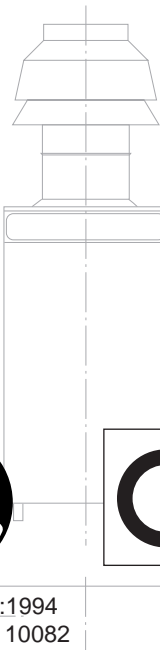
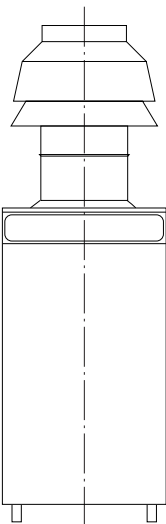
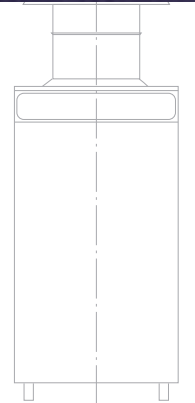
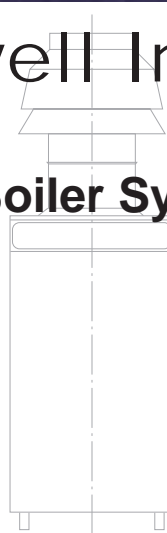


# Purewell Integra

## Gas Fired Modular Boiler Systems



BS EN ISO 9001:1994  
Certificate No. FM 10082



**HAMWORTHY**  
heating products

# Purewell Integra

## Cast Iron Atmospheric Gas Fired Modular Boilers Natural Gas or LPG

The latest range of Hamworthy atmospheric gas fired boilers offer simple reliable solutions, whilst incorporating modern technological advances.

The Purewell Integra offers a low profile design solution for applications where headroom is limited, often precluding the use of boilers with a conventional draught diverter.

The Integra simplifies the entry-level permanent pilot boiler and provides added benefits to the fully automatic range. There are three models with outputs of 40, 70 and 100kW.

Permanent pilot models operate in on/off mode with options to specify a flame failure kit for remote signalling and the wall hung Marshall HE sequence control system.

Fully automatic models also operate in on/off mode with hot surface ignition and volt free contacts, for BMS interface, fitted as standard.

Options on the fully automatic include hours run meters, pump over-run timer and a plug-in Marshall sequence control system.

Increased reliability is achieved by the use of our hot surface ignition system, which improves cold start situations and eliminates electrical spikes associated with conventional spark ignition systems.

Individual boiler shunt pumps are not required on Hamworthy Purewell boilers and therefore costs can be reduced on multiple installations.

To reduce working time on site and simplify installation the Purewell Integra range can be supplied with pre-fabricated reverse return header kits. An optional header insulation kit, which matches the boiler casings enhances the overall appearance of the installation.

*For further details of reverse return header kits please refer to publication 500002129.*

- Accurate load matching
- System design flexibility
- Reduced headroom requirement
- Simple design, reliable performance
- Reduced standing losses
- Alternative compact styling
- Lower servicing & maintenance costs

BENEFITS

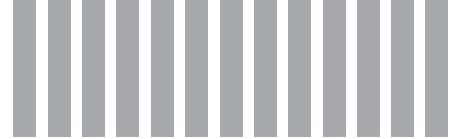
**Modular systems provide a reliable, tried and tested approach, and as the largest manufacturer of modular boilers in the UK, Hamworthy offer complete solutions for commercial heating requirements, which are both flexible and efficient.**

### Modular boilers

Infinitely variable outputs.



*Purewell Integra fully automatic boiler (left) and permanent pilot boiler (right)*



# Purewell Integra Specification

## Permanent Pilot Controls

The gas supply to the burner is controlled using a multifunctional valve with a permanent pilot ignition system. The operation of the gas valve is directly controlled from the boiler thermostat, which is connected via a pre-wired flying lead with plug & socket connections.

Flame monitoring is achieved using a simple thermocouple. The thermocouple is connected via an energy cut-off (ECO) lead to a manual reset limit thermostat that will interrupt

the signal to the pilot valve in the event of flame failure. An optional pilot flame failure pressure switch is available to provide volt free switching for remote indication of pilot failure. A piezo spark ignitor unit is fitted to the boiler in order to light the permanent pilot.

The control and limit thermostats are both housed within a fabricated steel control box that is accessed by removing the front door panel. The main electrical connection to the boiler is made using the fused 3-pin IEC plug supplied with the control box.

## Options

- **Marshall HE sequence controller**
- **Reverse return header kits**
- **LPG - propane**
- **Flame failure kit**

## Advanced features

- **Volt free contacts**
- **Remote start/stop circuit**
- **Hot surface ignition**

## Options

- **Hours run meters**
- **Plug-in Marshall sequence controller**
- **Reverse return header kits**
- **LPG - propane**
- **Pump over-run kit**

## Fully Automatic Controls

The Purewell Integra fully automatic boiler dispenses with a permanent pilot and utilises a hot surface ignition system. This highly effective and reliable form of ignition requires less maintenance than conventional spark ignition, and eliminates the electrical interference sometimes associated with that type of system. Flame proving is achieved using a flame rectification probe.



Fully automatic boilers are fitted with a fabricated steel control panel, which houses the main electronic control system. The control panel has a drop down fascia to facilitate access for servicing and a visual display, which allows the user to monitor the current operating status of the boiler.

All fully automatic boilers are fitted as standard with volt free contacts which allow for remote monitoring of the boiler status, indicating boiler run, lockout & high temperature conditions.

For effective control of multiple boiler installations the control panel has been designed to accept the plug-in Marshall sequence controller. Refer to page 10 for more details.

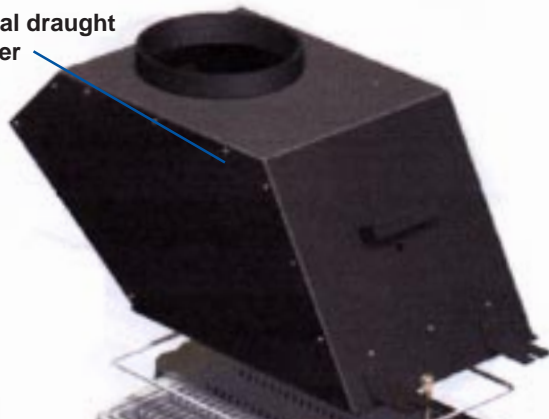
The boiler can be controlled remotely from a Building Management System or Timeclock controller using the remote start/stop circuit.

# Improved Efficiency

High efficiency is one of the key principles for the Purewell. The heat exchanger has been developed to maximise heat transfer, satisfying the efficiency requirements laid down within the European Boiler Efficiency Directive, whilst retaining a very robust construction for long life.



Integral draught diverter



Full 'R' sections

Wet base section

Basket assembly

Burner bars

## Heat exchanger

Using up to date casting technology, Hamworthy has a reliable proven design for the "series flow" heat exchanger, that has been developed specifically for the Purewell range of boilers.

- Each individual section has been designed exclusively to suit boiler input.
- The section design incorporates an increased finned surface area generating a highly efficient gas to water heat transfer.
- Each individual heat exchanger is nipped at alternate ends eliminating the problem of thermal stress.
- The Purewell is also designed specifically to operate at low water return temperatures for prolonged periods.

The wet base section is a crucial part of the heat exchanger and is therefore designed to optimise overall efficiency.

- The Purewell has a deep wet base section positioned close to the burner bars. This enables the bottom of the boiler to remain cool whilst absorbing heat normally wasted, thereby improving boiler efficiency.

Once assembled the heat exchanger is covered with an insulation jacket which retains heat within the boiler minimizing radiant heat losses.

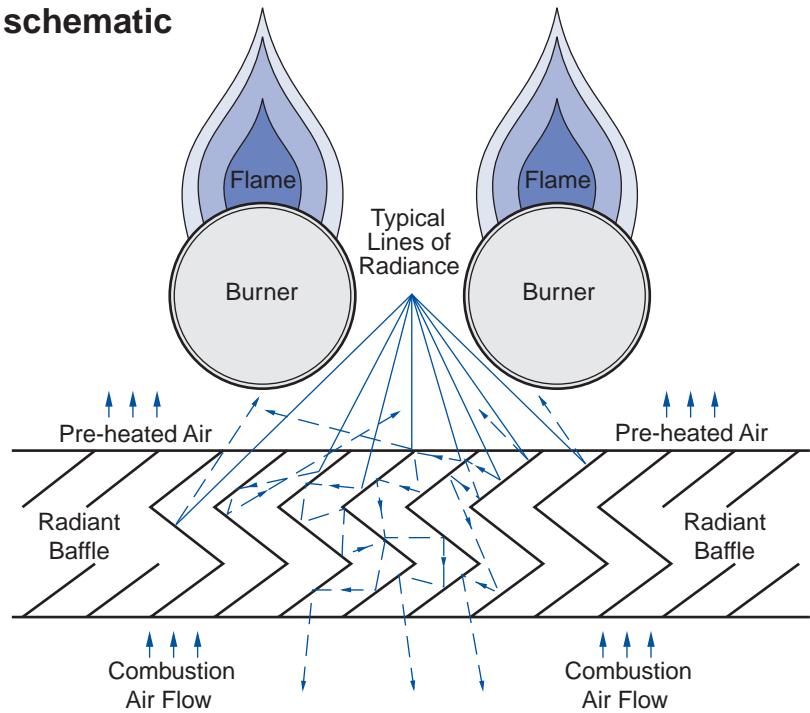
## Radiant baffle



The patented baffle is constructed such that it reflects radiant heat back into the combustion chamber, consequently minimizing heat losses from the boiler.

- The combustion air is pre-heated by extracting heat, as it passes through the baffle.
- By pre-heating the air, efficiency is improved which assists the process of combustion.
- The air travels in a convoluted pattern cooling the baffle in the process by impacting air onto the steel surface.
- The baffle ensures that there are very low temperatures beneath the boiler which protects the floor and provides a safer environment for servicing purposes.
- The baffle removes the need for ceramic insulation and its associated problems.

## Radiant baffle schematic



## High flow gas valves

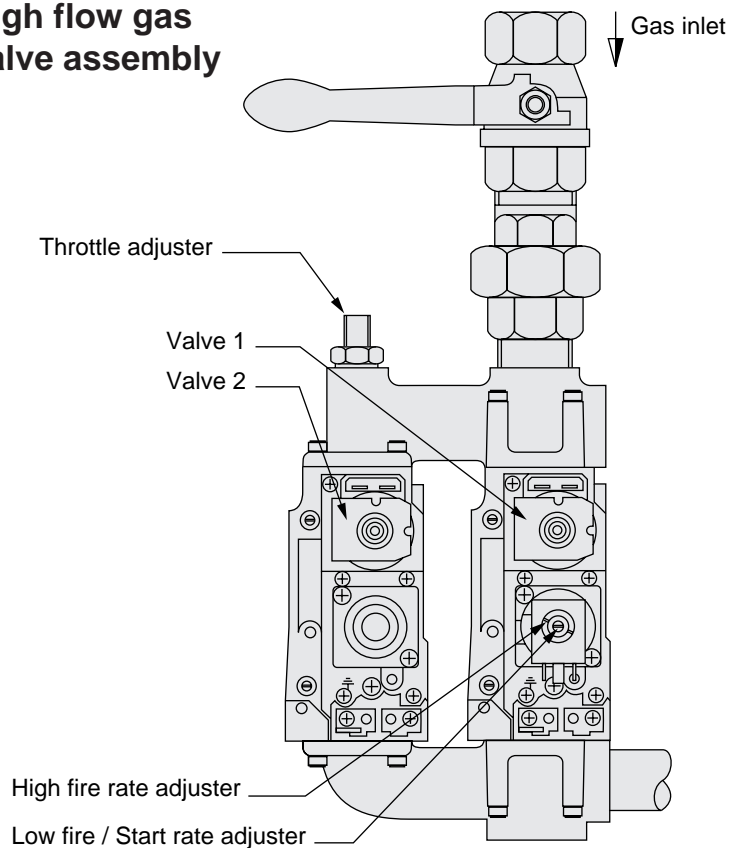


For 95 kW models and above, the Purewell fully automatic boiler has a unique patented flow sharing gas valve system demonstrating Hamworthy's skilled proficiency in design engineering.

- The flow share system enables a specified quantity of gas to be passed economically through small valves, whilst retaining the required degree of downstream pressure control.

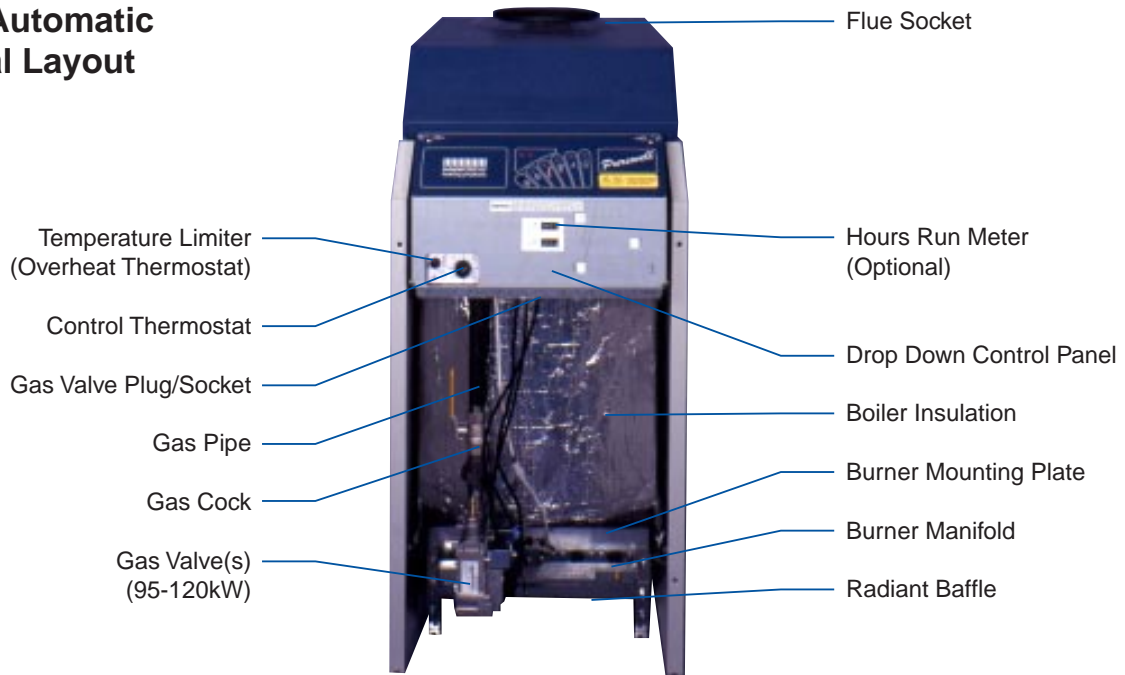
All Purewell fully automatic boilers have a low fire start rate which ignites across all burners at a given percentage of total output. This ensures a safer light up which is fully compliant with the Gas Appliance (Safety) Regulations.

## High flow gas valve assembly

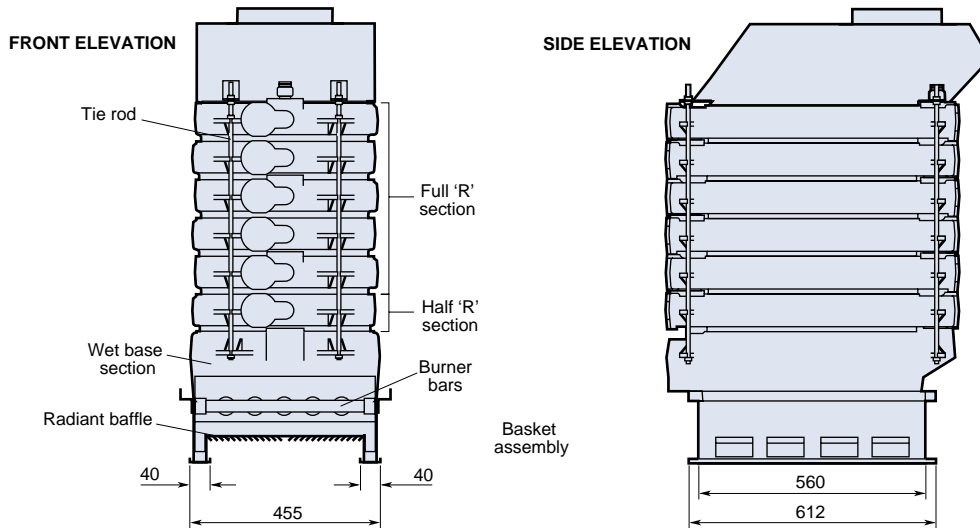


Note: Purewell 95,100,105 & 120kW models only

## Purewell Integra Fully Automatic Typical Layout



## The Heat Exchanger Module



Boiler Model	PI 40	PI 70	PI 100
Base Sec.	1	1	1
Tie Rods	4	4	4
Burners	4	4	5
Plain 'R' Sec.	0	0	0
Half 'R' Sec.	0	1	1
Full 'R' Sec.	3	3	4



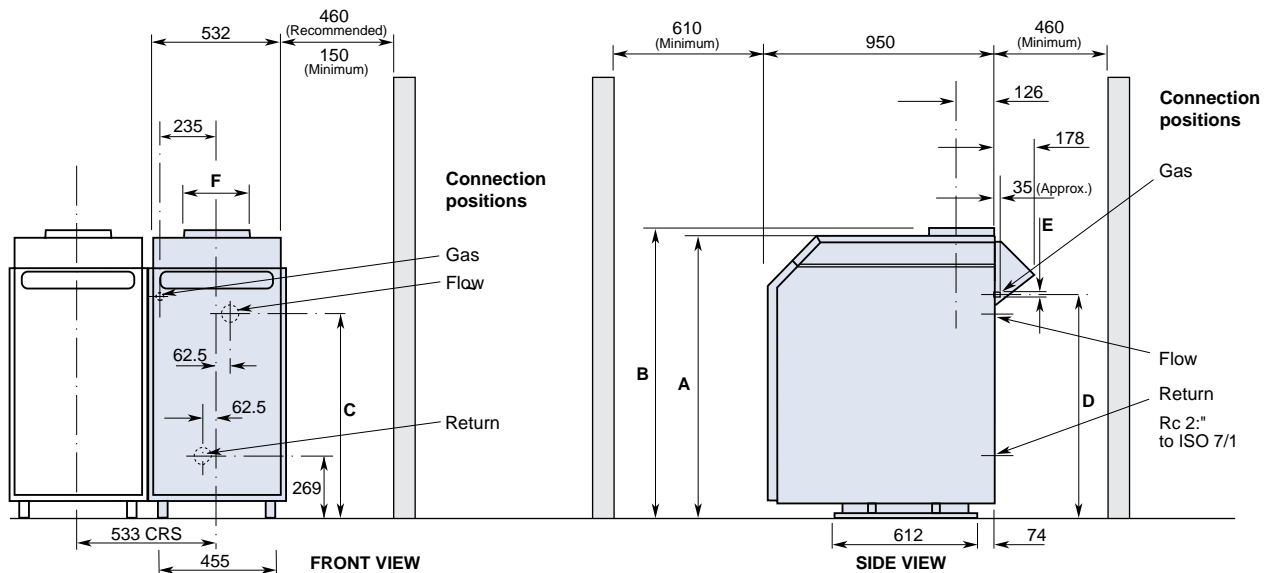
# Technical Data

## Purewell Integra Performance and General Data Information

BOILER MODEL		PI 40	PI 70	PI 100
Energy	Boiler output kW Btu/h x 1000	40 136.5	70 238.8	100 341.2
	Boiler input (Gross) kW Btu/h x 1000	49.3 168.2	88.4 301.6	126 429.9
	Boiler input (Nett) kW Btu/h x 1000	44.4 151.5	79.6 271.6	113.6 387.6
Water	Water content l UK gal	30 6.6	37.1 8.2	44.2 9.7
	System design flow rate @ 11°CΔt across module l/s UK gal/min	0.87 11.5	1.52 20.1	2.17 28.6
	Minimum flow rate at any time @ 22°CΔt rise l/s UK gal/min	0.43 5.7	0.76 10.0	1.08 14.3
	Waterside pressure loss @ 11°CΔt mbar in wg	5.10 2.0	20.59 8.3	41.12 16.5
	Maximum water pressure bar psig	6 87		
	Minimum water pressure modular application 82°C flow 11°CΔt bar psig	0.42 6.1		
Gas	Input rate natural gas m <sup>3</sup> /h ft <sup>3</sup> /h	4.73 167.0	8.27 292.1	11.8 416.7
	Nom.gas inlet pressure at boiler natural gas mbar in wg	20 8		
	Max.gas inlet pressure at boiler natural gas in wg	25 10		
	Gas setting pressure standard module natural gas mbar in wg	13.4 5.4	11.0 4.4	10.2 4.1
Flue	Approx flue gas volume @ 9% CO <sub>2</sub> @ NTP m <sup>3</sup> /h ft <sup>3</sup> /h	62.9 2221	110.0 3884	157.0 5543
	Approx flue gas temp. nett (primary flue) °C °F	190 365	220 423	205 401
Connection	Water flow/return Connections	Rc2" ISO 7/1		
	Gas inlet Connection	R <sup>3</sup> / <sub>4</sub> " ISO 7/1		R1" ISO 7/1
	Flue connections to draught diverter nominal dia. mm in	206 8.11		256 10.1
	Electrical supply	230v 50Hz Single phase, 6 amp fuse		

# Dimensional Data

## Purewell Integra Boiler Dimensions/Clearances



### Single units

Model	PI 40	PI 70	PI 100
Approx. dry weight kg.	240	290	350
A - Boiler height (Casing) mm.	1007	1195	1195
B - Flue height from floor mm.	1035	1126	1201
C - Flow connection height mm.	580	667	761
D - Gas connection height mm.	769	769	957
E - Gas connection size - BSP.T Male	R <sup>3</sup> / <sub>4</sub> "	R <sup>3</sup> / <sub>4</sub> "	R1"
F - Flue outlet Dia. mm. (nominal)	206	206	256

**Note:** The 533 centres relates to boilers close coupled in modular form. For stand alone applications, a minimum of 150mm should be allowed between casings. (Space baskets 200mm apart).

## Purewell Integra Modular Boilers

### Modular boiler systems

Multiple boilers installed on the modular principle allow each boiler to contribute part of the load.

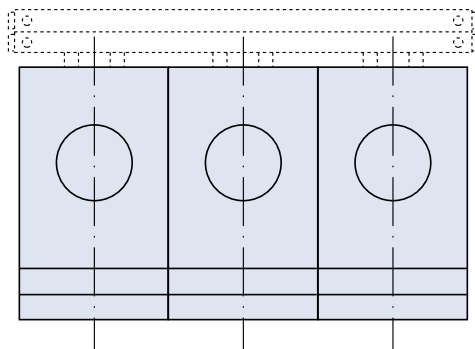
Each active boiler can operate at full load for optimum efficiency and through a sequence control system can be fired in turn until the sum of the boilers working equals the load.

The Purewell is designed for outstanding efficiency and in a modular configuration offers a greater degree of control.

### Modular selections

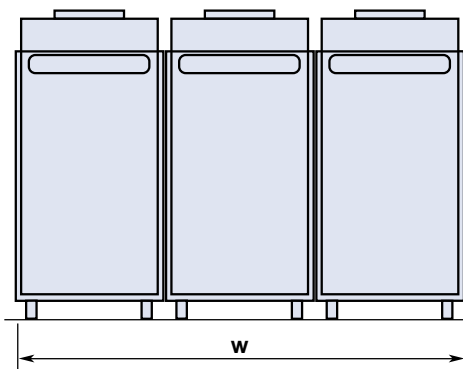
The table opposite shows the configuration for Purewell Integra boilers.

Details are given for up to six boilers in each module, and by adding modules the system output is infinitely variable.

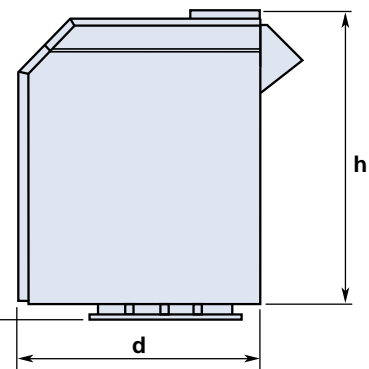


Note: For further details of Reverse Return Header Kits please refer to page 11.

**Plan**



**Front**



**Side**

Output to water		Model	No. of boilers	Input rate natural gas		Approx. dry weight kg	Approx. Overall size w x d x h (mm)
kW	Btu/h x 1000			m <sup>3</sup> /h	ft <sup>3</sup> /h		
80	273.0	MPI 80/2/40	2 x PI 40	9.46	334.1	480	1064 x 950 x 1035
120	409.5	MPI 120/3/40	3 x PI 40	14.20	501.5	720	1596 x 950 x 1035
140	477.7	MPI 140/2/70	2 x PI 70	16.54	584.1	580	1064 x 950 x 1129
160	545.9	MPI 160/4/40	4 x PI 40	18.90	667.4	960	2128 x 950 x 1035
200	682.4	MPI 200/5/40	5 x PI 40	23.68	836.3	1200	2660 x 950 x 1035
200	682.4	MPI 200/2/100	2 x PI 100	23.68	836.3	700	1064 x 950 x 1223
210	716.5	MPI 210/3/70	3 x PI 70	24.80	875.8	870	1596 x 950 x 1129
240	818.9	MPI 240/6/40	6 x PI 40	28.30	999.4	1440	3192 x 950 x 1035
280	955.4	MPI 280/4/70	4 X PI 70	33.08	1168.2	1160	2128 x 950 x 1129
300	1023.6	MPI 300/3/100	3 x PI 100	35.50	1253.7	1050	1596 x 950 x 1223
350	1194.2	MPI 350/5/70	5 x PI 70	41.35	1460.3	1450	2660 x 950 x 1129
400	1364.8	MPI 400/4/100	4 x PI 100	47.20	1666.9	1400	2128 x 950 x 1223
420	1433.0	MPI 420/6/70	4 x PI 70	49.60	1751.6	1740	3192 x 950 x 1129
500	1706.0	MPI 500/5/100	5 x PI 100	59.00	2083.6	1750	2660 x 950 x 1223
600	2047.2	MPI 600/6/100	6 x PI 100	70.50	2489.7	2100	3192 x 950 x 1223

# Purewell Specification

## Heat exchanger

Each individual boiler has a heat exchanger manufactured from horizontal cast iron sections which when pressed together with nipples at alternate ends, produce a proven horizontal series water flow pattern. During assembly each heat exchanger is pressure tested to 14bar (203 psi). The Purewell is tested to the latest boiler standards covering working pressure up to 6 bar (87 psi).

The boiler sections are positioned onto a fabricated galvanized mild steel basket assembly which houses the burner bar and igniter assembly. The burner bar and gas train assemblies are attached by two nuts to the basket emphasising serviceability and ease of inspection.

## Hot Surface Ignition

Fully Automatic boilers have a direct burner ignition system that ignites the burners each time the boiler is called to fire. This is achieved using a hot surface ignition element that reaches a temperature of approximately 1300°C.

Hot surface ignition replaces the traditional spark electrode that can sometimes produce electrical spikes, which are a possible cause of interference with control systems.

## Burner

The burner arrangement of the boiler comprises a tried and tested reliable burner bar system with 4/5 burner bars depending on thermal input. This system has been specifically designed to provide clean and efficient combustion.

## Radiant Baffle

A patented radiant baffle assembly is positioned beneath the burner bars, this both protects the floor underneath the boiler and improves overall

efficiency. The baffle assembly is extremely durable, constructed from coated steel, and obviates the need to use ceramic insulation. (For more detailed information refer to page 5).

## Layout

The Purewell boiler can be installed as a single unit or in modular form where a 'multi' casing maximizes available floor space.

It is recommended that a maximum of 6 boilers can be positioned on 533mm (21") centres if required. Larger numbers should be split into two or more banks with 150mm (6") between each bank.

The positioning of the boilers on 533mm (21") centres can be done with a high level of accuracy. To complete a modular formation, the baskets are butted against each other which ensures that distances cannot be sized incorrectly.

The Purewell is supplied on a dismantlable wooden pallet giving improved ease of installation.

The basket assembly incorporates runner type feet which increases the overall manoeuvrability of the boiler for final site positioning.

It is recommended that under normal circumstances a maximum of six boilers should be connected to one flue header with up to eight boilers being served by a single chimney.

## Sequence Control

Using a number of smaller boilers (modules) in order to accurately match the required load is acknowledged as an excellent approach to heating system design. In order to get the full benefit from a multiple boiler installation it is essential to fit some form of sequence controller in order to regulate the firing of each module.



*For further details of the Marshall Sequence Control System please refer to publication 500002128.*

Fully automatic Purewell Integra boilers can be fitted with the plug-in Marshall boiler sequence controller, which is housed directly within the individual boiler control panels. The Marshall unit utilises a form of floating control that monitors the rate of temperature change within the system and sequences the boilers to match the required load. This form of control eliminates the temperature overshoots that may occur in rapid response boiler systems, thus achieving close control over the mixed flow temperature without being over sensitive. The plug-in Marshall sequence control system consists of one Master unit and then a Slave unit fitted to each of the other boilers. The units are connected using pre wired plug-in leads to connect the Master & Slave units together in series. The plug-in Marshall is capable of providing full sequence control for up to nine on/off boilers.

In addition to providing sequence control of the boiler installation the Marshall is also capable of direct weather compensation and optimised boiler start. These features require optional external and room temperature sensors to be fitted, and enable further energy savings to be achieved.

For sequence control of Permanent Pilot Purewell Integra boilers, the Marshall-HE is capable of controlling up to 8 on/off boilers. The unit is enclosed within a smart, slim lightweight casing that is designed to be installed on a boilerhouse wall or



any other location within the building. The Marshall-HE panel has many of the same features as the integral Marshall panel including the ability to provide temperature compensation and optimised start.



For further details of the Marshall-HE Sequence Control System please refer to publication 500002136.

### The draught diverter

The Purewell Integra range has a specially designed low level draught diverter that can be connected directly to a suitably sized flue system, thus keeping the overall height of the installation to a minimum.

The draught diverter is essential for ensuring that the combustion process is unaffected by changes in draught conditions within the flue system. Down draught needs to be dispersed before it reaches the combustion chamber of the boiler otherwise it can adversely effect efficiency and can also lead to the production of carbon monoxide. The integral draught diverter redirects any down draught outside the boiler, without effecting combustion. For excessive up draught conditions the situation is reversed with air being drawn up through the draught diverter into the flue.

The integral draught diverter has been constructed incorporating a removable access plate to facilitate cleaning of the boiler without having to remove the flue.

### Boiler casing

Careful consideration has been given to casing design. The panels are of robust construction and mounted to the boiler giving greater rigidity to the unit. Due regard has been given to serviceability and easy access to the boiler. A deep removeable front door panel provides the end user with ease of inspection and maintenance. For modular applications two casing panels are provided and positioned on either side of the configuration. In between each module is a steel intermediate frame.

Optional rear cover plates are available to enhance the appearance of the boiler backs.

### The gas train

The gas train is completely detachable. Major items can be removed during servicing within 2-3 minutes if required. The gas train comprises a service cock, union connection, gas valve(s) and injector manifold.

### Connections

#### ■ Gas

The Purewell boiler is fitted with a gas inlet pipe which terminates at the rear of the casing.

Connection sizes are as follows:

*Purewell Integra 40, 70 - R<sup>3</sup>/<sub>4</sub>" (BS.21)*

*Purewell Integra 100 - R1" (BS.21)*

#### ■ Water

Designed to meet latest market requirements, the water connections are also at the rear of the boiler.

Each boiler has one 2" BSP female flow and one 2" BSP female return tapping.

### Reverse return headers

To ensure an even flow of water through each boiler in a modular installation, the water flow and return should be connected in a reverse return arrangement.

Designed specifically for the Purewell family of boilers, Hamworthy can supply pre-fabricated reverse return header kits complete with valves, fittings and inter-connecting pipework pre-cut and finished to length.

The reverse return header kits come with an optional insulation kit with casings to match the boiler.

(refer to publication 500002129 for further details).

### Commissioning

Hamworthy Heating Ltd strongly recommend that all boilers are commissioned by their service department who will issue a boiler log-book that details the initial operating settings and can be used to record future maintenance work.

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

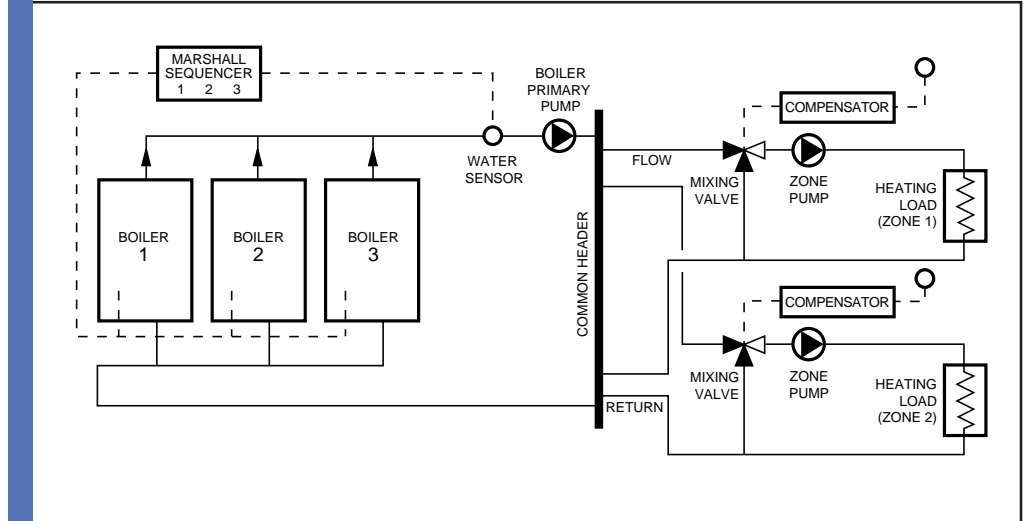


# System Design

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.

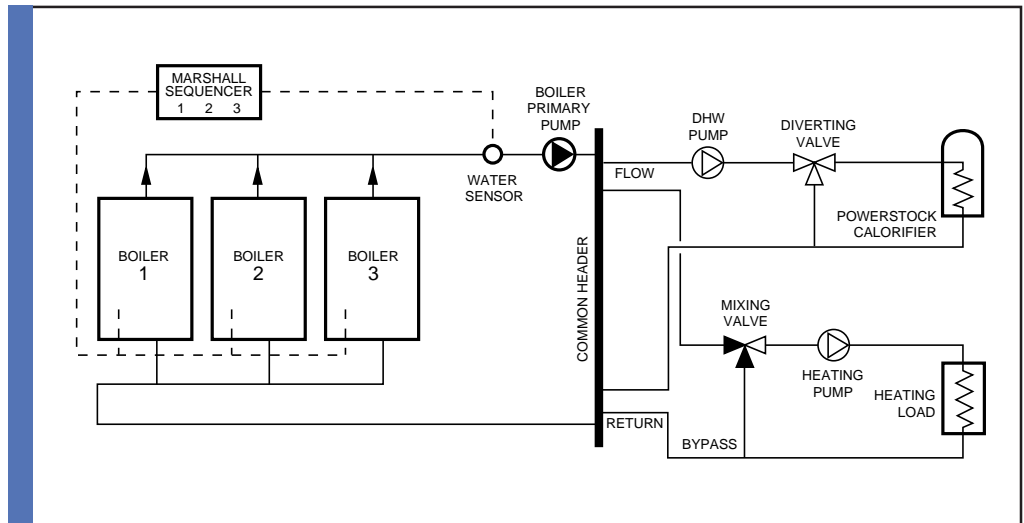
## Example 1

Heating only; with separate temperature compensation on each zone.



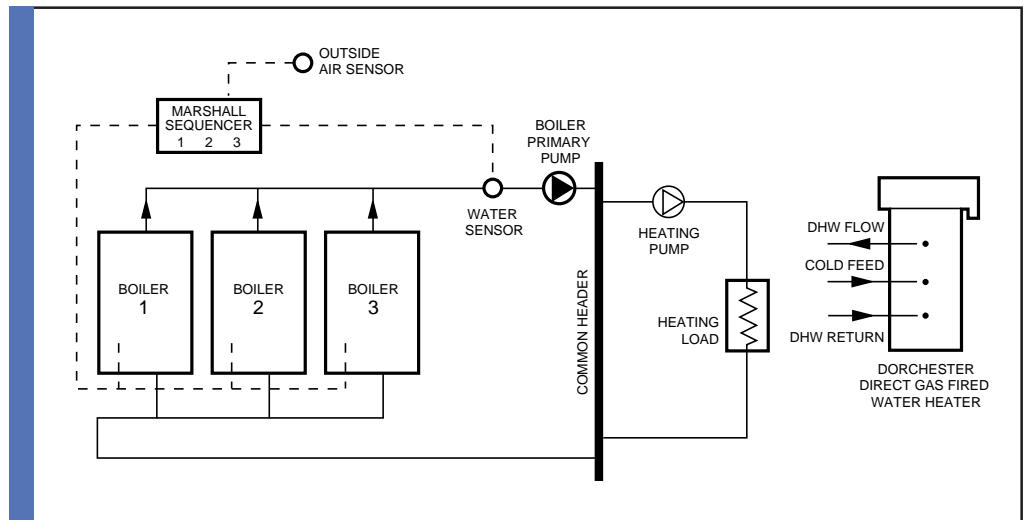
## Example 2

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



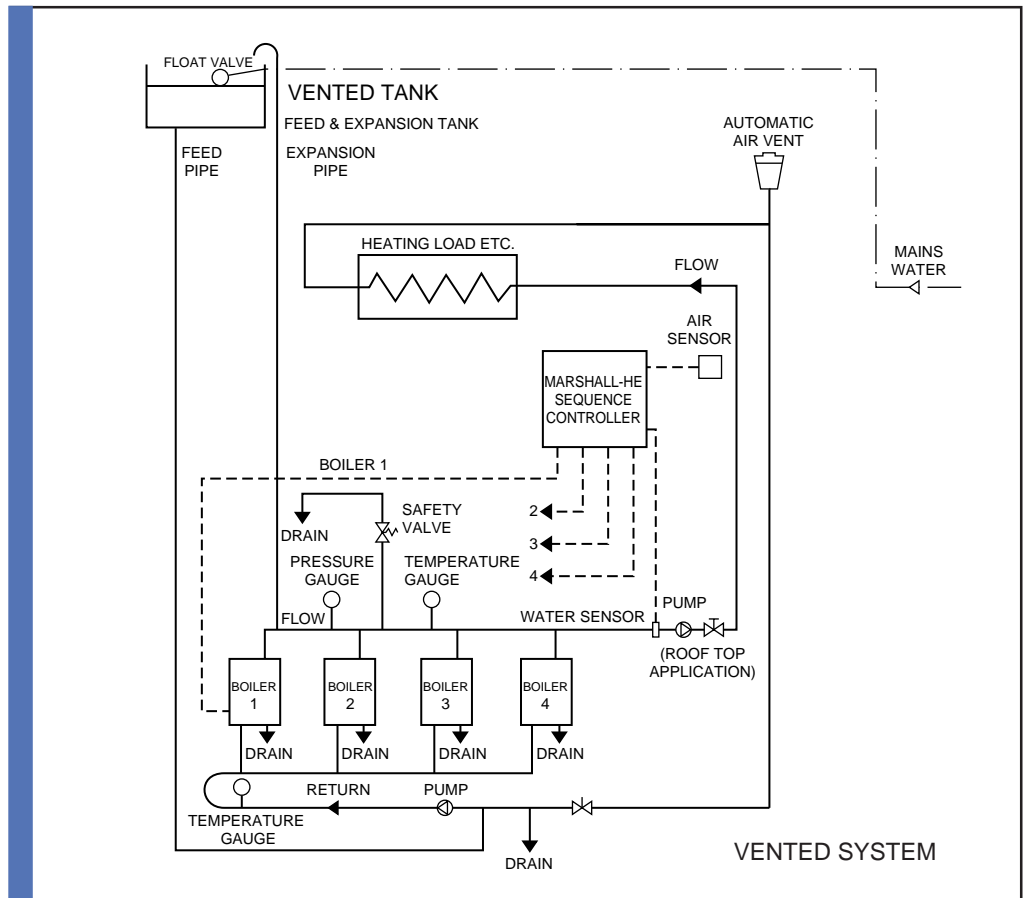
## Example 3

Split system. Completely separate heating and DHW systems. Multiple boilers under direct temperature compensation and a decoupled heating circuit, which may have a variable flow. DHW generated by direct gas fired water heaters.



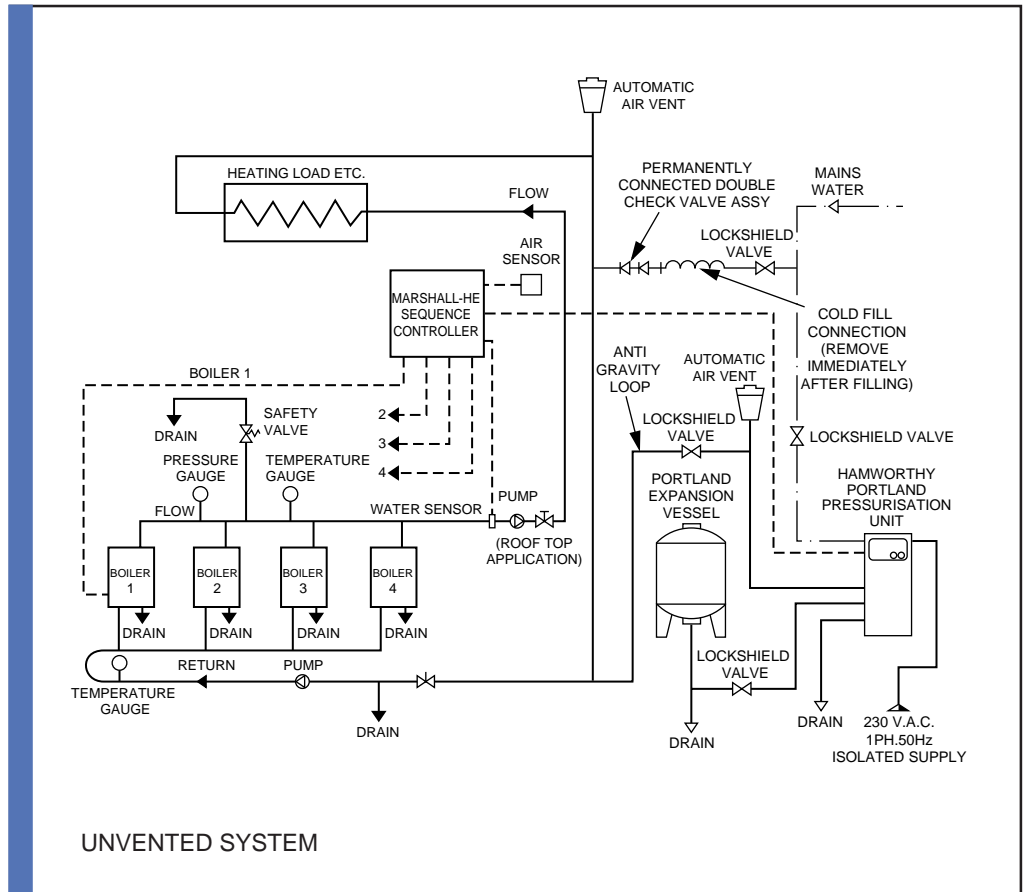
**Example 4**

Boiler installation (typical) vented system.



**Example 5**

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 8). 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.

# 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.

## Delivery

Each boiler is despatched as a fully assembled heat exchanger and basket (including burners and gas valve(s) etc.) positioned on a pallet packed in shrink wrap protective covers.

The integral draught diverter is supplied fully fitted as part of the heat exchanger assembly.

The following items are supplied packed in separate cardboard containers:

- Boiler casing complete with assembly instructions.
- Control assembly with relevant control system.

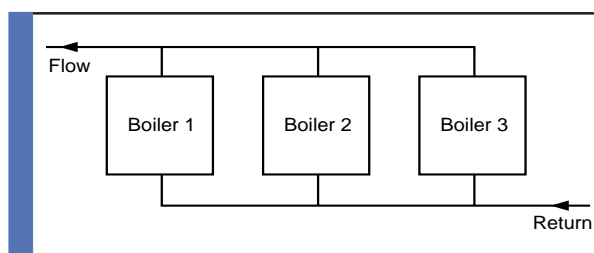
## Boiler base

Purewell 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. This should not normally be less than 460mm at the rear, for flow and return connections. Also allow at least 460mm on one side, the other side must be no less than 150mm. Allow 610mm (minimum) in front of the boiler for servicing.

## Water systems - Modular installations

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.

For details of Hamworthy's prefabricated reverse return header kits refer to publication 500002132.



Purewell modular boilers in "reverse return arrangement"

For further details relating to the design of multiple boiler systems refer to publication 500002194.

## Adequate water flow

The Purewell boiler is designed as a quick response, low water content unit to run continuously with minimal operating problems. Care should be taken in the initial design and layout, having due regard for adequate water flow through the boilers and the influence of the system control. Refer to technical data table for minimum water flows required. The control system and valves, where fitted, should be regulated to avoid lower flows occurring. The flow corresponding to 22°C temperature rise across the boiler is the minimum recommended flow at any time. A minimum return temperature of 30°C should be maintained. For boiler pressure drop refer to page 7 technical data table.

## 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.

## 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.**

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

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)

540cm<sup>2</sup> plus 4.5 cm<sup>2</sup> per kW in excess of 60kW total rated input.

### High Level (Outlet)

270cm<sup>2</sup> plus 2.25 cm<sup>2</sup> per kW in excess of 60kW total rated input.

### 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 mm<sup>2</sup> c.s.a.). Fascia fuse rating is 2 amp. External fuses should be 6 amp for all single boiler sizes.

### Thermostats

All Purewell Integra boilers are supplied as standard with a temperature limiter that has a range of 90-110°C, this will normally be factory set to 100°C. Permanent pilot boilers have a control stat supplied as standard with a range of 0-120°C. Fully automatic boilers are fitted with a single stage electronic temperature control, which has a standard range of 65-90°C. If higher control temperatures are required the range of the electronic temperature controller can be increased to 120°C. Where fully automatic or permanent pilot boilers are to be operated at control temperatures in excess of 100°C, a higher limit stat which has a maximum range of 120°C will be required. This should be specified at the time of ordering. The difference between the high limit stat setting and the control stat should not be less than 10°C.

### 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.





# Flue System

## General Requirements

Hamworthy Purewell boilers are designed to be used with natural draught flues. Flue systems should be designed in accordance with current regulations. The following points should be noted:

- Each boiler must have its correct draught diverter fitted in an unmodified condition before connection to the flue system.
- The bottom of the flue header should be at least 500mm (20") above the skirt of the integral draught diverter.
- The flue system must be self supporting in the correct position to avoid loading the draughtdiverter and enable its removal for maintenance.
- The integral draught diverter is equipped with an access plate to facilitate cleaning.
- The flue system should be designed to achieve a negative

suction at all times at the draught diverter outlet on all modules in a bank. For optimum boiler performance, draught conditions should be between 0.05 to 0.125 mbar. The 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.

For further details of Forston Packaged Fan Dilution Systems refer to the following publications:

Forston 400: 500002095  
Forston 200&300: 500002199

### 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

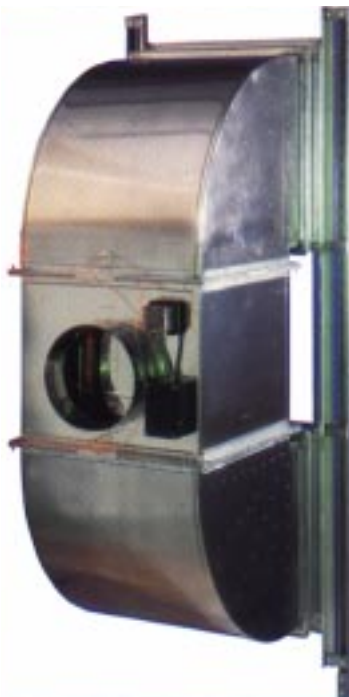


*Hamworthy Flue Components*

incorporating sizing, site survey and drawings for approval, (where necessary) prior to manufacture.

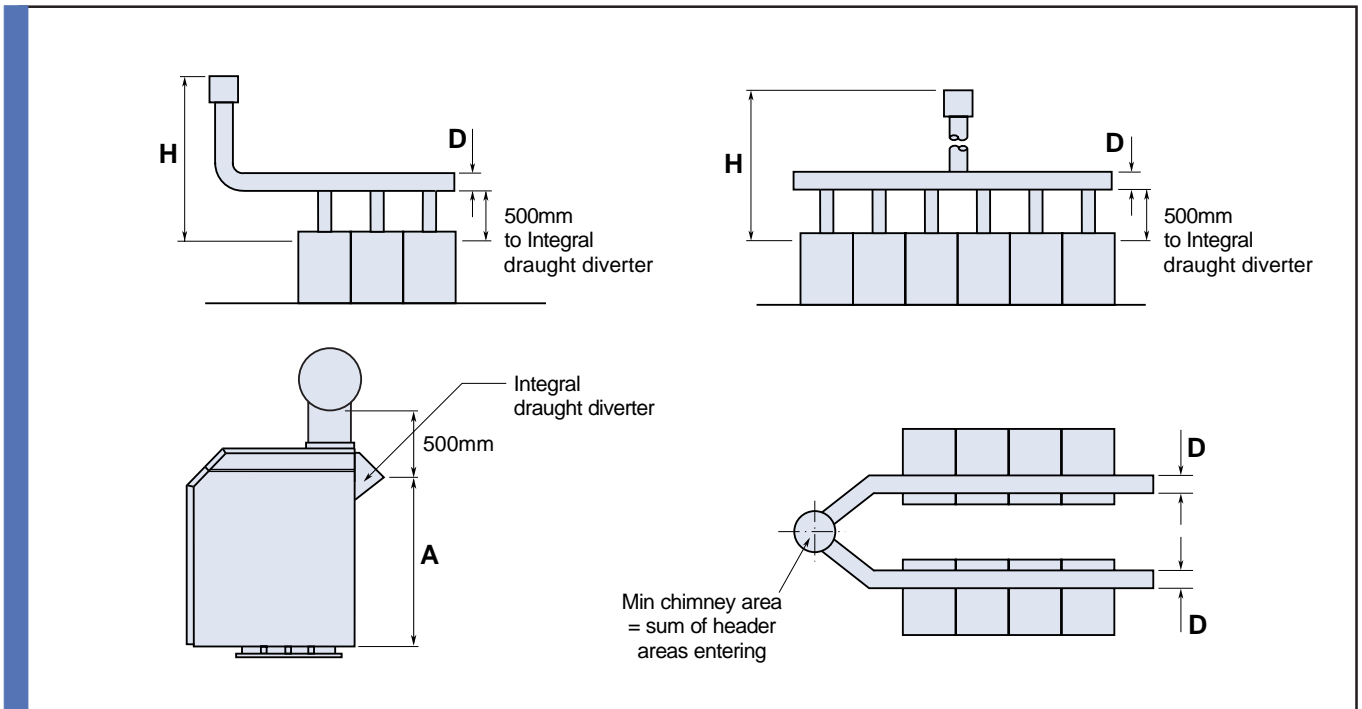
Engineered flue solutions from Hamworthy may well result in a reduction in sizes providing an efficient system at lower cost.

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



*Hamworthy Forston 400 Fan Dilution System*

## Guide to flue and header diameters



Model	A (mm)
PI 40	841
PI 70	941
PI 100	1041

For any atmospheric gas fired boiler system, certain factors must be taken into account to ensure the correct efficient and safe removal of flue gas.

The table opposite gives diameters for a selection of standard typical arrangements, and is for guidance only.

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.

Power (Output) kW	No. of Boilers	Height of chimney above draught diverter H m					
		2m	3m	6m	10m	15m	20m
Recommended Header Diameters D mm							
40	Single Boilers (consult technical department at Hamworthy Flue Products for multiple boiler applications)	203	203	203	203	203	203
50		203	203	203	203	203	203
60		203	203	203	203	203	203
70		203	203	203	203	203	203
80		203	203	203	203	203	203
95		254	254	254	254	254	254
100		254	254	254	254	254	254
105		254	254	254	254	254	254
120		254	254	254	254	254	254
160		Multiple Boilers (consult technical department at Hamworthy Flue Products with application design)	305	254	254	254	254
190	356		305	305	254	254	254
210	356		305	305	305	305	305
240	356		356	305	305	305	305
285	406		356	356	356	356	356
315	406		356	356	356	356	356
360	457		406	406	356	356	356
380	457		406	406	406	406	406
420	457		457	406	406	406	406
480	508		457	457	406	406	406
525	559		457	457	457	457	457
600	559		508	508	457	457	457
630	559		508	508	457	457	457
720	610		559	559	508	508	508

For more information on  
**Hamworthy Heating  
 Flue Products**  
 Contact:  
**0121 360 7000**

## Gas

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
20mm	0.5	0.5	0.3
25mm	0.5	0.5	0.3
40mm	1.0	1.0	0.3
50mm	1.5	1.5	0.5
65mm	2.0	2.0	0.5
80mm	2.5	2.5	1.0
100mm	3.5	3.5	1.5

For example: Purewell boilers with an output totalling 240kW being fed by 2 1/2" pipe with 6 elbows between gas meter and boiler header can have a maximum length of 72m - (6x2m) = 60 metres run to achieve a 1mbar loss.

**Note: Information above is based on IM/16.**

## Gas flows in pipes

Purewell Boiler Power (output) kW	Maximum length of gas pipe (Metres)						
	20mm	25mm	40mm	50mm	65mm	80mm	100mm
40	10	42	-	-	-	-	-
50	-	25	180	820	-	-	-
60	-	16	120	540	-	-	-
70	-	11	85	380	-	-	-
80	-	-	62	280	900	-	-
95	-	-	42	185	580	-	-
100	-	-	37	170	520	-	-
105	-	-	33	145	470	-	-
120	-	-	25	110	345	-	-
140	-	-	17	78	245	-	-
150	-	-	15	66	210	-	-
160	-	-	12	56	180	-	-
180	-	-	-	44	140	820	-
190	-	-	-	38	120	750	-
200	-	-	-	35	110	650	-
210	-	-	-	30	96	600	-
240	-	-	-	22	72	440	-
250	-	-	-	21	66	390	-
280	-	-	-	16	52	300	-
285	-	-	-	15	47	290	-
300	-	-	-	14	45	260	-
315	-	-	-	11	37	235	-
320	-	-	-	-	37	235	-
350	-	-	-	-	31	180	-
360	-	-	-	-	27	170	810
380	-	-	-	-	24	150	730
400	-	-	-	-	23	135	640
420	-	-	-	-	19	115	570
475	-	-	-	-	16	90	440
480	-	-	-	-	14	86	430
500	-	-	-	-	14	80	380
525	-	-	-	-	11	71	340
570	-	-	-	-	-	60	280
600	-	-	-	-	-	51	245
630	-	-	-	-	-	46	220
720	-	-	-	-	-	34	165

## Purewell Classic Range

Developed with energy efficiency as a fundamental part of the design philosophy. The Purewell Classic boiler is the template for Hamworthy's current range of gas atmospheric boilers.

The Purewell Classic is available, with either permanent pilot or fully automatic ignition, in eight models ranging from 40 to 120kW. The fully automatic boiler incorporates the highly effective hot surface ignition system.

A unique primary flue damper system has been designed to further enhance the performance of the Purewell Classic range.

The damper is available in two versions, high/low operation which is fitted as standard to all high/low fully automatic Purewell Classic boilers and on/off operation which is available as an alternative.

When the boiler is not firing the damper shuts off the primary flue preventing heat from escaping thus reducing standing losses.

As with the Purewell Classic range the Integra can be installed in a modular arrangement giving ultimate flexibility in matching the required load.

(For further details of the Purewell Classic range please refer to publication number 500002201)



## Warmwell Condensing Boiler

With ever greater emphasis being put on the energy efficiency of boiler systems the Warmwell Condensing boiler has been developed to offer maximum efficiency from an atmospheric boiler.

Available in three models 59, 93 and 135kW, the Warmwell is based on the Purewell Classic boiler with an additional heat exchanger that extracts extra heat by condensing water vapour out of the products of combustion. The Warmwell shares many of the same features as the Purewell Classic and Integra models including Hot Surface Ignition.

With the exception of systems that run continuously at a lower temperature it is often more cost effective to install a combination of both condensing and non-condensing boilers. In this way

the more efficient condensing boiler can take the base load whilst the additional non-condensing boilers provide extra heat at times of peak demand. With this in mind the Warmwell is capable of being installed in a modular configuration

alongside Purewell Classic or Integra models.

(For further details of the Warmwell range please refer to publication number 500002025)





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Main switchboard tel: 01202 662500

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- flue components
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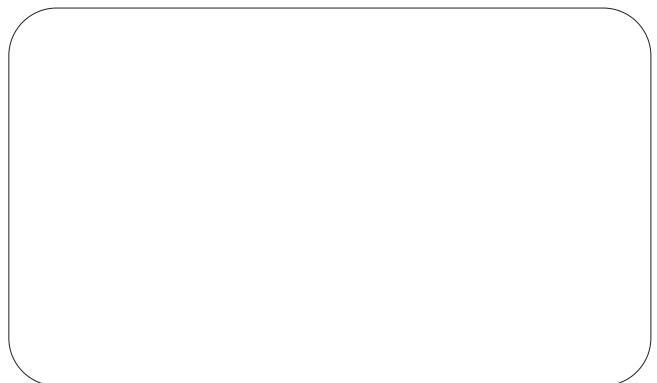
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Applications & quotations	☐ 0121 325 2302 / 2303
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Associate Companies, Offices and Agents throughout the World.

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