



Hamworthy Lilliput-HE

Cast Iron
Sectional Boilers
Outputs 43kW-87kW



Heating *at work.*

Lilliput-HE

Power Flame Cast Iron
Sectional Boilers

Designed as traditional European cast iron sectional boilers, the Lilliput series has 3 models with outputs ranging from 43kW to 87kW. The multi-pass design and high level of thermal insulation contributes to increased efficiency, up to 94% nett CV (oil fired).

Savings in fuel reinforce the high performance of the Lilliput, which is particularly suited to buildings with consistently high heat demands.

The boilers are supplied with a choice of matched on/off burners, compliant with CE marking requirements, and capable of firing class (D) 35(SR1) oil, natural gas or LPG.

Key features of power flame boilers from Hamworthy are the high quality cast iron sections and a design which enables reduced loading on the heat exchanger surfaces.

Combined with the use of proven combustion technology, the Lilliput provides high levels of operational reliability and a long life expectancy.

Ideally suited for both single and multi-boiler installations, the Lilliput is available with a Hamworthy Marshall-HE control system as an option, enabling optimum efficiency to be achieved from a multi-boiler installation.

Options

- **Choice of matched burners**
- **Choice of fuels, oil, natural gas or LPG**
- **Volt free contacts (BEMS Compatibility)**
- **Marshall-HE controller (for multi boiler installations)**

- **Flexibility in choice of fuels**
- **High efficiency, saves on fuel costs**
- **High level of operational reliability**
- **Tolerant of site conditions**
- **Long life expectancy**

BENEFITS

The power flame range of boilers offer solutions where consistently higher heat demands are required, and is backed up by the Hamworthy commitment to after-sales service, maintenance and spares support.



The Lilliput range of boilers compliment the smaller range outputs of the Hamworthy power flame series.

Other models in the power flame cast iron series include, Broadstone S (110kW to 130kW), Shaftesbury (280kW to 400kW) and Wimborne (450kW to 900kW). Higher outputs are achieved through Lulworth high efficiency steel boilers, (470kW to 1170kW).

Specification

Heat Exchanger

Lilliput cast iron sectional boilers are constructed from vertical extended surface sections, assembled with mild steel nipples which locate into machined bores of each sections waterways.

The hinged combustion door, which locates on the front section, can be swung open to give full access to the combustion chamber (left or right opening is available).

Each rear section is fitted with a removable flue box and a horizontal flue connecting flange. The flow and return connections are also located on the rear section. Pre-cut blanket lagging sections, are supplied for fitting over the assembled boiler sections which are then fully enclosed with a robust steel casing.

Control Assembly

The Lilliput boiler comes equipped with its own integral control panel which is mounted on the top casing. The panel consists of an illuminated mains on/off switch, control thermostat range 30-90°C, manual re-set temperature limiter set at 100°C and a water temperature gauge.

Volt Free Contacts

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

Burners

Lilliput oil, natural gas & LPG fired boilers are supplied with a matched burner and mounting plate. Oil burners are supplied with flexible oil pipes and filter.

Thermostats

The control thermostat supplied as standard has a range of 0-120°C, and will be factory pre-set in the range 0-90°C. (The minimum boiler operating temperature setting should be 65°C). In a multi-boiler system controlled by an external sequencer, the control stat would be typically some 10°C above the system set point. The temperature limiter that is supplied as standard has a range of 90-110°C. This will normally be factory pre-set at 100°C.

Electrical Details

Supply 230v 50Hz, single phase
Wiring external to the boiler must be installed in accordance with I.E.E. regulations and any local regulations which apply. Wiring must be completed in heat resistant 3 core cable, (size 1.0 mm² c.s.a.). Fascia fuse rating is 6.3 max amp. An isolator correctly fused at 5 amps should be sited close to the boiler, for each control panel.

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.

Delivery

Heat exchanger sections are supplied as works assembled, pressure tested prior to despatch, palletised and shrink wrapped for protection.

The boiler casing is supplied flat packed for on-site assembly and delivered along with the control panel assembly and burner, packaged in separate cardboard containers.

The boilers are delivered on vehicles equipped with a tail-lift for off-loading to ground level.

Assembly & Site Erection

All boiler heat exchangers are supplied works assembled and pressure tested prior to despatch.

For restricted access into plant rooms the boiler can be supplied unassembled, for site erection by Hamworthy's own service/installation engineers or by an approved contractor.

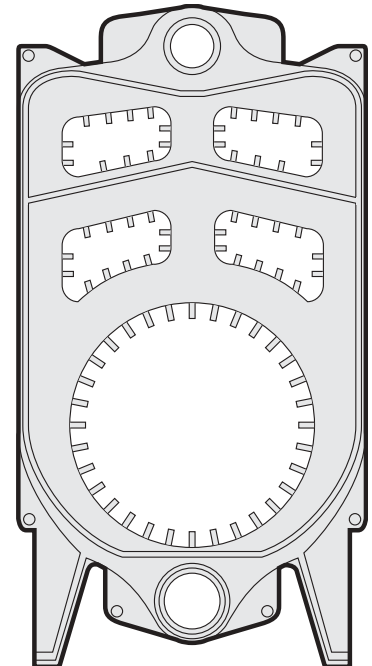
Commissioning

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

For more information on commissioning or on-site erection contact Hamworthy Heating Service Dept: 0845 4502866

Section

Each section is ultrasonically tested for uniform thickness and hydraulically pressure tested to 10bar. The section arrangement of the intermediate sections provides a three pass combustion gas flow, which ensures efficient heat transference giving operating efficiencies of 94% (based on nett CV, oil fired).



Three Pass High Efficiency Boiler

First Pass:

The flame is contained in the lower waterway combustion chamber giving radiant heat into the primary heating surfaces of the boiler.

Second Pass:

The flue gases pass between the sections into the finned secondary heating surfaces of the boiler where heat is conducted into the vertical waterways.

Third Pass:

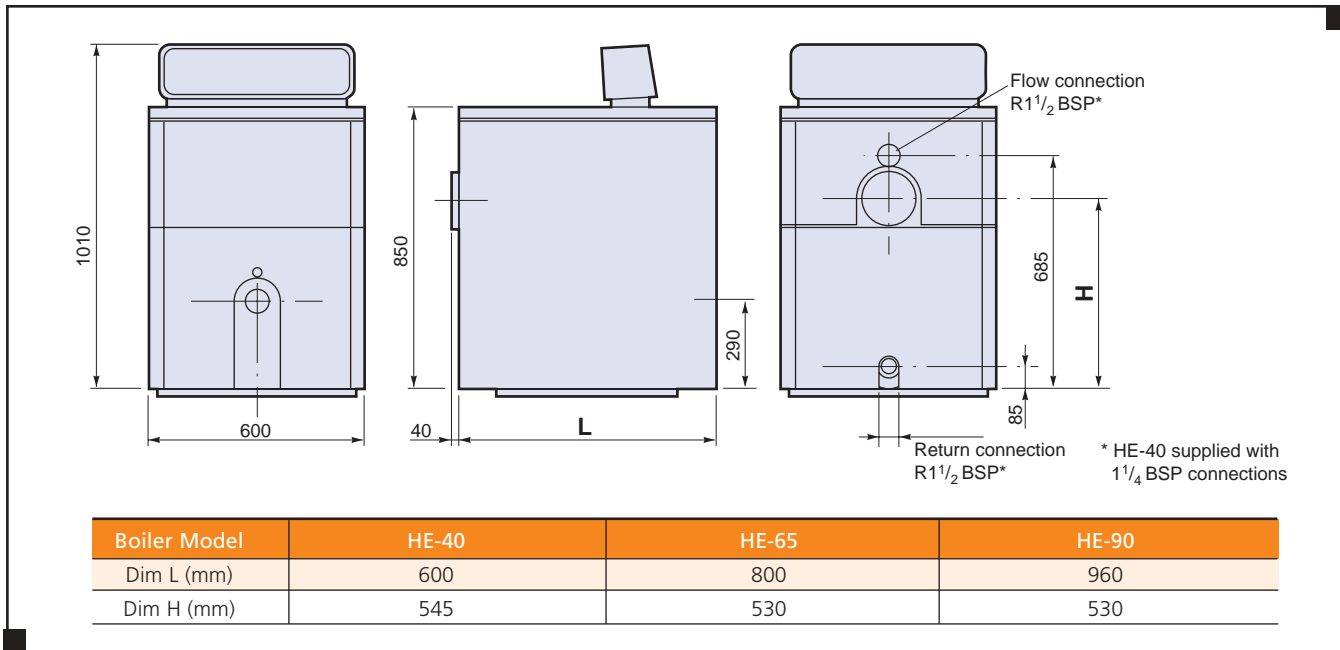
The flue gases pass towards the rear of the boiler along the finned top pass, giving final heat into the waterways before passing into the flue outlet connection.

Technical & Dimensional Data

Lilliput Series: Performance and General Data Information

Boiler Model	HE-40	HE-65	HE-90	
Energy	No. of sections	5	7	9
	Heat output to water kW Btu/hr x 1000	43.0 147	66.3 226	87.0 297
	Heat input (net) - Gross kW Btu/hr x 1000	45.9 156.6	70.2 239.5	92.7 316.2
Water	Water content l UK gal	17.5 3.9	24.5 5.4	31.5 7.0
	Design flow rate @ 11°C Δt l/min UK gal/min	56.0 12.30	86.3 19.00	113.5 25.00
	Waterside pressure drop @ 11°C Δt mbar in wg	14.00 5.60	23.80 9.60	34.50 13.90
	Minimum flow rate @ 20°C Δt l/min UK gal/min	30.90 6.80	47.70 10.50	62.50 13.80
	Maximum water pressure bar psig	5.0 73.0		
	Maximum water flow temperature	90		
Gas	Combustion resistance (Gas & Oil) mbar in wg	0.10 0.04	0.20 0.08	0.30 0.12
	Input rate-oil (35 SR1) l/h UK gal/h	4.80 1.06	7.40 1.63	9.80 2.16
	Approx. flue gas vol. at NTP noil m³/h ft³/h	64.80 2288	99.60 3517	130.80 4619
	Approx. flue gas temp - oil	200		
	Input rate Natural Gas (G20) m³/h ft³/h	4.75 168.0	7.27 258.0	9.60 339.0
	Nominal inlet pressure required* Natural gas - inlet to gas train mbar in wg	20 8.0		
	Approx. flue gas volume at NTP natural gas m³/h ft³/h	58.80 2077	90.00 3178	118.20 4174
	Approx. flue gas temp - natural gas	190		
Flue	Flue connection O/D mm in	150 6	180 7	180 7
	Flue draught required at boiler outlet	(-)1 to (-) 2.5mm wg / (-) 0.04 to (-) 0.10" wg		
Electrics	Electrical supply - boiler control panel	230v 1PH 50Hz Fused and rated at 10A		
	Electrical supply - burner	230v 1 PH 50Hz Consult Technical Applications Team in Poole for further details		

Lilliput Dimensions



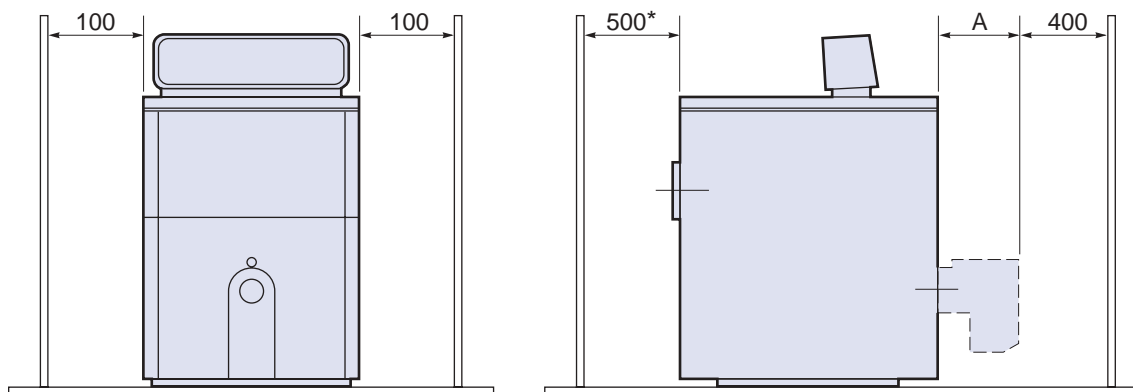
Layout

The Lilliput series must be installed on a level, fire proof plinth, which should be 50mm high (minimum) and capable of supporting the weight of the boiler, pipework and ancillary equipment.

The plinth should end flush with the boiler casing front to prevent interference with the burner oil pipework or gas train and should be at least the width and length of the casing dimensions.

Boiler Clearances

The Lilliput series requires adequate clearances for fuel, flue, water connections and maintenance.



Model	A (mm)				Shipping Weight Dry (kg) Approx.
	Oil		Gas		
	Riello	NuWay	Riello	NuWay	
HE-40	236	206	295	265	172
HE-65	261	206	347	290	235
HE-90	261	325	347	290	298

This dimension is a minimum recommendation permitting access to the rear of the boiler for maintenance. It may not, however, be adequate for the installation of flue bends within the boiler house. Where necessary this dimension must be increased accordingly.

For detailed specification on burner options - contact Hamworthy Heating Technical Applications Team for details, 0845 4502867

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 5854 Code of practice for flues and flue structures in buildings.

BS 6644 Specification for installation of gas fired hot water boilers of rated inputs between 70kW (net) and 8MW (net).

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

BS EN 806-2 Specification for installations inside buildings conveying water for human consumption.

Part 2: Design

BS 6880 Code of practice for low temperature hot water heating systems of output greater than 45kW.

Part 1: Fundamentals and design considerations.

Part 2: Selection of equipment

Part 3: Installation, commissioning and maintenance.

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

I.Gas E. Publications

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

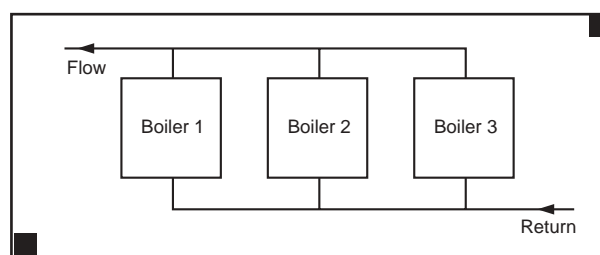
IGE/UP/1A Soundness testing and direct purging of small low pressure industrial and commercial natural gas installations.

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

IGE/UP/10 Installation of gas appliances in industrial and commercial premises.

Water systems - Multi-installations

Lilliput boilers are suitable for installation in both open vented and closed systems. Irrespective of the type of system, the water flow and return headers should be connected in a "reverse return" arrangement (i.e. the water flow in each header follows the same direction) thus providing equal flow through each boiler. This also ensures that pressure loss across any number of boilers will never be greater than the head loss across one boiler plus local pipework losses.



Lilliput multi-boiler installation in "reverse return arrangement"

Adequate water flow

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. 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. 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 20°C temperature rise across the boiler is the minimum recommended flow at any time. Minimum return temperature must be maintained for both oil and gas firing: Oil-60°C, Gas-55°C. For boiler pressure drop refer to the technical data table.

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.

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.

Oil supply

The oil supply and supply system should be designed and installed in accordance with BS 5410 Part 1 or 2, as appropriate.

Gas supply

The gas safety (installation and use) regulations require that only competent persons i.e. Corgi registered gas installers, should install gas appliances.

LPG-Propane supply

It is strongly recommended that gas detection equipment is fitted on LPG installations. Sensors should be positioned near the burner and at low level.

The installation of LPG storage vessels, pipework and pressure regulators must be in accordance with current standards and codes of practice. If in doubt, consult the LPG fuel supplier for advice.

Boiler	Open vent size	Cold feet size
<60kW	25mm (1in)	19mm (¾ in)
60kW - 150kW	32mm (1¼ in)	25mm (1in)
<60kW - 150kW	38mm (1½ in)	32mm (1¼ in)
<60kW - 150kW	50mm (2in)	38mm (1½ in)

Pressure relief valve

Each boiler, or in the case of a multi-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.

Boiler Accessories

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

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 multi-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.**

Multi-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
Safety margin	17°C
Temperature rise across modules at minimum flow rate	11°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 free from contamination such as building dust and insulation fibres from lagging. To avoid unnecessary cleaning and servicing of the burner, we recommend that the boilers are not fired whilst building work is being undertaken. The air supply should be achieved using:

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

Note: Fans must be selected such that a negative pressure is not created in the 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)

540cm² plus 4.5 cm² per kW in excess of 60kW total rated input.

High Level (Outlet)

270cm² plus 2.25 cm² per kW in excess of 60kW total rated input.

For oil, refer to BS 5410 Part 2.

Controls System

The Lilliput boiler houses a simple, easy to use electro-mechanical control panel, with a drop down fascia allowing good access for servicing. A simple mimic diagram gives visual indication of boiler function and its running condition at any given point. The boilers are supplied as standard with a remote stop/start feature.

For multi-boiler installations, the Hamworthy Marshall-HE Boiler Sequence Control System is recommended and provides a comprehensive range of features to achieve optimum efficiency.

In a multi-boiler installation, each boiler will fire on low fire and then high fire (where fitted) in turn until the heat demand is satisfied.

A sequence control system should be used to achieve optimum efficiency from a multi-boiler installation.

Multi-Boiler Control System

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

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

The control panel, housed within a smart, slim lightweight casing, is designed to be installed on the boilerhouse wall or alternatively can be located anywhere within the building. Programming the controller is achieved through an easy to follow display with settings entered using the numeric keypad. The entire system is protected and requires input of a security code to access the programming setup. A service mode is available to allow servicing of the boilers and override the control system.

The Marshall-HE can control a combination of on/off and high/low boilers up to a maximum of 8 sequence stages, as well as providing circulation pump control.

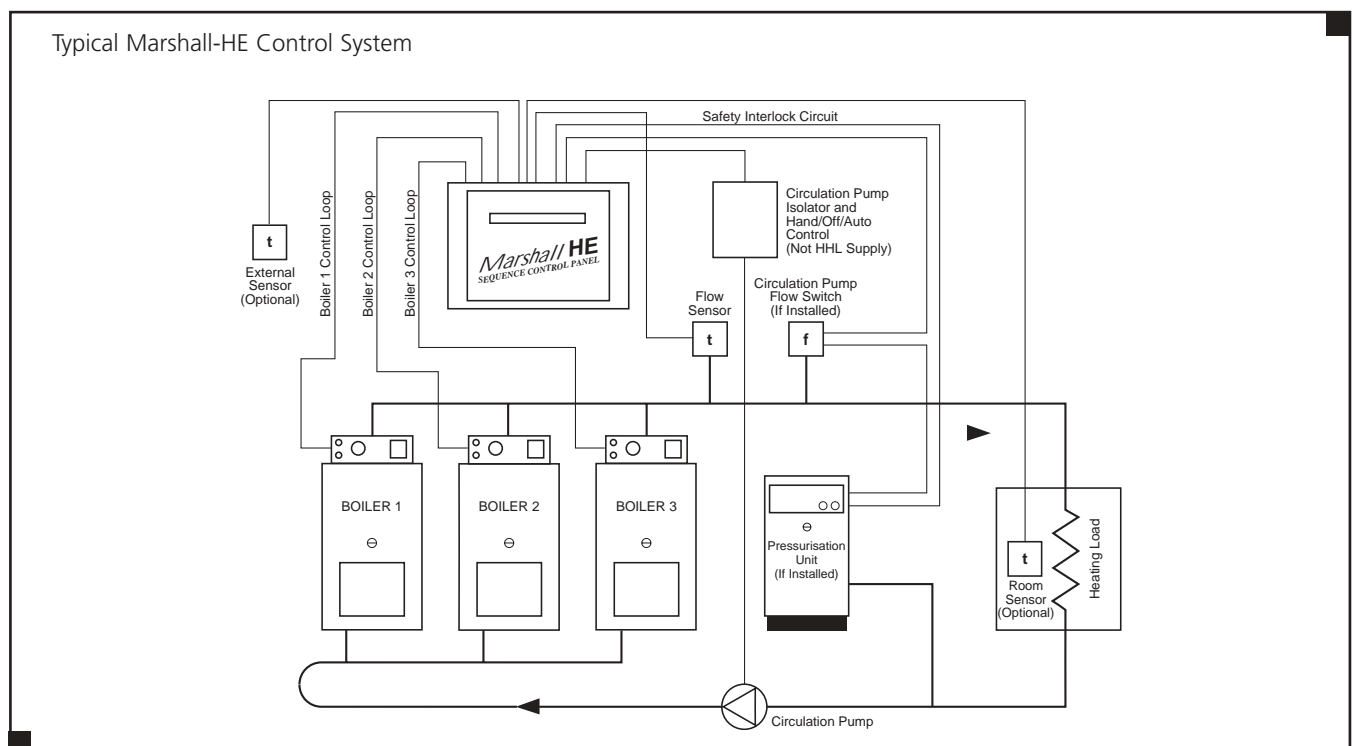
Boilers fitted with burners which have an electrical rating in excess of 3A will need to be controlled via a power relay. (Not HHL supply).

The boilers and circulation pump contactor are individually wired to the Marshall-HE panel. The water temperature, room temperature and external temperature sensors (where fitted), are individually wired to the control panel using shielded twisted pair cable.

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



Marshall-HE Boiler Sequence Controller



System Design

Lilliput

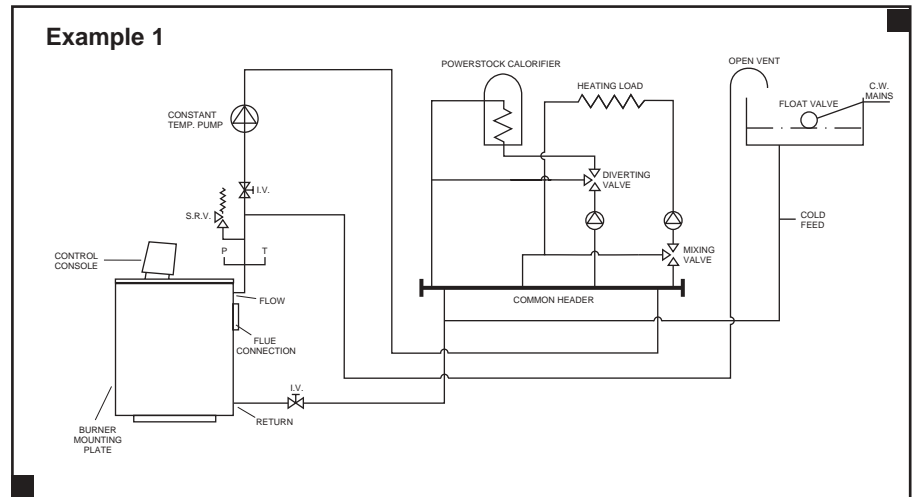
Cast Iron Sectional Boilers

The installation of power flame boilers in commercial and industrial heating and hot water systems, offers a wide choice of design options and applications.

The following systems shown are typical and should be considered for general guidance only.

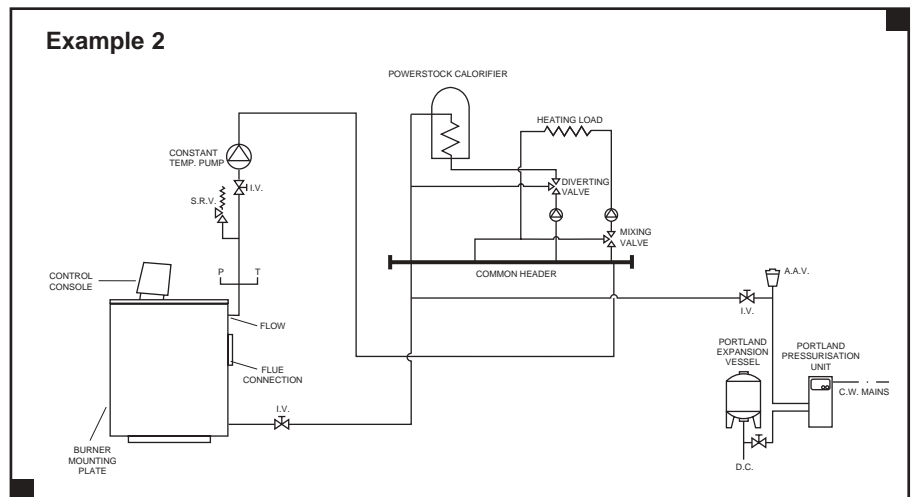
Example 1

Boiler installation (typical) with an open vented system showing combined heating and hot water.



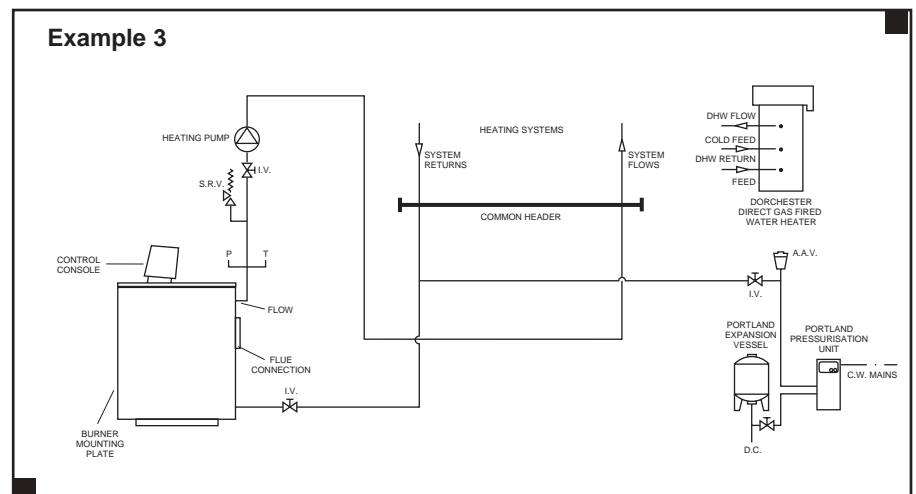
Example 2

Boiler installation (typical) with an unvented system showing combined heating and hot water.



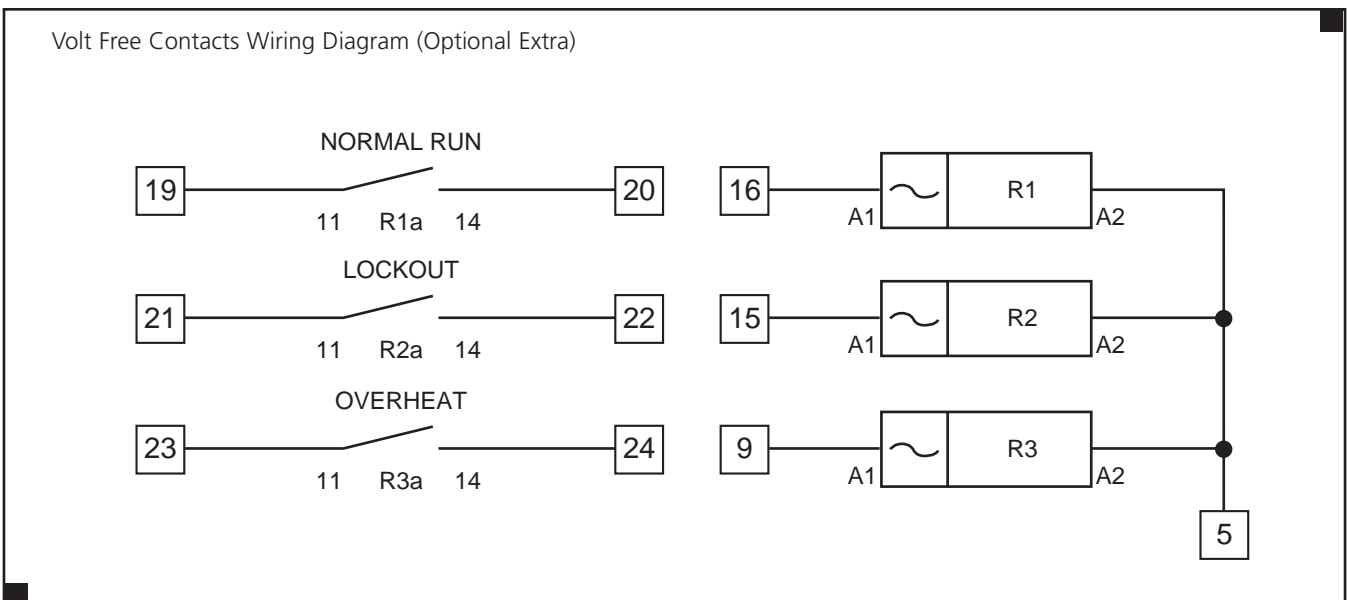
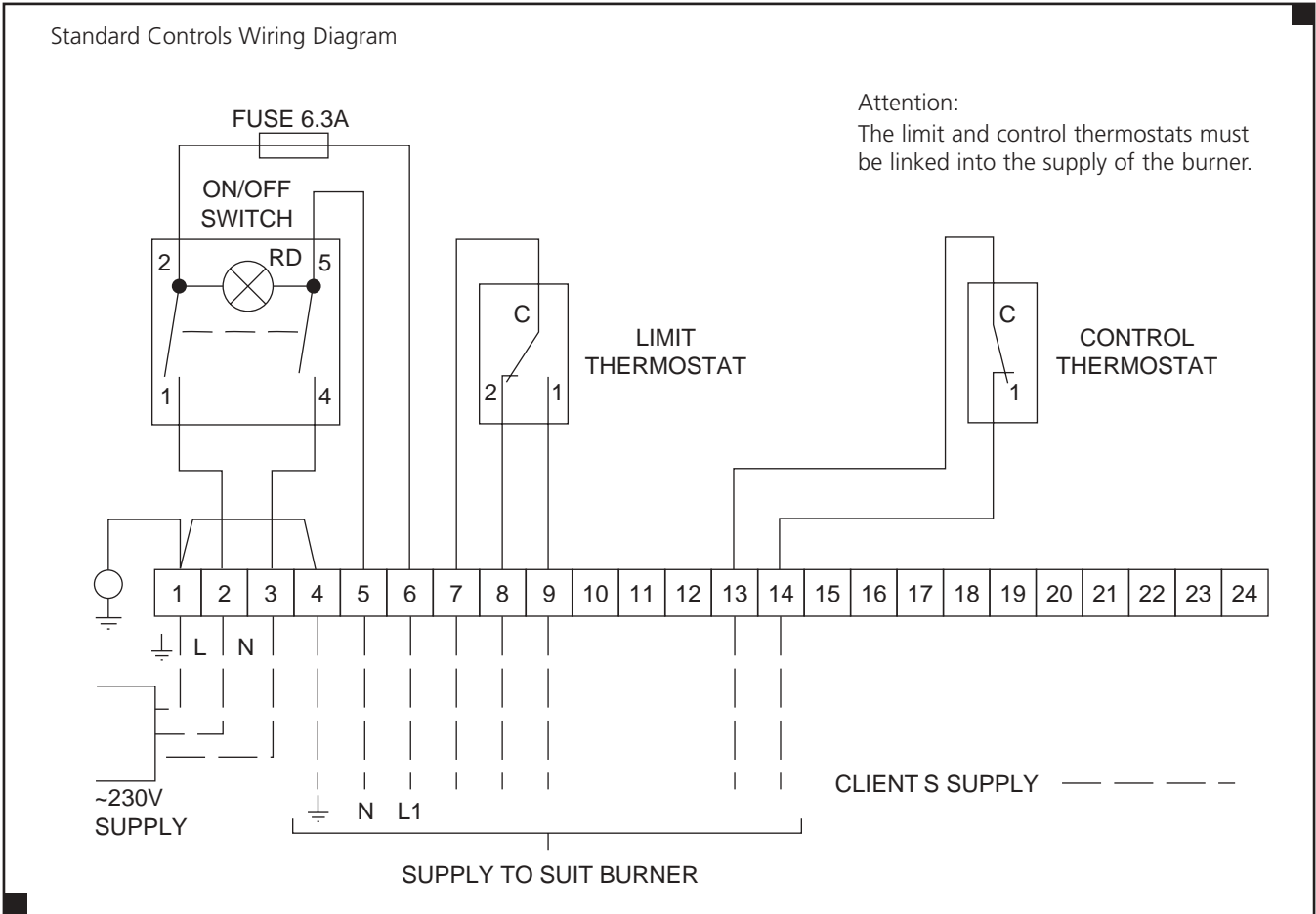
Example 3

Split system Lilliput boiler supplying the heating requirements and a Dorchester direct fired water heater supplying the DHW.



Wiring Diagrams

Lilliput



Flue System

Hamworthy Lilliput boilers are designed to be used with natural draught flue systems, which should be designed in accordance with current regulations. The following points should be noted:

- The boiler is designed for connection to a single flue system, or a common flue header, where part of a multiple boiler installation.
- The flue system should be designed to maintain atmospheric pressure or a slight suction at the boiler flue connection at all times.
If at any time the suction is likely to exceed 0.3 mbar (0.12 in wg), it is recommended that a draught stabiliser be fitted to the flue system.
- The flue system must be self supporting and facilitate access for cleaning and maintenance near the boiler connection.
- When designing the flue system, care must be taken to ensure that any condensate that may form within the system can be drained safely to a suitable waste point, and that the flue and drain materials are resistant to the corrosive effects of the condensate.
- The Lilliput boiler has generously sized flueways, accessible at both ends to facilitate rodding through the boiler for easy cleaning.
- Oil fired boilers will require more frequent service intervals



Flues from Hamworthy

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

Leak-Free

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

Corrosion-Free

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

Worry-Free

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

The Masterflue range from Hamworthy also comprises 3 further specialist flue lines:

Masterflue ME - single wall, fully welded flue system.

Masterflue AG - gas vent system for atmospheric appliances

Masterflue BF - balanced flue system.

Design & Install, or Supply Only

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

Offering a comprehensive range of flue and chimney equipment for natural draught, fan assisted and fan dilution applications, Hamworthy will provide a full design and installation service incorporating sizing, site survey and drawings for approval (where necessary) prior to installation. All this with the added benefit of a single commissioning visit for boiler and flue system together.

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

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

Phone 0845 450 2865

Email flues@hamworthy-heating.com



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

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