Amp	1.2	2.4	1.68	2.8	3.2	4	4.5
	Run current (per module)	Amp	0.3	0.6	0.42	0.61	0.7	0.9	1.14
	Approx shipping weight	kg	50	60	90	90	95	100	125
	Noise emission @1m: @maximum modulation	dB (A)	57.4	59.7	57.3	57.3	58.5	61.6	59.3
	Noise emission @1m: @minimum modulation	dB (A)	34.3	35.8	33.5	33.5	34.3	35.4	36.8



Note: All dimensions in mm unless otherwise stated.

Stratton mk2 models

Ref.	Units	S2-40	S2-60	S2-70	S2-80	S2-100	S2-120	S2-150	
A	Boiler depth	mm	477	477	574	574	574	692	800
B	Flue connection centreline	mm	241	241	242.5	242.5	242.5	242.5	242.5
C	Flue connection centreline	mm	143.5	143.5	120	120	120	120	120
D	Flue spigot height	mm	86	86	111	111	111	111	111
Ø Q	Heating return connection		G 1¼"	G 1¼"	G 1¼"	G 1¼"	G 1¼"	G 1¼"	G 1¼"
Ø R	Gas supply		G 1"	G 1"	G 1"	G 1"	G 1"	G 1"	G 1"
Ø S	Heating outlet connection		G 1¼"	G 1¼"	G 1¼"	G 1¼"	G 1¼"	G 1¼"	G 1¼"
Ø T	Safety valve connection		G ½" (female)	G ½" (female)	G ½" (female)	G ½" (female)	G ½" (female)	G ½" (female)	G ½" (female)
Ø U	Condensate drain	mm	24	24	24	24	24	24	24
Ø V	Air inlet	mm	125	125	150	150	150	150	150
Ø W	Fume duct	mm	80	80	100	100	100	100	100

Recommended clearances to walls or opposing structures for maintenance

	Units	S2-40	S2-60	S2-70	S2-80	S2-100	S2-120	S2-150
Front	mm	800	800	800	800	800	800	800
Sides	mm	250	250	250	250	250	250	250
Top	mm	Dependent on flue - see pages 20 to 24						

Pipe kit details & dimensions

All models

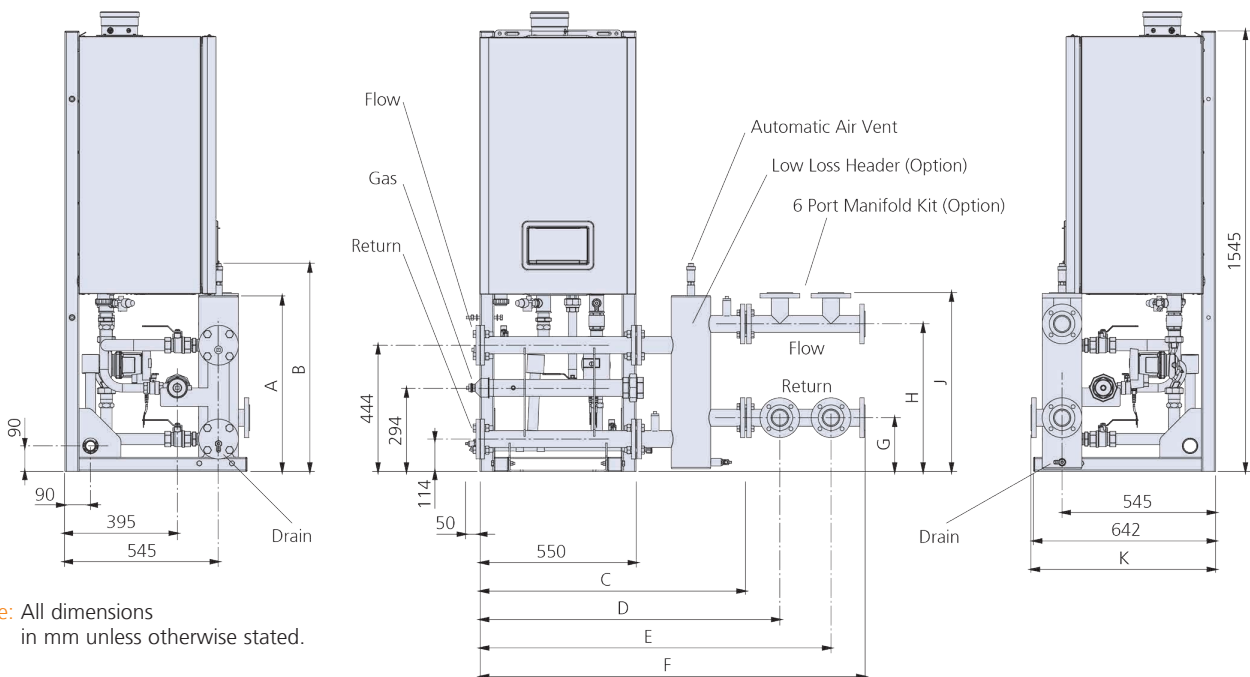
Multiple boiler pipe kits with frame and headers

For multiple boiler installations pipe frame and header sets are available for one to four boilers. Individual mounting frames are provided for each boiler. Header sets are also available for one and two boilers allowing combinations up to four boilers to be installed by simply bolting two header sets together. Pipe kits can be located against a wall or be free standing when using suitable floor tie bolts.

Kits include:

- ⊕ Fully welded boiler mounting frames with holes for wall and floor ties
- ⊕ Simple hook arrangement allowing fast mounting of boilers to frame
- ⊕ DN50 or DN80 flow and return headers – PN06, blank flanges provided
- ⊕ 2" gas header with pressure test point and plugged purge connection
- ⊕ 32mm polypropylene condensate header
- ⊕ Individual boiler isolating valves for water and gas
- ⊕ Non-return valve to prevent reverse circulation through non-firing boiler modules
- ⊕ ErP compliant boiler shunt pumps optimised for 20°C differential temperature
- ⊕ Safety relief valve – 4 bar
- ⊕ Flexible interconnecting pipes between boilers and headers
- ⊕ Optional low loss headers to suit DN50 or DN80 pipe kit assemblies (see page 8)
- ⊕ Optional 6 port extension manifold kit to suit DN50 or DN80 pipe kit assemblies (see page 8)

Single boiler assembly



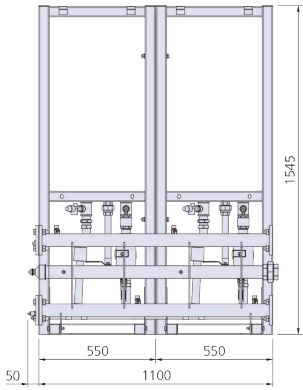
Note: All dimensions in mm unless otherwise stated.

Boiler models	Flow header	Return header	Gas header	Condensate header
S2-40, S2-60, S2-70, S2-80	DN50 PN06	DN50 PN06	R2"	32mm Poly
S2-100, S2-120, S2-150	DN80 PN06	DN80 PN06	R2"	32mm Poly

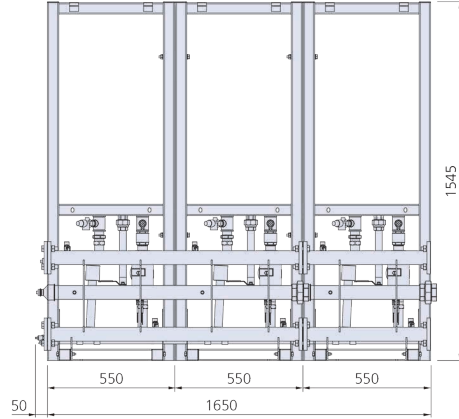
Boiler models	A	B	C	D	E	F	G	H	J	K
S2-40, S2-60, S2-70, S2-80	620	735	933	1056	1236	1356	189	519	629	651
S2-100, S2-120, S2-150	720	832	1010	1155	1385	1530	214	565	684	694

Note: Hydraulic circuits should never impede circulation through the boilers. The use of a low loss header (optional) is strongly recommended to ensure adequate boiler flow. See page 27 for hydraulic circuit design.

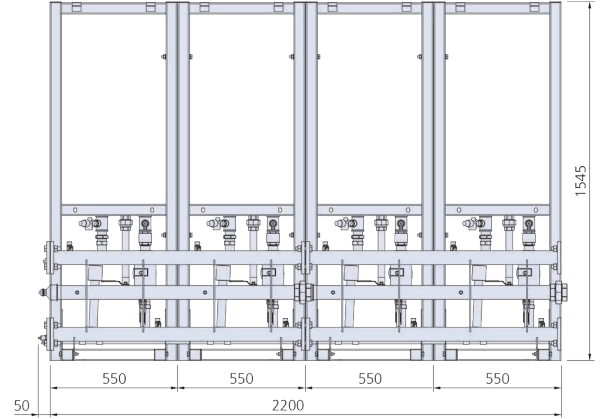
Two boiler assembly



Three boiler assembly



Four boiler assembly



Boiler support frame

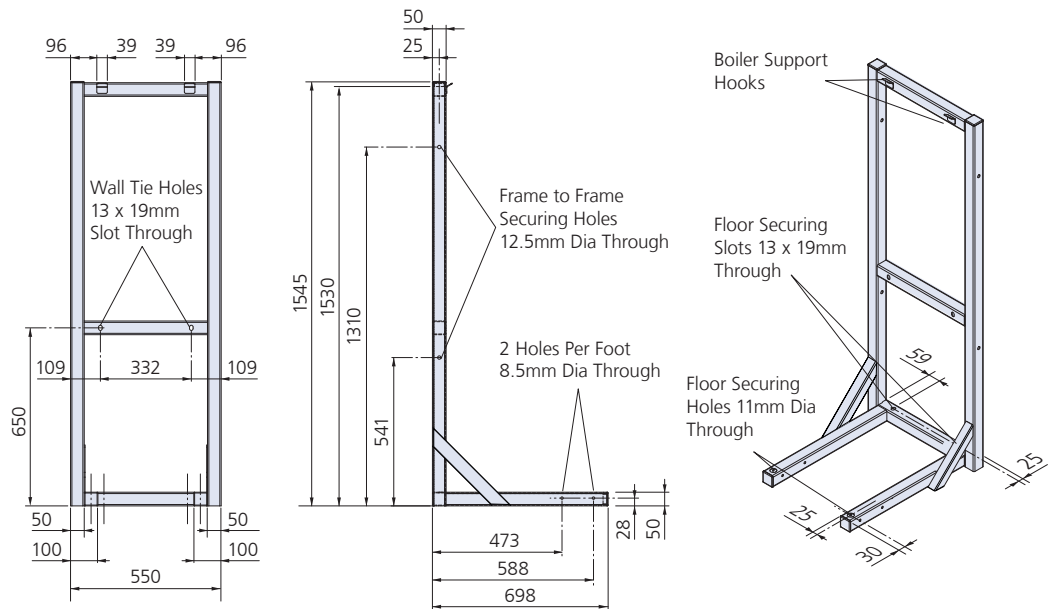
For single Stratton mk2 boilers providing support where weak walls or standalone requirement is present. Transferring the weight to the floor, multiple frames can be bolted together for modular boiler installations.

Each frame kit includes:

- ⦿ Fully welded construction
- ⦿ Pre-drilled holes for floor and wall tie bolts
- ⦿ Simple hook arrangement allowing fast mounting of boilers to frame
- ⦿ Bolts for securing multiple frames together are supplied with frame
- ⦿ Matt black finish

Weight - 18kg

Note: Boiler frame is not compatible with single boiler pipe kit shown on page 9.



Note: All dimensions in mm unless otherwise stated.

Low loss header & 3 port manifold

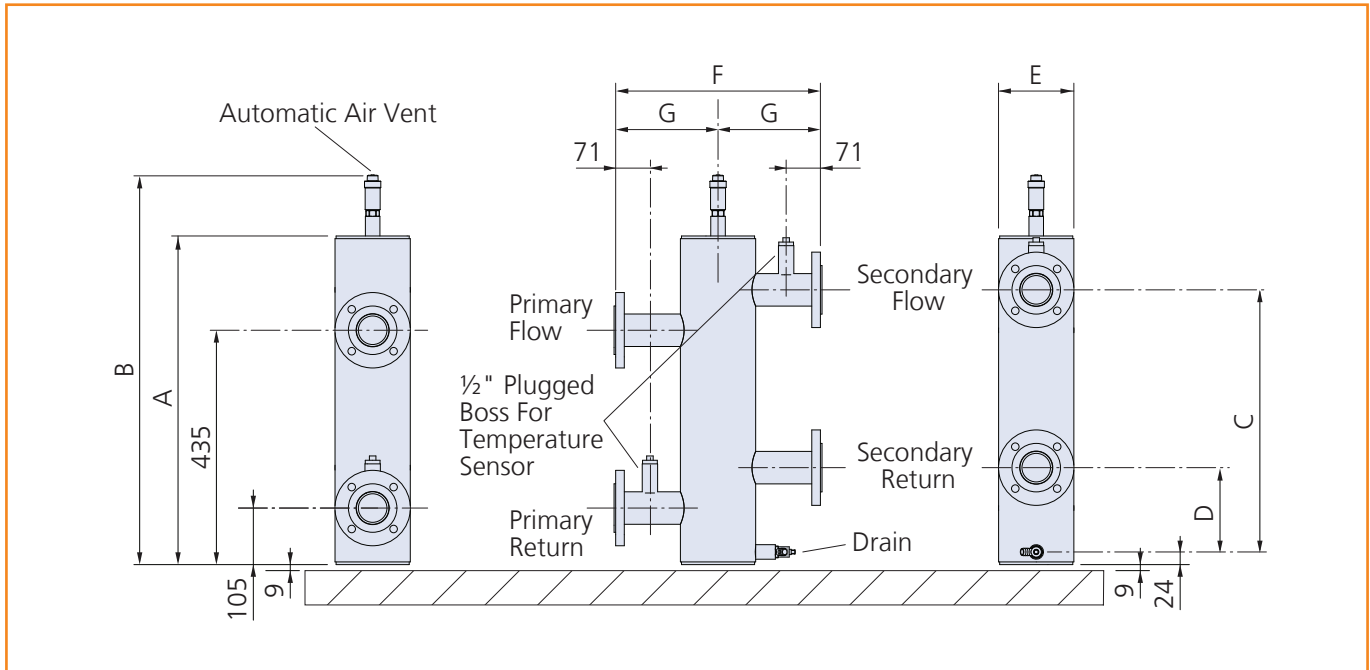
When choosing Hamworthy pipework kits you can also select the following optional components:

- Low loss header
- 3 port manifolds

Sizes are matched to the pipework kits to help speed up installation and simplify procurement.

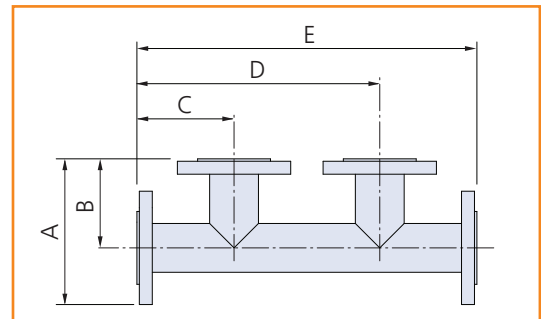
Low loss headers (optional)

Boiler models	A	B	C	D	E	F	G
S2-40, S2-60, S2-70, S2-80	663	785	510	180	152	420	210
S2-100, S2-120, S2-150	710	824	535	205	220	460	230



Manifold extension kits (optional)

Boiler models	A	B	C	D	E
S2-40, S2-60, S2-70, S2-80	180	110	120	300	420
S2-100, S2-120, S2-150	235	140	145	375	520



Boiler models	Primary flow connection	Primary return connection	Secondary flow connection	Secondary Return Connection
S2-40, S2-60, S2-70, S2-80	DN50 PN06	DN50 PN06	DN50 PN06	DN50 PN06
S2-100, S2-120, S2-150	DN80 PN06	DN80 PN06	DN80 PN06	DN80 PN06

Note: All dimensions in mm unless otherwise stated.

Electrical connections

Connections to boiler

Low voltage connections

Terminal reference	Function	Electrical	Max load
H5	Programmable input for: 1 Remote interlock (external 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 2 Sequence control (Master boiler only)		
BX1	Not for customer use		
H6	Not for customer use		

High voltage connections

Terminal reference	Function	Electrical	Max load
AUX1	Not used		
AUX2	Not used		
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	1 Amp
QX2	Programmable power supply for either: 1 DHW pump/circulator 2 Direct uncompensated heating circuit pump	230v 50Hz 1Ph	1 Amp
LMS 230V	Not for customer use		
LNE	Main power supply	230v 50Hz 1Ph	6.3 Amp

Note: Boiler shunt pumps supplied as part of Hamworthy pipe kits are connected to terminals QX3 providing mains 230V.

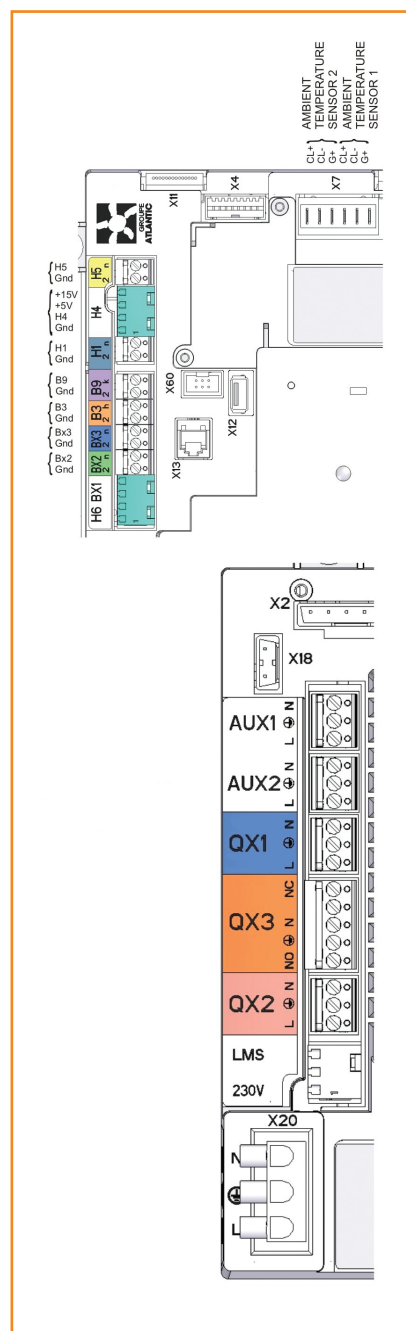
Electrical connections

There are a number of cable entry glands located on the underside of the boiler to the right-hand side beneath the controls centre. 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.



Product training

Get hands on training with Hamworthy's commercial boilers and water heaters

We can provide training onsite or you can attend a course at one of our training centres. Delivered by Hamworthy 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 centre is conveniently located within the Logic4Training facility in Northolt, North London. Also launched in 2017 is a new training area in the Groupe Atlantic UK Training Centre of Excellence in Reading.

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

www.hamworthy-heating.com/training/training-centre



Want to improve your industry knowledge?



Book a CIBSE-accredited CPD seminar for you and your colleagues today and we'll even provide the lunch.



Courses available include:

- Best practice heating and hot water plant refurbishment
- Energy saving in commercial heating and hot water
- Best practice in domestic hot water (5 modules)
- New boilers and old heating systems:
Hydraulic design - A story of separation

www.hamworthy-heating.com/cpd



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

"Very interesting topic and relevant cost benefit analysis for replacing boilers."

Specification

Pre-mix burner (1)

Stratton mk2 boilers feature a pre-mix burner for clean combustion with low ErP Class 6 emissions. Full modulation from 20% to 100% output is managed from the boiler control varying the fan speed and gas input to deliver correct gas air ratio across the range of modulation. With NOx emissions less than 40mg/kWh, maximum BREEAM credits are available for contribution towards an 'Excellent' building accreditation.

The burner head features spark ignition with flame detection provided by flame ionisation probe.

Heat exchanger (2)

Using stainless steel heat exchangers throughout the boiler range makes the Stratton mk2 boilers very tolerant to varying water conditions in both new and existing systems. Manufactured from 316L grade stainless steel gives a high resistance to corrosion and a long life backed by a 5-year heat exchanger warranty.

The design of flue passages and waterways within the heat exchanger matched with optimised combustion ensure highly efficient operation. Part load efficiency exceeds 108% nett for all models when operating in suitable system conditions.

Operating efficiency

Dependent on operating temperatures the Stratton mk2 boiler is capable of delivering high efficiency with part load efficiency in excess of 108% nett and full load efficiency exceeding 97% nett across the whole boiler range.

The boiler range exceeds the minimum requirements of Building Regulations Part L and European ErP legislation for both new and existing buildings.

Fuel supply

Stratton mk2 boilers are certified for operating with Natural Gas and LPG. Factory set to operate with Natural Gas, boilers up to 100kW can be site adjusted for operation using LPG requiring parameter changes and gas orifice replacement as part of the commissioning process. Each boiler is supplied with the required parts to facilitate conversion to LPG firing if required.

Boiler models S2-120 and S2-150 are not suitable for operation with LPG.

System connections (3)

All connections for flow, return and gas are located in a recess on the underside of the boiler enabling the boiler to be stood flat on the ground and reducing the potential for damage during the installation process.

Condensate discharge

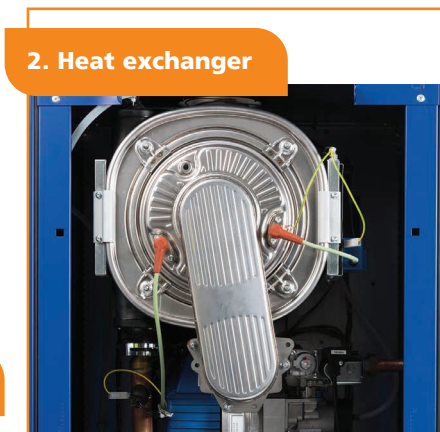
Condensate from the combustion process is safely removed from the heat exchanger via a syphon trap to the outside of the boiler. This allows condensate to flow safely but prevents the escape of flue gases via the drain.

Water pressure sensor

The boiler is protected from both high and low water pressure conditions. Water pressure within the boiler is monitored by the integral sensor and the boiler prevented from operating under the following conditions:

High pressure. The burner is prevented from firing should internal boiler pressure reach 4 bar and released for operation once the pressure drops to 3.8 bar.

Low pressure. The burner is reduced to 20% modulation should internal pressure drop below 1 bar, and prevented from firing should internal pressure drop below 0.8 bar. Once the internal pressure recovers to 1 bar the burner operates at 20% modulation until pressure reaches 1.2 bar when full burner modulation resumes.



Water flow switch

Protecting the boiler from inadequate circulation, the integral water flow switch prevents the boiler from firing should the flow rate become too low.

Air pressure switch

A differential air pressure switch monitors air flow through the flue passages of the boiler to ensure there is adequate air flow before the burner is permitted to light. This offers protection from operation with a blocked flue or a poorly maintained and blocked burner.

Temperature controls (4)

Stratton mk2 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 85°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 85°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.

4. Temperature controls



Flues (5)

Stratton mk2 boilers are suitable for open flue and room sealed flue systems.

A concentric flue connection is located centrally towards the top of each boiler allowing compact flue arrangements above the boiler.

For multiple boiler installations, optional flue headers are available allowing connection of up to 4 boilers onto a common open B23 type flue system.

Optional flue kits are available for individual boilers to enable room sealed connections. Using either concentric or twin pipe arrangements, the flue can be terminated both horizontally and vertically within permitted legislative requirements.

A flue connection kit is mandatory for all flue installations using Hamworthy components and recommended for all other installations.

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.

5. Flues



Pipe & frame kits (6)

Hamworthy offers a choice of pipe and frame kits to aid ease of installation. Available for single boiler applications or for up to four boilers. The frame kit is also available separately where weak walls or a standalone requirement is present.

Low loss header

The boiler must be used with a low loss header arrangement to provide hydraulic separation from the heating circuits, thus ensuring flow conditions within secondary circuits cannot adversely affect operation of the boiler. Hamworthy can supply low loss headers for up to four boiler modular arrangements.

Wall mounting

To aid installation, each boiler is provided with a wall mounting plate to fix to the wall ahead of hanging the boiler. Once secured to the wall the boiler simply hooks onto the wall bracket.

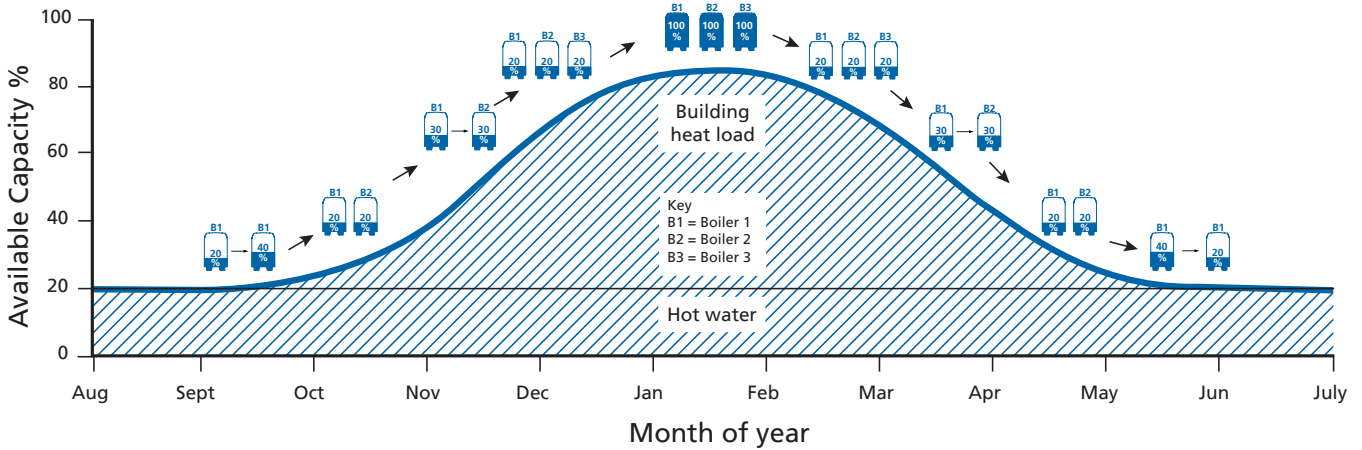
Primary circulation shunt pump

A dedicated pump can be connected to each boiler module and controlled by the boiler controls platform for primary circulation.

6. Pipe and frame kits



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 an arrangement of 3 modules will have 15 to 1 turndown. This gives you a substantial range of outputs.

Stratton mk2 - turndown

- ⊙ A Stratton mk2 S2-150 module has a 5:1 turndown ratio & can deliver energy from 26kW to 146kW.
- ⊙ Four Stratton mk2 S2-150 on a pipe and header kit has a combined 20:1 turndown and can deliver energy from 26kW to 584kW



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 Stratton mk2 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

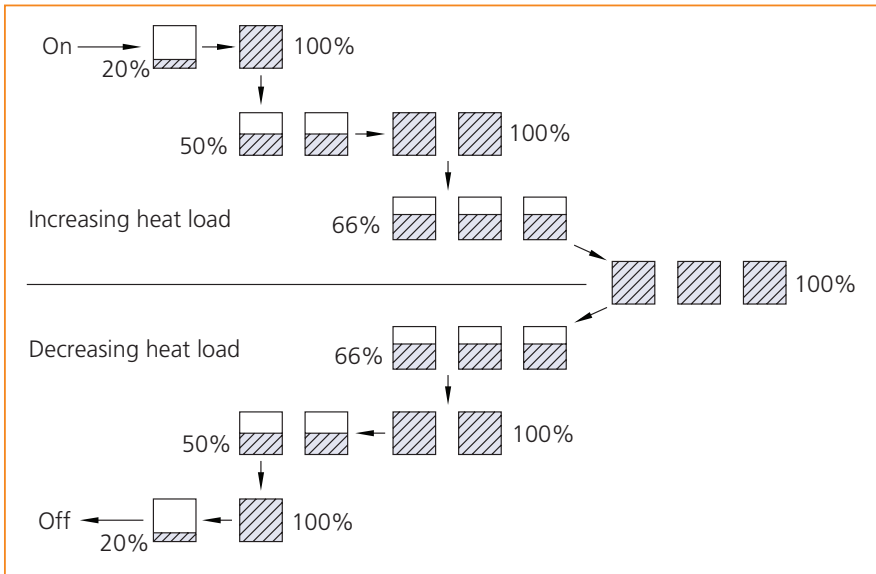
But have you also considered the impact of replacing one large output single boiler with multiple smaller output modular boilers? The differences in gas use for the right application can be huge.

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 set up 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.

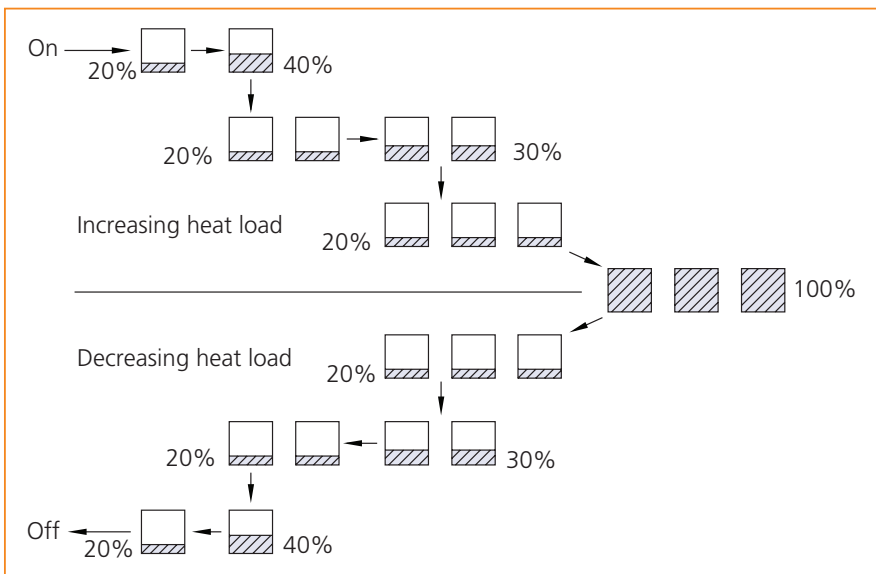
This arrangement offers the benefit of reduced energy consumption for pumping as well as increased standby capacity should one pump fail. There will be increased requirements for electrical supplies and controls wiring with this arrangement.

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

Stratton mk2 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. Stratton mk2 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 overrun for shunt pump
- ⊗ Pump kick for shunt pump to help prevent seizure
- ⊗ Frost protection based on water temperature, 5°C fixed set point

Optional outside air temperature sensor QAC34

Whatever the level of control required, 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 pre-determined set-point
- ⊗ **Adaptable weather compensation** - Matches boiler flow temperature to building thermal dynamics as outside air temperature fluctuates up and down.

Part number 533901457 – Model QAC34

Optional heating circuit control kit

Up to 2 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.

An optional heating circuit control kit is required for each heating circuit.

Part number 059753 – for single heating circuit.

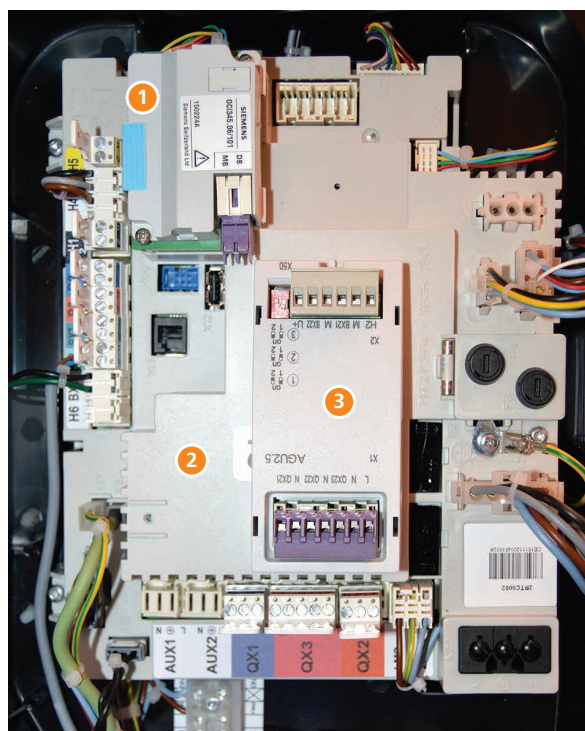
Remote interlock

Each boiler can be interlocked to prevent operation when external controls elements are in fault, such as gas solenoid valve closure. A programmable input on terminals H5 can be commissioned to shut down the boiler if the contacts go open circuit. External switches using this circuit must be volt free.

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 QAA74, 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.

- 1 Optional LPB Bus communication kit
- 2 Navistem controller
- 3 Optional heating circuit control kit



Optional programmable room sensor - QAA74

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

- ⊗ 3 programmable periods per day
 - ⊗ Reduced temperature/night set back for non-occupancy hours
 - ⊗ Holiday period (frost protection remains active)
 - ⊗ Indication of operating parameters and boiler fault condition
 - ⊗ 7 day time clock with automatic summer/winter clock adjustment
- Part number 563605695 – Model QAA74



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 – Model QAA55

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.

Part number 563605674 – Model QAZ36

Optional controls kits for single boilers

Controls option	Part number
Outside air temperature sensor QAC34	533901457
Domestic hot water sensor kit (sensor and pocket)	563605674
Mixing valve heating circuit control kit (clip in control module, temperature sensor and pocket) for 1 zone	059753
Programmable room sensor QAA74	563605695
Offset adjustable room sensor QAA55	533901589

Remote start stop

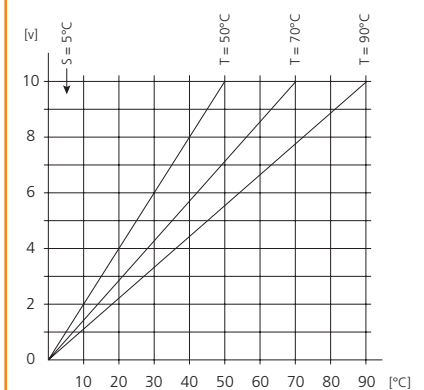
Each boiler is equipped with a remote start stop circuit. On receiving a start signal from for instance an outside time clock the boiler will operate according to its internal temperature management program. This level of control simply overrides the boiler's internal time clock program. The boiler may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

BMS control

Additionally, all Stratton mk2 boilers may be controlled using more sophisticated controls such as Building Management Systems using the 0-10 volt analogue input which can be configured for temperature or load control. Where a Building Management System 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 O&M Navistem B3000 ref 500001310

0 – 10 volt analogue temperature input chart



T = maximum value of heat demand
S = minimum limitation of heat demand = 5°C

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 client's 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

Using 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

Whatever the level of control required, it is always recommended to fit an outside air temperature sensor. This allows 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. It then manages the number of boilers in operation and the 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 over-ridden until the over-ride function is manually de-activated. Frost protection and summer shutdown controls remain active.

Remote enable

The master boiler can be programmed to receive an enable signal from an outside control system. Whilst the built-in time clock and optimiser are overridden, frost protection and summer shutdown 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 option	Part number
Outside air temperature sensor QAC34	533901457
Volt free contact kit for remote status signalling AGU2.550A109	563605666
Heating circuit sensor kit (sensor and pocket) QAZ36	563605673
Merley boiler sequence controller, wall mounted	563605672
Merley boiler sequence controller, loose kit for panel mounting	563605671
LPB Bus communication module OCI345, one required per boiler module	563605667
Programmable room sensor QAA74	563605695



Navistem (Siemens LMS) control panel.

B23p open flue system

B23p pressurised open flues for single boilers include a dedicated flue pipe for removing the flue gases to outside. Combustion air is drawn into the boiler directly through the outer annulus of the concentric flue connection on top of the boiler which is supplied.

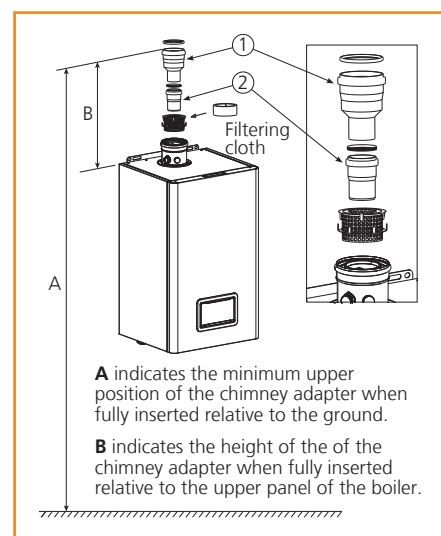
A flue connection kit is mandatory for all flue installations using Hamworthy components (see first table below) and is recommended on all other flue installations as best practice.

Flue components are constructed in polypropylene with EPDM seals for removing flue gases from the boiler. Flue terminal kits are manufactured from stainless steel.

Flue components are CE certified EN14471 T120 H1. Flue pressure H1 up to 5000 Pa, and flue temperature T120 up to 120°C.

Flue components other than terminals are only suitable for installation inside the building.

Flue connection kit



B23p Flue connection kits including air inlet filter - required for all B23p flue installations using Hamworthy components

Item	Boiler models S2-40 and S2-60		Boiler models S2-70, S2-80, S2-100, S2-120, S2-150		
	Final flue diameter		Final flue diameter		
	80mm Item 2 only	125mm Item 1 & 2	110mm Item 1 & 2	125mm Item 2 only	160mm Item 1 & 2
Flue connection kit including air inlet filter part number	040945	040940	041052	040940	041050
Minimum height A (mm)	2000	2140	2090	2155	2170
Minimum height B (mm)	220	260	310	375	390

B23p Open flue components

Item	Dia. 80mm	Dia. 110mm	Dia. 125mm	Dia. 160mm
	Part number	Part number	Part number	Part number
Flue connection kit including air inlet filter	040945	041052	040940	041050
Flue pipe 1000mm length	573407321	532511255	573407338	573407314
Flue pipe 500mm length	573407288	532511256	573407337	573407313
Flue elbow 90 degrees	573407289	532511257	573407341	573407316
Flue elbow 45 degrees	573407320	532511258	573407340	573407317
Pitched roof terminal kit including flashing	573407386	562511115	573407388	573407390
Flat roof terminal kit including flashing	573407387	562511116	573407389	573407391
Wall bracket	532511270	532511259	532511016	573407328

B23p Pressurised open flue performance data for Stratton mk2 boilers

Model	S2-40	S2-60	S2-70	S2-80	S2-100	S2-120	S2-150
Flue diameter (mm)	80	80	110	110	110	110	110
Maximum flue length (m)	43	20	72	83	50	24	40
Equivalent length 90° Elbow (m)	3	3	3	3	3	3	3
Equivalent length 45° Elbow (m)	2	2	2	2	2	2	2
Flue diameter (mm)	125	125	125	125	125	125	125
Maximum flue length (m)	100	100	100	100	100	62	80
Equivalent length 90° Elbow (m)	2	3	3	4	4	4	3
Equivalent length 45° Elbow (m)	1	2	2	2	2	2	2
Flue diameter (mm)	N/A	N/A	160	160	160	160	160
Maximum flue length (m)	N/A	N/A	100	100	100	100	300
Equivalent length 90° Elbow (m)	N/A	N/A	2	3	5	5	5
Equivalent length 45° Elbow (m)	N/A	N/A	1	2	3	3	3

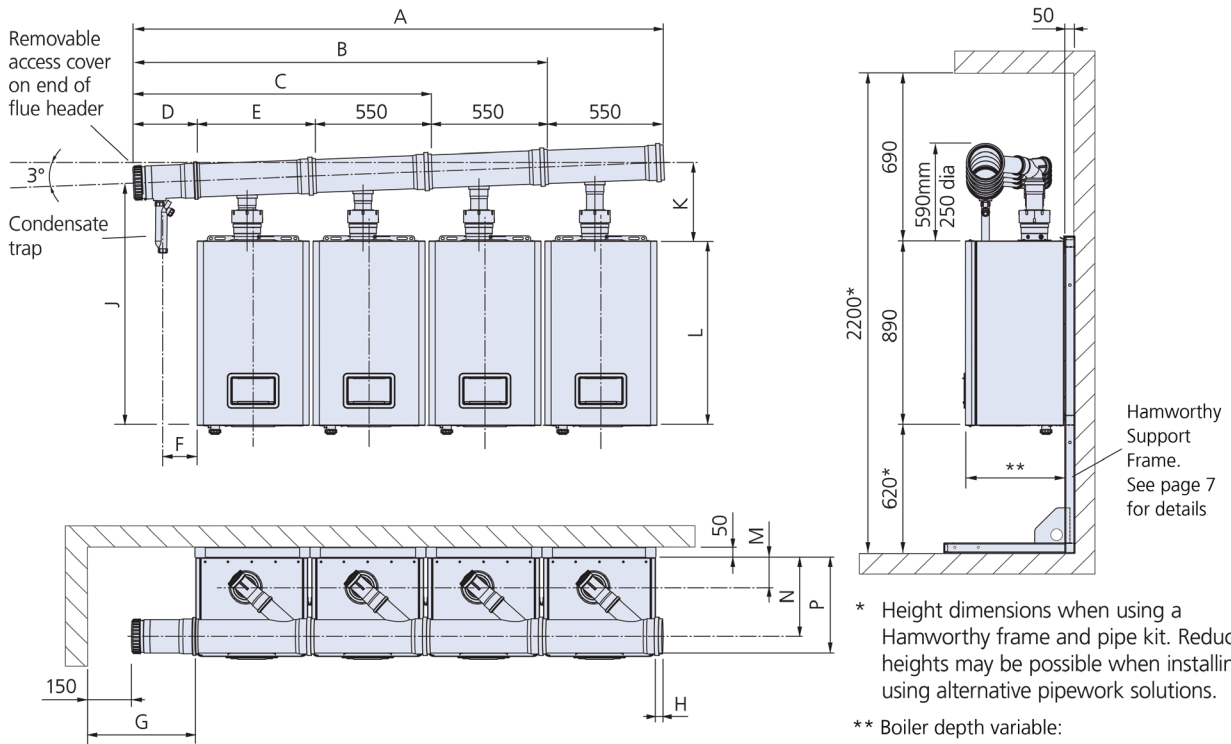
B23p open flue header system

Flue headers are provided for 2, 3 or 4 boiler installations and sized according to the maximum output capacity of the combined installed boilers. The flue header can be installed to run to the left or the right and must run continuously downhill in the direction of the condensate removal fitting at the end of the header at a minimum 3 degrees.

B23p Open flue header kits including air inlet filter						
	Boiler models S2-40 & S2-60		Boiler models S2-70, S2-80 & S2-100		Boiler models S2-120, S2-150	
No. of boilers	Flue header kit diameter (mm)	Flue header kit part number	Flue header kit diameter (mm)	Flue header kit part number	Flue header kit diameter (mm)	Flue header kit part number
2 Boiler header	160	082287	160	082290	200	082296
3 Boiler header	160	082288	200	082291	200	082297
4 Boiler header	160	082289	200	082292	250	082298

Flue headers are constructed in polypropylene with EPDM seals for removing flue gases from the boiler. Flue components are CE certified EN14471 T120 H1. Flue pressure H1 up to 5000 Pa, and flue temperature T120 up to 120°C.

Header diameter (mm)	Number of boilers and models			Dimension (mm)													
	2	3	4	A	B	C	D	E	F	G	H	J	K	L	M	N	P
160	S2-40, S2-60, S2-70, S2-80, S2-100	S2-40, S2-60	S2-40, S2-60	2532	1982	1432	311	571	170	461	30	1170	382	1272	144	384	476
200	S2-120, S2-150	S2-70, S2-80, S2-100, S2-120, S2-150	S2-70, S2-80, S2-100	2557	2007	1457	311	596	155	461	55	1255	462	1352	120	358	472
250	N/A	N/A	S2-120, S2-150	2696	2146	1596	450	596	292	600	55	1241	458	1348	120	385	522



Note: All dimensions in mm unless otherwise stated.

* Height dimensions when using a Hamworthy frame and pipe kit. Reduced heights may be possible when installing using alternative pipework solutions.

** Boiler depth variable:
 S2-40 S2-60 477mm
 S2-70 S2-80 S2-100 574mm
 S2-120 S2-150 692mm

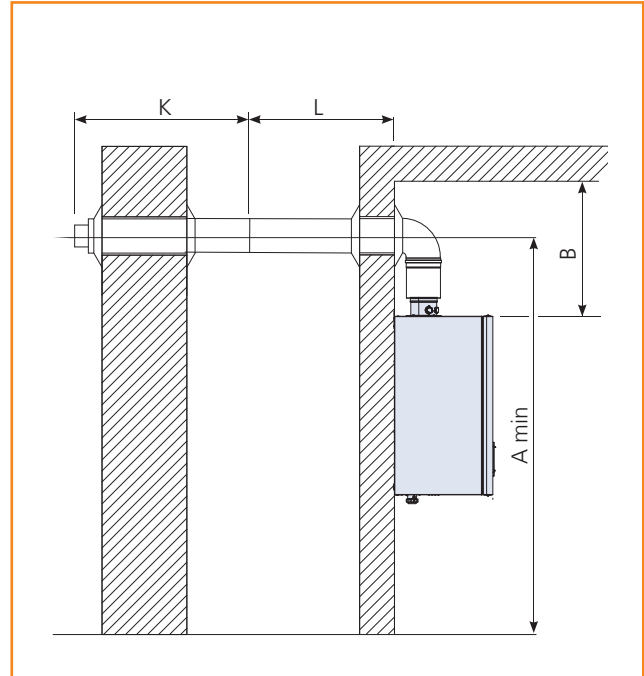
C13 room sealed flue system

C13 room sealed flues include a concentric flue system designed for termination horizontally through an external wall carrying combustion air from and flue gases safely to the outside.

Flue components are CE certified EN14471 T120 H1. Flue pressure H1 up to 5000 Pa, and flue temperature T120 up to 120°C.

Flue components other than terminals are only suitable for installation inside the building.

Note: It is recommended that horizontal flue terminals should be 3m above external ground level. This can be reduced provided the Risk Assessment contained in IGEM UP10 is satisfactorily completed. Below 2m a terminal guard is also required. Any termination must not cause nuisance or build-up of localised flue gas emissions.



Flue component materials of construction			
Flue diameter - mm	Inner pipe	Outer pipe	External finish
80/125	Polypropylene	Polypropylene	White
100/150	Polypropylene	Powder coated metal	White

C13 Room sealed flue performance data for Stratton mk2 boilers							
Model	S2-40	S2-60	S2-70	S2-80	S2-100	S2-120	S2-150
Flue diameter (mm)	80/125	80/125	100/150	100/150	100/150	100/150	100/150
Minimum height A (mm)	1948	1948	1995	1995	1995	1995	1995
Minimum ceiling clearance B (mm)	290	290	350	350	350	350	350
Maximum flue length L Nat Gas (m)	15	10	10	10	10	8	6
Maximum flue length L LPG (m)	15	8	10	10	10	N/A	N/A
Flue terminal length K (mm)	900	900	950	950	950	950	950
Equivalent length 90° Elbow (m)	1	1	1	1	1	1	1
Equivalent length 45° Elbow (m)	0.5	0.5	0.5	0.5	0.5	0.5	0.5

C13 Concentric flue components	Boiler models S2-40 to S2-60		Boiler models S2-70 to S2-150	
	Dia. 80/125 mm		Dia. 100/150 mm	
	Part number		Part number	
C13 Flue terminal kit including 90° elbow and wall plates. (black)	040946		040987	
Flue pipe 1000mm long	532511243		532511251	
Flue pipe 500mm long	532511244		532511252	
Flue pipe telescopic 300mm to 500mm	532511248			
Flue elbow 90°	532511246		532511249	
Flue elbow 45°	532511247		532511250	
Wall bracket	532511016		532511033	

Note: The risk assessment procedure detailed in IGEM/UP/10 Appendix 9 should be followed to determine suitability of the desired location and position of any horizontal flue termination.

Note: All dimensions in mm unless otherwise stated.

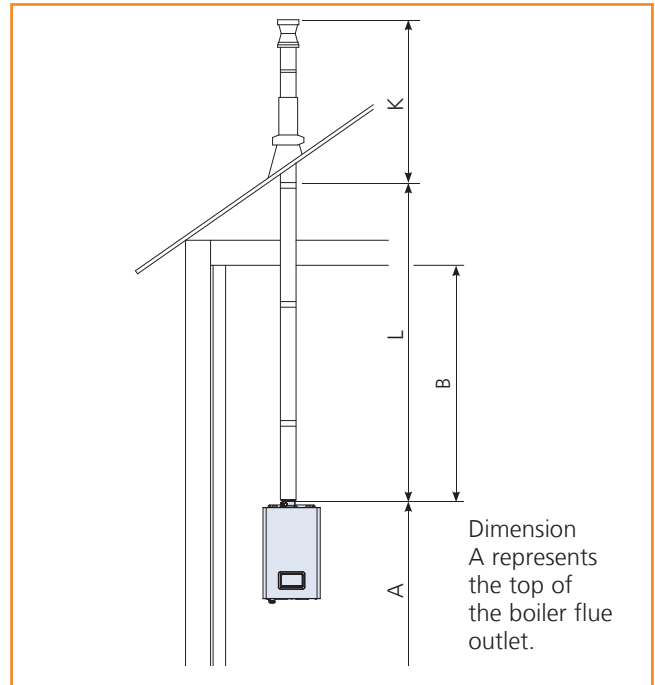
C33 room sealed flue system

C33 room sealed flues include a concentric flue system designed for termination vertically through a roof carrying combustion air from and flue gases safely to the outside.

Flue components are CE certified EN14471 T120 H1. Flue pressure H1 up to 5000 Pa, and flue temperature T120 up to 120°C.

Flue components other than terminals are only suitable for installation inside the building.

Flue component materials of construction			
Flue diameter - mm	Inner pipe	Outer pipe	External finish
80/125	Polypropylene	Polypropylene	White
100/150	Polypropylene	Powder coated metal	White



C33 Room sealed flue performance data for Stratton mk2 boilers							
Model	S2-40	S2-60	S2-70	S2-80	S2-100	S2-120	S2-150
Flue diameter (mm)	80/125	80/125	100/150	100/150	100/150	100/150	100/150
Minimum height A (mm)	1865	1865	1890	1890	1890	1890	1890
Minimum ceiling clearance B (mm)	140	140	170	170	170	170	170
Maximum flue length L Nat Gas (m)	15	10	10	10	10	8	6
Maximum flue length L LPG (m)	15	8	10	10	10	N/A	N/A
Flue terminal length K (mm)	1100	1100	1150	1150	1150	1150	1150
Equivalent length 90° Elbow (m)	1	1	1	1	1	1	1
Equivalent length 45° Elbow (m)	0.5	0.5	0.5	0.5	0.5	0.5	0.5

C33 Concentric flue components	Boiler models S2-40 to S2-60		Boiler models S2-70 to S2-150	
	Dia. 80/125 mm		Dia. 100/150 mm	
	Part number		Part number	
C33 Flue terminal kit including 90° elbow and wall plates.(black finish)	040947		040988	
Flue pipe 1000mm long	532511243		532511251	
Flue pipe 500mm long	532511244		532511252	
Flue pipe telescopic 300mm to 500mm	532511248		N/A	
Flue elbow 90°	532511246		532511249	
Flue elbow 45°	532511247		532511250	
Wall bracket	532511016		532511033	
Pitched roof flashing	532511177		532511178	
Flat roof flashing	532511173		532511174	

Note: All dimensions in mm unless otherwise stated.

C53 room sealed flue system

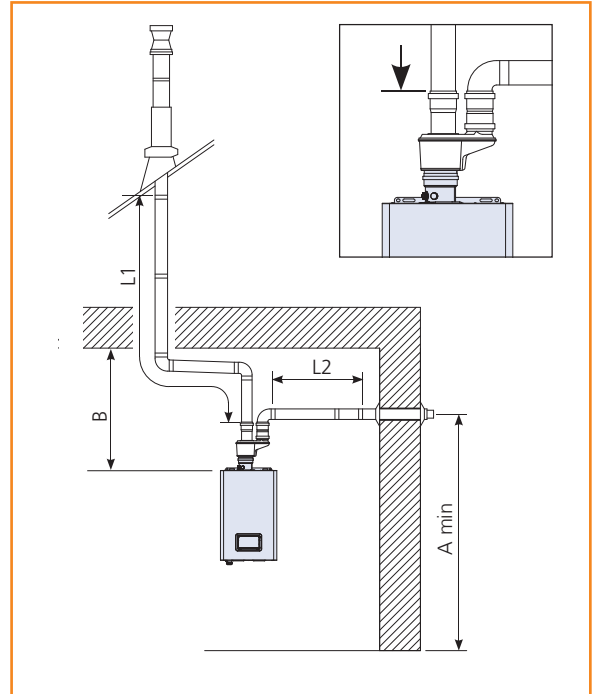
C53 room sealed flues consist of a twin pipe system with separate pipes carrying independently the combustion air from and flue gases to the outside.

Flue components are constructed from polypropylene with EPDM seals for carrying flue gases and combustion air from the boiler to outside.

Flue components are CE certified EN14471 T120 H1. Flue pressure H1 up to 5000 Pa, and flue temperature T120 up to 120°C.

Flue components other than terminals are only suitable for installation inside the building.

The appropriate adaptor kit for converting the concentric outlet of the boiler into a twin pipe system must be specified in addition to flue components and terminal.



C53 Room sealed flue performance data for Stratton mk2 boilers

Model	S2-40	S2-60	S2-70	S2-80	S2-100	S2-120	S2-150
Flue and air diameter (mm)	80	80	100	100	100	100	100
Minimum height A (mm)	2194	2194	2240	2240	2240	2240	2240
Minimum ceiling clearance B (mm)	510	510	570	570	570	570	570
Maximum flue length L1 Nat Gas (m)	17	15	15	15	15	14	6
Maximum air length L2 Nat Gas (m)	20	15	20	20	20	10	6
Maximum flue length L1 LPG (m)	17	15	15	15	15	N/A	N/A
Maximum air length L2 LPG (m)	20	15	20	20	20	N/A	N/A
Equivalent length 90° Elbow (m)	1	1	1	1	1	1	1
Equivalent length 45° Elbow (m)	0.5	0.5	0.5	0.5	0.5	0.5	0.5

C53 Concentric flue components	Boiler models S2-40 to S2-60	Boiler models S2-70 to S2-150
Item	Dia. 80 mm	Dia. 100 mm
	Part number	Part number
Flue terminal kit including air inlet and flue terminals, and concentric to twin pipe boiler connection kit.	040950	040999
Flue pipe 1000mm long	573407321	532511130
Flue pipe 500mm long	573407288	N/A
Flue elbow 90°	573407289	532511115
Flue elbow 45°	573407320	532511114
Pitched roof flashing	532511269	532511178
Flat roof flashing	532511263	532511262
Wall bracket	532511270	532511017

Note: All dimensions in mm unless otherwise stated.

Application and water system

Water systems

Stratton mk2 boilers are suitable for sealed pressurised systems only. 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 (see page 28 for details of these products).

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 waterborne debris. Cleaning strainers should be part of a regular site maintenance schedule. Additional use of a Clenston air and dirt 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 makeup water introduced to the system will dilute water treatment. It is therefore recommended to fit a water meter in the makeup 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 makeup 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.

System water meter

Adding a large amount of untreated water always contributes to a significant amount of scaling. To monitor this and to detect problems, a system water meter must be installed.

Water filter

A coarse filter and dirt separator must be fitted in the return pipework to remove suspended particles, and air separation must be provided at high points in the circuit.

Safety relief valves

Boiler safety relief valves are only provided as part of optional pipe kits. Where a Hamworthy pipe kit is not used, an appropriately sized safety relief valve must be fitted on the flow outlet before any isolation valve. Full details regarding the selection and sizing of safety relief valves is provided in BS 6644.

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 page 5 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. Stratton mk2 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.

Water flow requirements

The Stratton mk2 boiler is designed as a rapid response, low water content unit to run continuously with maximum reliability. Care should be taken in the initial design and layout to ensure adequate water flow through the boiler(s) having due regard for the influence of the control system. The primary circuit design should be such that secondary circuit conditions cannot have an influence over reliable operation of the boilers. The use of the matched low loss header to separate the two systems is recommended.

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.

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 Stratton mk2 boilers are equipped with a polypropylene syphon drain connection to which plastic polypropylene piping, with glued sealed joints should be connected to dispose of the condensate.

The condensate discharge pipe should have a minimum fall of 3° 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 5440 for boiler installations less than 70kW nett rated input, and 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:

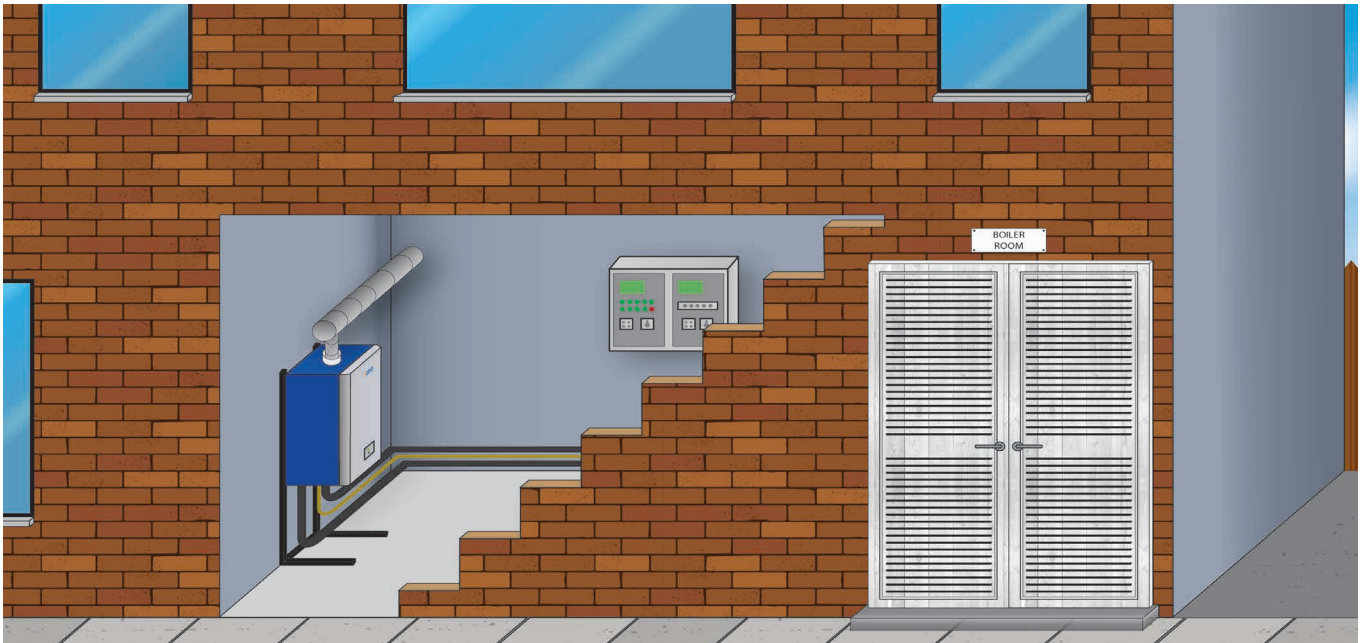
- ⊙ At floor level, 25°C (or 100mm above floor level)
- ⊙ At mid-level, 32°C (1.5m above floor level)
- ⊙ At ceiling height, 40°C (or 100mm below ceiling height)

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

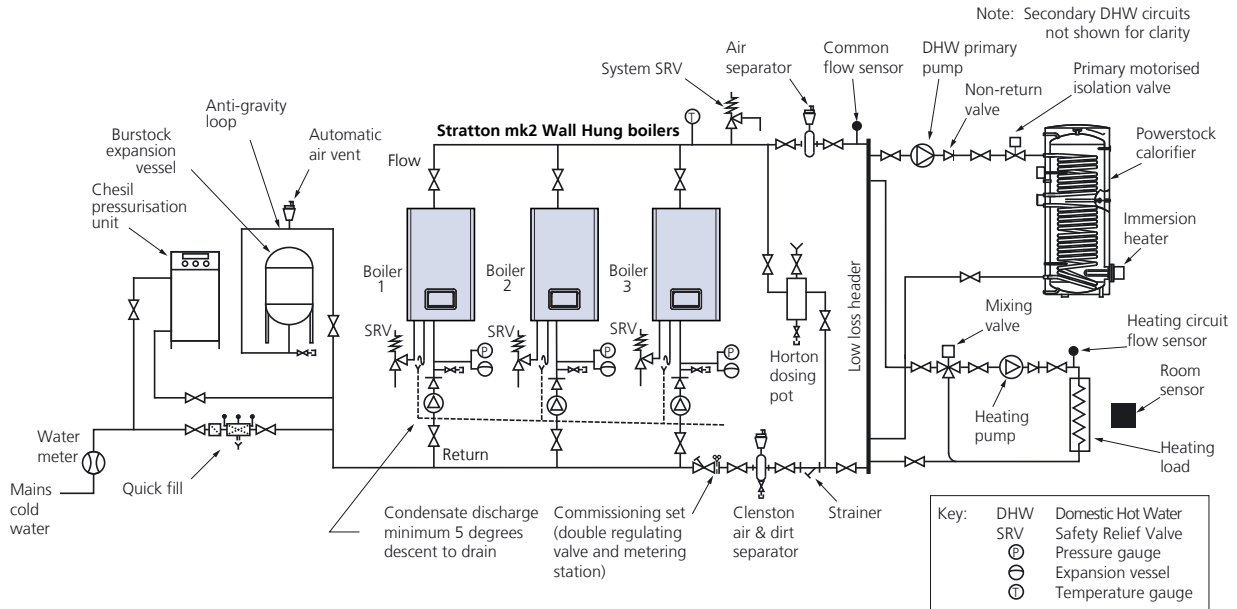
The air supply should be free from contamination such as building dust and insulation fibres from lagging. To avoid unnecessary cleaning and servicing of the boiler modules, the boilers should not be fired whilst building work is being undertaken. Where a boiler installation is to operate throughout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



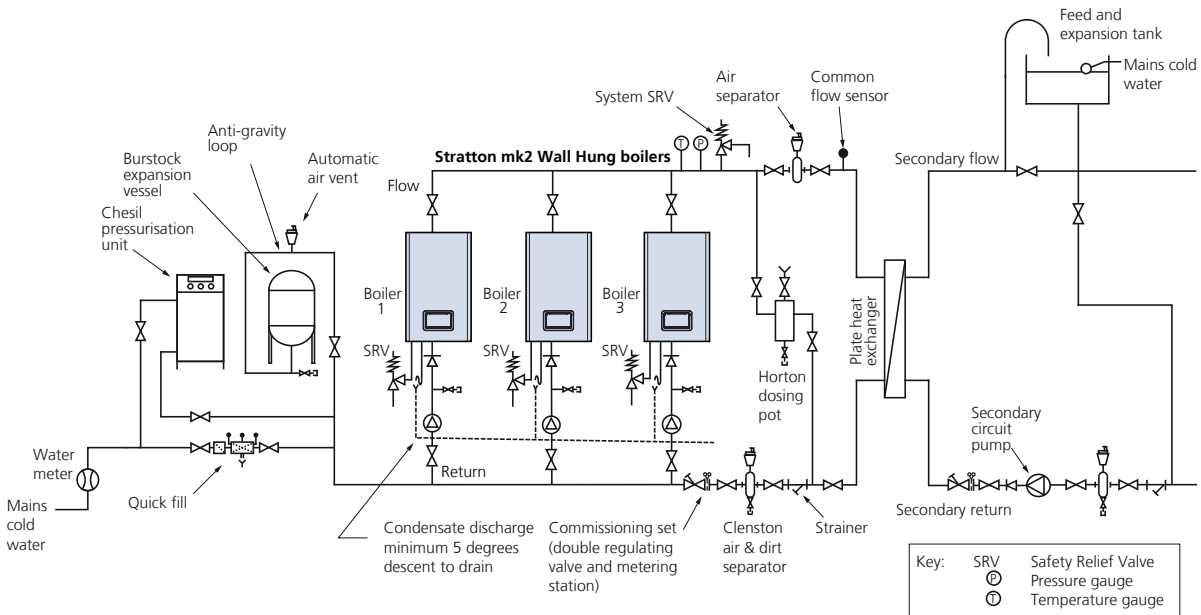
Typical boiler house ventilation.

Hydraulic schemes

Scheme 1: Sealed system with low loss header



Scheme 2: Sealed primary and open-vented secondary system with plate heat exchanger separation and without a low loss header



Note: These schematics have been provided for reference only.

Hydraulic circuits should never impede circulation through the boilers. The use of a low loss header is strongly recommended, or use of a plate heat exchanger for hydraulic separation to ensure adequate boiler flow.

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.

Dorchester direct fired water heaters



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 501 to 1,635 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 room sealed, fully automatic and permanent pilot options. Available in 31 models with continuous outputs from 369 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 and RHI heat meter for non-domestic Renewable Heat Incentive claims.

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 Stratton mk2 boiler has been designed with ease of service in mind. The combustion analysis point is easily located on the boiler making it easier for service engineers. 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 Stratton mk2 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 the Hamworthy Heating service department.



Warranty

The Stratton mk2 boiler comes with a 5-year warranty on the heat exchanger. All other parts carry Hamworthy's standard two-year 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. Standard delivery for all Hamworthy products is free of charge.

Boilers are delivered to ground level and are closely co-ordinated with the customer, to suit the site construction programme.

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**

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.

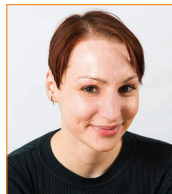
Lifetime support

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

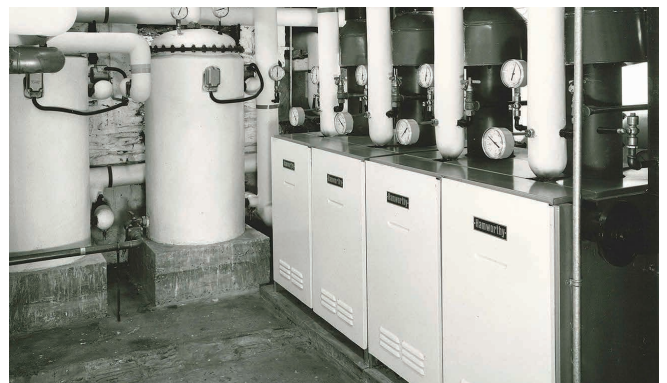
We are an active member of trade associations and professional bodies supporting the industries we work in.

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:

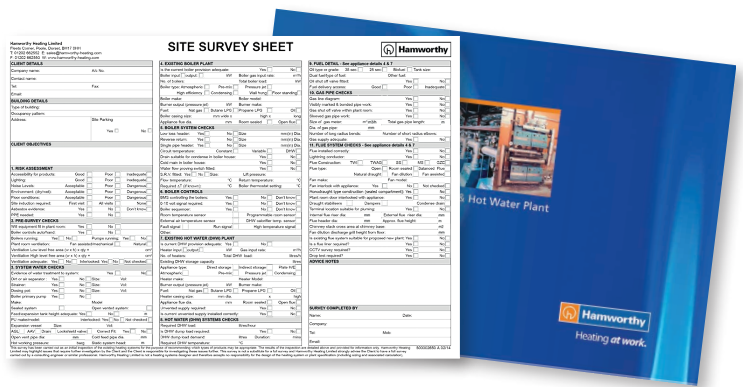
- ISO 9001 Quality Management System
- ISO 14001 Environmental Management System
- OHSAS 18001 Health and Safety Management System

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the commercial heating and hot water specialists.**



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