



# Hamworthy Ensbury LT

Low Temperature High Efficiency  
Steel Power Flame Boilers  
Gas, Oil, Biofuel or Dual Fuel Burners  
Outputs 70kW to 580kW



Heating *at work.*

# Ensbury LT

Low Temperature,  
High Efficiency Boilers  
Gas, Oil, Biofuel or Dual Fuel

Meeting the needs of modern low temperature or mixed temperature heating systems, the Ensbury range of steel boilers can accept a minimum return temperature of 15°C without condensing, whilst delivering flow temperatures up to 90°C. The boiler is also designed for operating at low flow conditions, making it a very versatile and robust boiler solution.

The Ensbury range comprises 14 models with outputs from 70 to 580kW, for use with fully modulating or high/low matched burners, delivering operating efficiencies up to 95% nett (86% gross) part load.

The burner options give a choice of fuel; Natural gas, LPG (propane) or oil. Selected models are also suitable for dual fuel arrangements.

Oil burners are suitable for 28 second and 35 second oil and where matched burners are available, FAME and RME blends of liquid biofuel may be specified, offering sustainable energy solutions.

The boilers are based on a three-pass heat exchanger and incorporate an innovative design feature which reduces the level of NOx.

Additionally, there is a range of low NOx matched burners to further improve the environmental credentials of the boiler, achieving up to European Class 5 performance.

The thermal mass within the Ensbury boiler can accommodate fluctuating operating conditions, and with no minimum water flow requirement, eliminates the need for a shunt pump, simplifying the hydraulic system design.

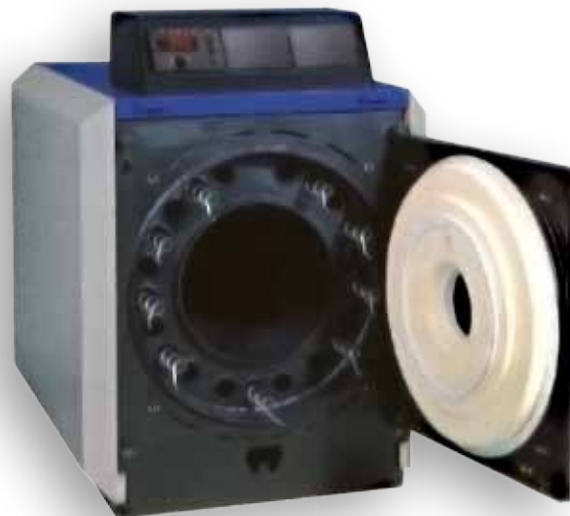
## Options

- **Natural gas, LPG propane, oil, biofuel or dual fuel burners**
- **High low or modulating burners**
- **Low NOx burners**
- **Flue gas economiser**

- **Suitable for low temperature heating systems**
- **Close load matching**
- **High differential temperature range**
- **No minimum water flow**
- **Low standing losses**
- **Robust heat exchanger design**
- **Lower NOx emissions**
- **Sustainable energy solutions**

BENEFITS

**Using innovative design for delivering excellent hydraulic and combustion performance, the Ensbury offers versatility in system applications.**



*Ensbury LT boiler with hinged door provides easy access to the combustion chamber and flue ways.*

# Specification

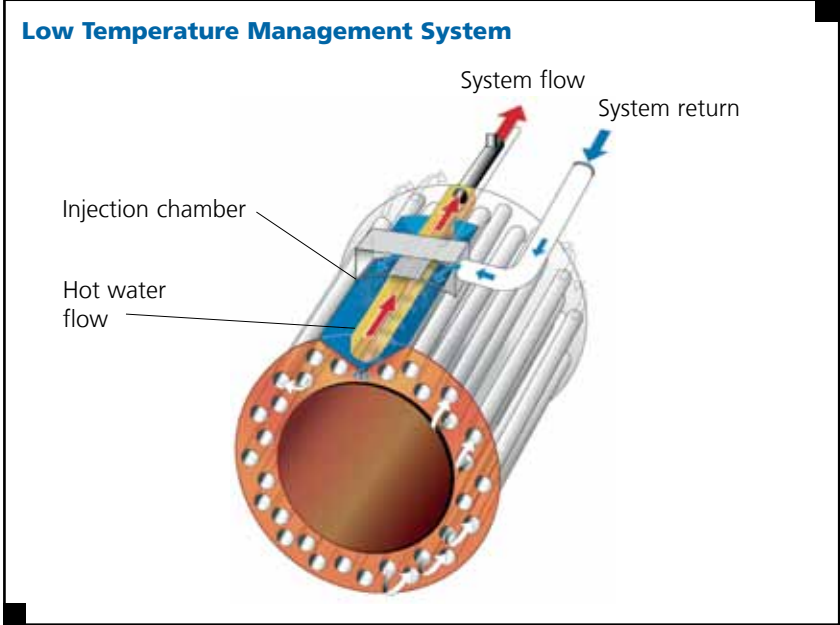
## Ensbury LT

The Ensbury boilers incorporate an innovative design feature which enables the system return temperature to be as low as 15°C, whilst preventing formation of condensate within the boiler, protecting the boiler from corrosion. Coupled with the low flow capability, this allows the Ensbury boilers to operate with a wide differential temperature, and tolerate fluctuating operating conditions. Minimum flow temperatures must be maintained at all times.

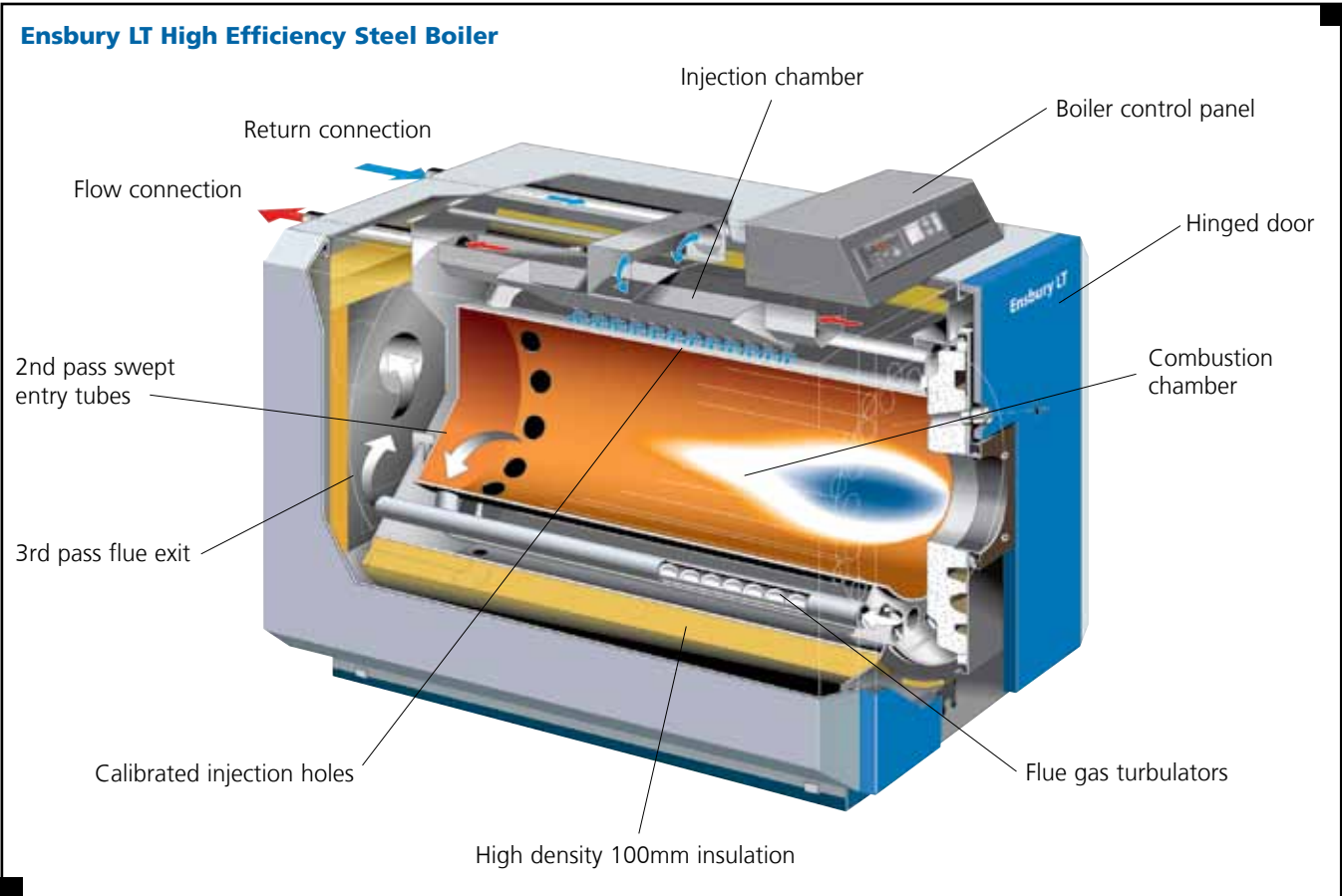
### Low Temperature Management System

On entering the boiler, the system return water is routed through the injection chamber. The hot water outlet is drawn through the injection chamber in a heat exchanger, to pre-heat the return water, which is then injected through calibrated holes into the hottest part of the boiler above the combustion chamber.

This design by-passes the colder tubes of the second and third passes, to ensure a stabilised load in which corrosive condensates cannot occur.



The low temperature management does not require electronic controls and is achieved via mechanical design, which simplifies the solution and ensures a long and reliable performance.



# Specification

## Ensbury LT

Ensbury high efficiency boilers can be used individually, or in multiple boiler configurations, and are suitable for use on open vented or sealed low temperature hot water heating systems. For domestic hot water (DHW) production they can be used in conjunction with the Hamworthy Powerstock range of calorifiers.

With no minimum flow rate and low return temperatures, the Ensbury boilers are ideal for mixed temperature heating systems with compensated temperatures. *Further details are shown in the system design section on page 14.*

### Construction

The boilers are manufactured from high quality steel, with the multiple second and third pass tubes arranged radially around the combustion chamber.

Back-end protection is provided by the low temperature management system which pre-heats return water using the hot water from the flow side of the boiler.

A large hinged door provides ease of access to the combustion chamber and flue ways for cleaning and servicing. This door can be arranged to swing open to either the left or right hand side.

The entire boiler shell is provided with a generous 100mm depth of glass fibre insulation ensuring standby losses are minimised.

### Boiler Casings

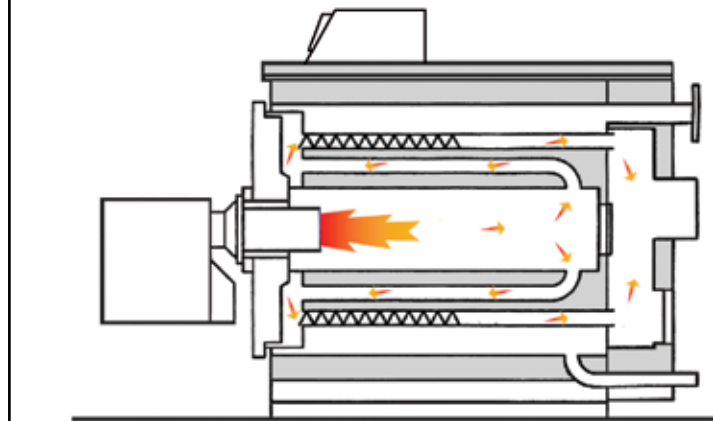
Ensbury boiler casings are robust steel panels finished externally using powder coating. The casings are supplied flat-packed for site assembly.

### Low NOx Performance

Ensbury boilers are designed with a three-pass heat exchanger to maximise heat transfer and performance of the boiler.

An innovative and patented element of the design is the second-pass heat transfer tubes with swept entry, to reduce turbulence within the combustion chamber, improve the flow of hot gases into the tubes and effectively evacuate heat away from the combustion chamber, which in turn reduces the production of thermal nitrogen oxide (NOx).

### 3-pass Flow Through Ensbury LT High Efficiency Boilers



### Controls

Each boiler is supplied with a pre-wired control panel that mounts on top of the boiler casing. The control panel includes the following features:

- Control fuse 6.3 AT
- Limit thermostat 110°C manual reset
- Control thermostat 35°C to 90°C
- High fire control thermostat 35°C to 90°C
- Burner on/off switch
- Limit thermostat test button
- Overheat indicator lamp
- Safety interlock indicator lamp
- Burner lock out lamp
- Water temperature thermometer
- High and low fire hours run meters
- 5 Volt free contacts for remote signalling

### Burners

The Ensbury range of boilers is available with a choice of high/low or fully modulating matched Riello burners. Other burner manufacturers available on request.

There is a choice of fuel; natural gas, LPG (propane) or oil. Selected models are also suitable for dual fuel arrangements. Oil burners are suitable for 28 second and 35 second oil and where matched burners are available, FAME and RME blends of liquid biofuel may be specified. *For further information, please refer to liquid biofuel section on page 5.*

For gas fired burners, the burner and gas train selections are based on standard design requirements as stated in IGE/UP/2, 20mbar gas pressure available at the burner under maximum flow conditions. Where this pressure is not available, it may be possible to select an alternative matching. *For further details please contact our technical department. Tel: 01202 662500.*

A drilled mounting plate is supplied to suit the specified burner. Burners are supplied with a flying lead and plug for connection to the boiler control panel.

For new buildings with a total heat load greater than 500kW, it is a requirement of Building Regulations Part L: 2006 that each boiler will be fitted with a fully modulating gas burner, or a multi stage burner for oil fired installations.



### Low NOx Burners

For further reduction in emissions, low NOx burners are available for natural gas. Where low NOx burners are used, the nominal boiler output is slightly reduced. For further details please contact our technical department: Tel: 01202 662500.

### Liquid Biofuel

Liquid biofuel must conform with the requirements of EN 14213. Suitable classifications of liquid biofuel for use with Riello burners are FAME (Fatty Acid Methyl Ester) and RME (Rape Methyl Ester) blends up to B50. Higher concentrations of liquid biofuel up to B100 can be accommodated, however, burners must be matched specifically to the fuel specification. All liquid biofuel specifications must be referred to our technical department. Tel: 01202 662500. Email technical@hamworthy-heating.com

Where external storage is used for liquid biofuel, it is recommended that Kerosene (Class C2) blend is used. Kerosene blends have better cold filter plugging points (CFPP) than gas oil (Class D) blends, providing improved reliability during cold weather. Other blends may cause problems with gelling and blockages in the fuel system when ambient temperatures are very low.

Blended liquid biofuel must be sourced from a reputable supplier, capable of demonstrating compliance with a certified quality assurance system such as ISO 9000, and able to provide the correct specification of fuel.

Liquid bio fuel burners are supplied with specific flexible oil feed hoses. It is important to stipulate the use of liquid biofuel at the time of ordering. For further advise on liquid biofuel, please contact our technical department: Tel: 01202 662500.

### Burner Connection

Each control panel is supplied with a set of cables for making electrical connections to the burner. Final connection between control panel and burner is made using polarised plugs and sockets.

### Liquid Biofuel Storage and Handling

Oil storage tank manufacturers' must verify that their tank construction and ancillary equipment is suitable for use with liquid biofuel. Any suitable existing oil storage tank must be thoroughly cleaned prior to use.

Liquid biofuels are hygroscopic and any traces of water absorbed into the oil could result in blocked filters, oil pumps or nozzles.

Liquid biofuels can be susceptible to bacteria growth so it is advisable to implement management best practice for storage of the fuel. Prudent precautions such as using additives and limiting the storage volume (not oversizing) may help limit bacterial growth.

### Burner Matchings

The following table illustrates the availability of Riello matched burners with Ensbury LT boiler models.

Fuel Type	Natural Gas or LPG (Propane)				Oil or Liquid Biofuel		Dual Fuel	
	High/low		Modulating		High/low	Modulating	Mod (gas) High/low (oil)	
Boiler / Burner	Standard	Nat Gas Low NOx	Standard	Nat Gas Low NOx	Standard	Standard	Standard High/Low	Nat Gas Low NOx (Mod)
ETL 70	1	1	1	1	1	n/a	n/a	n/a
ETL 90	1	1	1	1	1	n/a	n/a	n/a
ETL 120	1	1	1	1	1	n/a	n/a	n/a
ETL 145	1	1	1	1	1	n/a	n/a	n/a
ETL 165	1	1	1	1	1	1	1	n/a
ETL 190	1	1	1	1	1	1	1	n/a
ETL 225	1	1	1	1	1	1	1	n/a
ETL 260	1	◆	1	◆	1	1	1	n/a
ETL 300	Nat Gas = ◆ LPG = 1	n/a	Nat Gas = ◆ LPG = 1	◆	◆	1	1	n/a
ETL 335	◆	n/a	◆	3	◆	3	1	3
ETL 370	◆	n/a	◆	3	◆	3	3	3
ETL 440	Nat Gas = 3 LPG = ◆	n/a	Nat Gas = 3 LPG = ◆	3	3	3	3	3
ETL 510	3	n/a	3	3	3	3	3	3
ETL 580	3	n/a	3	3	3	3	3	3

1 = single phase    3 = three phase    ◆ = choice of 1ph or 3ph    na = not available  
Note: Low NOx burner not available for oil or LPG.

# Technical Data

## Ensburly LT Boilers Performance and General Data

	Boiler Model	ELT 70	ELT 90	ELT 120	ELT 145	ELT 165	ELT 190	ELT 225	
Energy	Building Regulations seasonal efficiency (%) gross	84.35	84.50	84.60	84.67	84.72	84.78	84.74	
	Boiler output at 80/60°C	kW 70	90	120	145	165	190	225	
		Btu/h x 1000 239	307	409	495	563	648	768	
	Boiler input (gross) - Maximum	kW 85	110	146	177	201	232	274	
		Btu/h x 1000 290	375	498	604	686	792	935	
	Boiler input (nett) - Maximum	kW 77	99	132	159	181	209	247	
	Btu/h x 1000 263	338	450	543	618	713	843		
Water	Water content litres	130		185		220		260	
	System design flow rate at 20°C ΔT rise	l/s	0.84	1.08	1.44	1.73	1.97	2.27	2.69
	Waterside pressure loss at 20°C ΔT rise	mbar	11	18	10	15	19	25	12
	System design flow rate at 10°C ΔT rise	l/s	1.67	1.96	2.87	3.47	3.94	4.55	5.38
	Waterside pressure loss at 10°C ΔT rise	mbar	43	71	40	58	76	100	48
	Water flow rate - Minimum	l/s	No minimum flow rate						
Water pressure - Maximum	barg	4							
Water pressure - Minimum	barg	0.5							
Water flow temperature - Maximum	°C	90							
Water flow temperature for gas - Minimum	°C	60							
Water flow temperature for oil - Minimum	°C	50							
Water return temperature - Minimum	°C	15							
Fuel	Flow rate for natural gas - Maximum	m <sup>3</sup> /h	8.1	10.5	14.0	16.9	19.2	22.1	26.2
	Inlet pressure for natural gas - Nominal*	mbar	20						
	Inlet pressure for natural gas - Maximum	mbar	50						
	Input rate for oil (35Sec)	l/h	8.1	10.4	13.8	16.7	19.0	21.9	26.0
Flue	Flue gas volume at 15°C, 9%CO <sub>2</sub> , N.T.P - Approx	m <sup>3</sup> /h	92.2	123.0	153.7	215.2	241	271	301
	Flue gas temperature at 80/60°C	°C	177	188	176	188	184	193	189
	Combustion chamber resistance	mbar	0.45	0.84	1.00	1.64	1.81	2.69	2.21
Connections	Water flow connection	R1½"		PN6 - DN50				PN6-DN65	
	Water return connection	R1½"		PN6 - DN50				PN6-DN65	
	Gas inlet connection	Rc¾"				Rc1¼"			
	Safety valve connection	Rc¾"		Rc1"				Rc1¼"	
	Drain connection	R1"							
	Flue diameter (O/D) - Nominal	mm	150						200
Electrical	Electrical supply for boiler	230V 1Ph 50Hz							
	Electrical supply for burner	230V 1Ph 50Hz / 400V 3Ph 50Hz depending on burner selection							
	Shipping weight (excluding burner) - Approx	kg	283	284	393	394	447	448	522

1. Data applies to gas and oil fired boilers, unless otherwise stated.
2. \*The nominal gas inlet pressure shown is for Riello burners. Alternative burners and dual fuel burner requirements may change. Nominal gas inlet pressure must be maintained under full gas flow operating conditions.
3. The performance specification for boilers with low NOx burners may be reduced.



# Technical Data

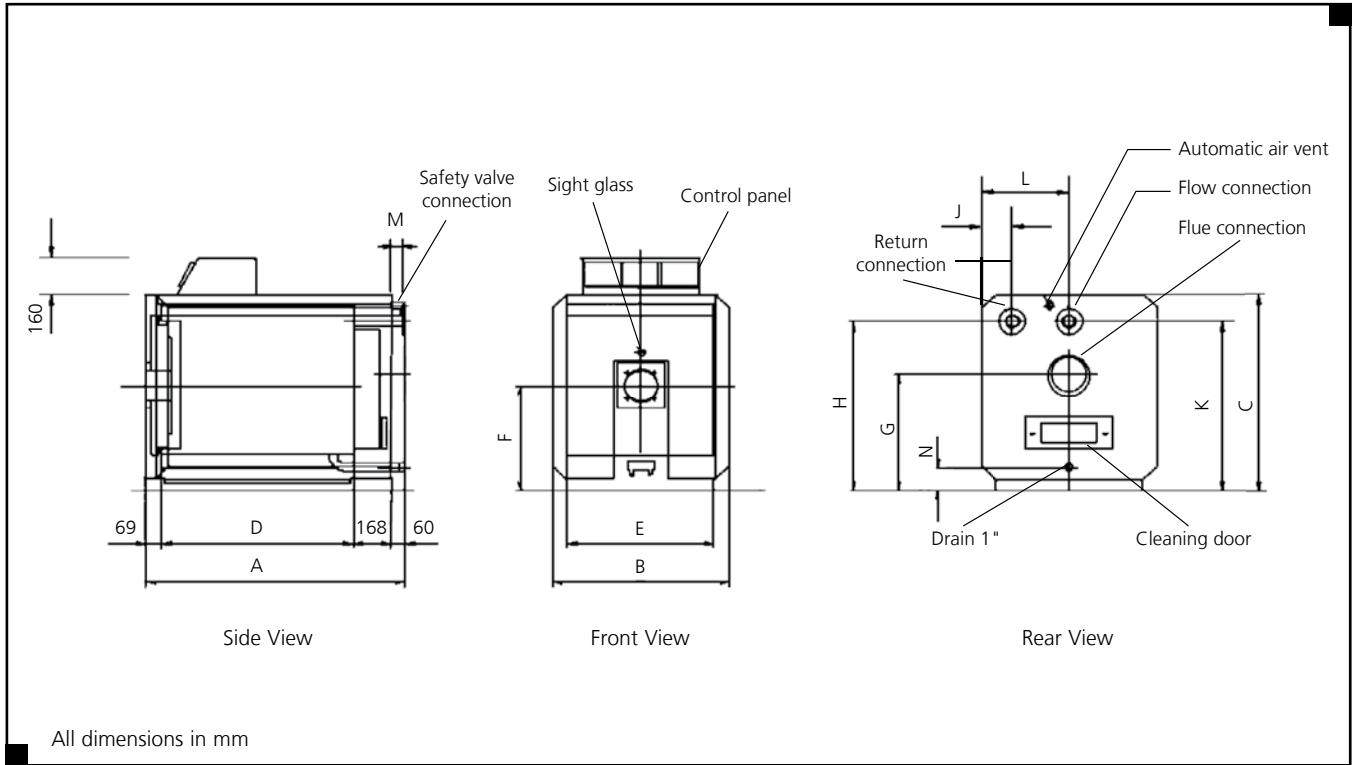
## Ensbury LT Boilers Performance and General Data

	Boiler Model	ELT 260	ELT 300	ELT 335	ELT 370	ELT 440	ELT 510	ELT 580	
Energy	Building Regulations seasonal efficiency (%) gross	84.81	84.80	84.87	84.83	85.07	85.11	84.97	
	Boiler output at 80/60°C kW	260	300	335	370	440	510	580	
	Btu/h x 1000	887	1024	1143	1262	1501	1740	1979	
	Boiler input (gross) - Maximum kW	317	366	409	451	537	622	707	
	Btu/h x 1000	1082	1249	1396	1539	1832	2122	2412	
	Boiler input (nett) - Maximum kW	286	330	368	407	483	560	637	
Btu/h x 1000	976	1126	1256	1389	1649	1911	2173		
Water	Boiler output at 80/60°C for natural gas - Minimum kW	60	87	87	87	100	100	165	
	Btu/h x 1000	205	297	297	297	341	341	563	
	Boiler output at 80/60°C for oil - Minimum kW	83	133	133	133	127	127	219	
	Btu/h x 1000	283	454	454	454	433	433	747	
	Water content litres	315		360		540			
	System design flow rate at 20°C ΔT rise l/s	3.11	3.59	4.01	4.43	5.26	6.10	6.94	
	Waterside pressure loss at 20°C ΔT rise mbar	17	22	27	33	20	27	35	
	System design flow rate at 10°C ΔT rise l/s	6.22	7.18	8.01	8.85	10.53	12.2	13.88	
	Waterside pressure loss at 10°C ΔT rise mbar	66	87	108	132	81	108	140	
	Water flow rate - Minimum l/s	No minimum flow rate							
	Water pressure - Maximum barg	4							
	Water pressure - Minimum barg	0.5							
Water flow temperature - Maximum °C	90								
Water flow temperature for gas - Minimum °C	60								
Water flow temperature for oil - Minimum °C	50								
Water return temperature - Minimum °C	15								
Fuel	Flow rate for natural gas - Maximum m <sup>3</sup> /h	30.2	34.9	39.0	43.0	51.2	59.3	67.4	
	Inlet pressure for natural gas - Nominal* mbar	20							
	Inlet pressure for natural gas - Maximum mbar	50							
	Input rate for oil (35Sec) l/h	30.0	34.6	38.6	42.7	50.8	58.8	66.9	
Flue	Flue gas volume at 15°C, 9%CO <sub>2</sub> , N.T.P - Approx m <sup>3</sup> /h	361	430.4	461.2	522.6	614.9	707.1	830.1	
	Flue gas temperature at 80/60°C °C	191	202	192	198	182	192	197	
	Combustion chamber resistance mbar	2.31	3.50	2.88	3.88	2.53	3.83	5.86	
Connections	Water flow connection	PN6 - DN65				PN6 - DN80			
	Water return connection	PN6 - DN65				PN6 - DN80			
	Gas inlet connection	Rc1½"			Rc2"	Rc1½"	Rc2"		
	Safety valve connection	Rc1¼"				Rc1½"			
	Drain connection	R1"							
	Flue diameter (O/D) - Nominal mm	200					250		
	Electrical supply for boiler	230V 1Ph 50Hz							
	Electrical supply for burner	230V 1Ph 50Hz / 400V 3Ph 50Hz depending on burner selection							
	Shipping weight (excluding burner) - Approx kg	606	607	737	739	973	976	980	

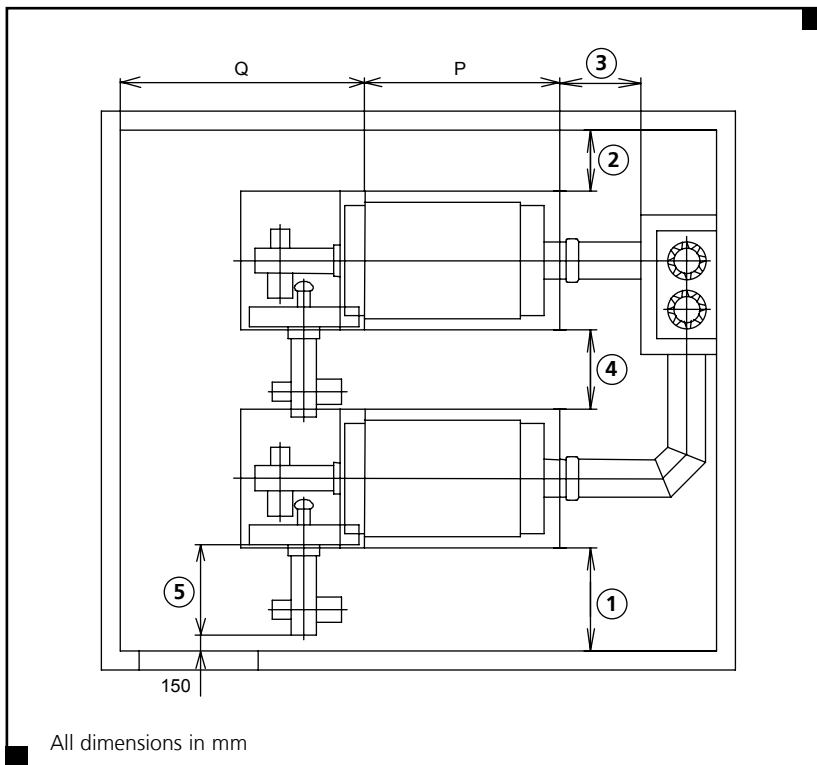
1. Data applies to gas and oil fired boilers, unless otherwise stated.
2. \*The nominal gas inlet pressure shown is for Riello burners. Alternative burners and dual fuel burner requirements may change. Nominal gas inlet pressure must be maintained under full gas flow operating conditions.
3. The performance specification for boilers with low NOx burners may be reduced.  
For further details please contact our technical department: Tel: 01202 662500.

# Dimensional Details

## Ensbury LT Boilers



Model	Dimensions														
	Overall Length	Casing Width	Overall Height	Frame Length	Frame Width	Burner Centreline	Flue Height	Return (height) Connection	Return (width) Connection	Flow (height) Connection	Flow (width) Connection	Flow/Return Connection	Drain (height) Connection	Boiler Shell Length	Front Clearance
	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
ELT 70	1141	770	880	844	640	470	520	757	135	757	385	60	100	1015	1220
ELT 90	1141	770	880	844	640	470	520	757	135	757	385	60	100	1015	1220
ELT 120	1283	870	955	986	740	500	550	835	185	835	435	70	88	1155	1310
ELT 145	1283	870	955	986	740	500	550	835	185	835	435	70	88	1155	1310
ELT 165	1483	870	955	1186	740	500	550	835	185	835	435	70	88	1355	1310
ELT 190	1483	870	955	1186	740	500	550	835	185	835	435	70	88	1355	1310
ELT 225	1483	920	1040	1186	790	550	600	933	185	900	460	80	103	1355	1310
ELT 260	1742	920	1040	1445	790	550	600	933	185	900	460	80	103	1445	1310
ELT 300	1742	920	1040	1445	790	550	600	933	185	900	460	80	103	1445	1310
ELT 335	1742	1000	1120	1445	870	590	640	933	145	978	500	80	104	1445	1310
ELT 370	1742	1000	1120	1445	870	590	640	933	145	978	500	80	104	1445	1310
ELT 440	1998	1068	1208	1701	938	624	674	1069	160	1053	534	90	104	1701	1600
ELT 510	1998	1068	1208	1701	938	624	674	1069	160	1053	534	90	104	1701	1600
ELT 580	1998	1068	1208	1701	938	624	674	1069	160	1053	534	90	104	1701	1600



### Clearances for Access & Maintenance

Notes:

- ① The boiler door including burner should be able to swing open through 90° providing access to the burner head and combustion chamber for cleaning and maintenance.
- ② At least 200mm should be allowed to the side of the boiler for fitting the casing. After fitting the casing the boiler may be moved closer to the wall, but no closer than 60mm. Burner clearance will be required if door handing is opposite to that shown.
- ③ Rear clearance should be no less than 600mm, providing access to the rear cleaning door.
- ④ A minimum distance of 200mm must be maintained between boiler casings. If the door handing is as shown, then it should be noted that burner lengths vary by model, and this distance may need increasing.
- ⑤ Burner lengths vary by model.

Please contact our technical department for further assistance: Tel: 01202 662500.

Dimensions for P and Q are shown in the table on page 8.

# Specification

## Ensburly LT

### Multiple Boiler Sequencing

Each boiler is provided with remote enable circuitry allowing the use of external boiler sequence controls with high/low and fully modulating burners.

Fully modulating burners are supplied with a temperature sensor that must be fitted in the flow pipe work immediately leaving the boiler, and wired directly to the burner. This sensor provides temperature feedback data from which the burner derives the correct load setting to maintain the temperature set-point.

Alternatively fully modulating burners can be specified with optional controls, to provide full BMS compatibility using a 0-10 volt analog signal to set the load performance of the burner within its operating band. This option must be stated at the time of ordering.

### Low Flow Rate

Owing to the design of the Ensburly boiler it is not necessary to maintain flow through the boiler as there is sufficient thermal mass to absorb residual combustion heat, without tripping the high limit thermostat.

This allows more flexible heating system design with no differential temperature restraint at the boiler, and eliminates the requirement for primary circuit pumps or boiler shunt pumps, so reducing energy consumption.

### Pressures and Temperatures

Ensburly boilers are suitable for operation on open vented or pressurised systems with a minimum head pressure of 0.5 bar and a maximum operating pressure of 4.0 bar.

Maximum flow temperature is 90°C.

Minimum flow temperatures are 50°C oil fired and 60°C gas fired.

# Application & System Data

## Ensbury LT Boilers

The installation of the boiler MUST be in accordance with the relevant requirements of the Gas Safety Regulations, Building Regulations, IEE Regulations and the Water Supply (Water Fittings) Regulations. It should also be in accordance with any relevant requirements of the local gas region and local authority and the relevant recommendations of the following documents:

These British Standard Codes of Practice and additional publications have relevant recommendations regarding the installation of Ensbury boilers.

### British Standards

**BS 5410** Code of practice for oil firing. Part 2: Installations of 45kW and above output capacity for space heating, hot water and steam supply services.

**BS 6798** Boilers of rated input not exceeding 60kW.

**BS 6644** Installation of Gas Fired Hot Water Boilers, 70kW to 1.8MW (nett input).

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

**BS 6891** Installation of low pressure gas pipe work of up to 35mm (R1¼") in domestic premises.

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

**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.

**BS 7671** Requirements for electrical installations. IEE Wiring Regulations. Seventeenth edition.

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

**BS EN 12828** Heating systems in buildings, Design for water-based heating 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, Part 1 flued appliances.

### Health and Safety Executive

Guidance note PM5 - Automatically controlled steam and hot water boilers.

### CIBSE Publications

**CIBSE Guide B** Heating, ventilating, air conditioning and refrigeration.

**CIBSE Guide H** Building Control Systems

**CIBSE Guide Energy Efficiency in Buildings**

**CIBSE Commissioning Code B: 2002**

### Dept Environment, Scottish Development Dept & Welsh Office

Third edition of the 1956 Clean Air Act Memorandum

### Communities & Local Government, England & Wales

The Building Regulations 2000: Conservation of Fuel and Power.

Part L 2A, new buildings other than dwellings

Part L 2B, existing buildings other than dwellings

### Location

Ensbury boilers must be installed on a non combustible flat and level surface capable of supporting the weight of the boiler when filled with water, plus any ancillary equipment. It is recommended that a plinth at least 50mm high is used for the boiler.

Where L.P.G. fuels are used the boiler house must not be in a basement location.

Adequate space should be allowed around the boiler for installation and servicing. *Refer to page 9 for further details.*

### Water Systems

Ensbury boilers are suitable for operation on open vented or pressurised systems with a minimum head pressure of 0.5 bar. Sealed systems must comply with Health and Safety Document PM5 requirements for fuel supply cut off in the event of low and high pressure conditions. To ensure compliance, consider using a proprietary pressurisation unit with correctly sized expansion vessels.

*For details of Hamworthy Chesil pressurisation units, refer to publication 500002486.*

### Safety Valves

Each boiler must be provided with a suitably sized and rated safety valve located in the boiler flow between the boiler flow connection and any isolating valve. The safety valve will ideally be located as close to the boiler as possible. Safety valves should be sized in accordance with the requirements of BS6644.



### Adequate Water Flow

Ensbury boilers do not have minimum flow rate requirements, however, care must be taken to ensure system hydraulics are designed to maintain the minimum required flow temperature of 60°C when gas firing and 50°C when oil firing, irrespective of the system return temperature.

### System Feed Water Quality

If the boiler feed water has a high degree of hardness, >100mg CaCo<sup>3</sup>/litre, it is recommended that the water be treated to prevent the precipitation of scale and sludge in the boiler waterways. Details of additives can be obtained from any reliable manufacturer of water treatment products or the local water authority.

It should be noted however, that even if the boiler water is of average hardness, not requiring treatment, subsequent draining of the system for repair or constant make-up water due to an undetected leak will cause additional deposits and gradual build up of scale. It is essential therefore, that leaks are attended to promptly and draining is kept to absolute minimum. It is recommended that the system be flushed out at least twice before any water treatment is added.

### Air and Dirt Removal

To provide effective degassing of circulating system water and for sludge removal, an air and dirt separator equipped with a fast action flushing valve must be installed in the return pipe work to the boiler.

Additionally for the removal of larger particulate matter from circulating system water, a coarse strainer must be fitted in the return pipe work to the boiler, upstream of the air and dirt separator.

### Open Vent Pipe and Cold Feed Pipe Data

Boiler	Open Vent Size	Cold Feed Size
<60kW	25mm (1 in)	19mm (¾ in)
60kW - 150kW	32mm (1¼ in)	25mm (1 in)
150kW - 300kW	38mm (1½ in)	32mm (1¼ in)
300kW - 600kW	50mm (2 in)	38mm (1½ in)

### Oil Supply Storage

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

### Liquid Biofuel Storage and Handling

Oil storage tank manufacturers' must verify that their tank construction and ancillary equipment is suitable for use with liquid biofuel.

Any suitable existing oil storage tank must be thoroughly cleaned prior to use.

Liquid biofuels are hygroscopic and any traces of water absorbed into the oil could result in blocked filters, oil pumps or nozzles.

Liquid biofuels can be susceptible to bacteria growth so it is advisable to implement management best practice for storage of the fuel. Prudent precautions such as using additives and limiting the storage volume (not oversizing) may help limit bacterial growth.

### Gas Supply

Some of the larger burners may require a boosted gas supply. Hamworthy offer optional gas boosters as part of the burner boiler package.

On some models, as an alternative to using gas boosters, a larger gas train may be available. Consult with our technical sales team for further advice.

The Gas Safety (Installation and Use) Regulations require that only competent persons (Gas Safe Certified engineers), 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 at low level.

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

### Delivery & Handling

Each boiler is delivered to site on a wooden pallet in one package containing the boiler, casing and control panel.

Each boiler is fitted with lifting eyes allowing lifting by crane where necessary.

The boiler casing is supplied flat packed for on-site assembly along with the boiler control panel.

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

### Commissioning

Hamworthy Heating strongly recommend that all boilers are commissioned by their service department or by an approved burner specialist. *For more information on commissioning contact Hamworthy Heating Service Department: Tel: 0845 450 2866.*

### Warranty

Products from Hamworthy Heating carry a standard two-year warranty on parts, which is extended to include labour when the product is commissioned by Hamworthy service engineers. Hamworthy can tailor packages to suit individual customer requirements, many of which include extended warranty benefits. *For more information on commissioning and other after-sales services, please contact Hamworthy Heating Service Department: Tel: 0845 450 2866.*

## 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. In all cases the system pressure shall not be lower than the boiler minimum operating pressure detailed in the technical data table. See pages 6 and 7.

### 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 5.1m (17ft).

Required flow temperature	90°C
Safety margin	17°C
Equivalent saturated steam temperature	107°C

**From steam tables corresponding gauge pressure 0.3 bar – 3.0m head of water.**

**Minimum boiler operating pressure takes priority if greater than calculated gauge pressure.**

See technical data tables on pages 6 and 7.

### Modular Installations

The minimum pressure should be equal to the gauge pressure equivalent to the saturated steam temperature. This is obtained by adding 17°C to the sum of the required mixed flow temperature plus the temperature rise across the modules.

System $\Delta t$	11°C	20°C
Required mixed flow Temperature	82°C	80°C
Temperature rise across modules at minimum flow rate	11°C	20°C
Safety margin	17°C	17°C
Equivalent saturated steam temperature	110°C	117°C

**From steam tables corresponding gauge pressure at 11°C $\Delta t$  0.43 bar, 4.4 m**

**From steam tables corresponding gauge pressure at 20°C $\Delta t$  0.80 bar, 8.2 m**

**Minimum boiler operating pressure takes priority if greater than calculated gauge pressure.**

See technical data tables on pages 6 and 7.

### 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 low level with natural discharge through a high level opening.
- A fan to supply air to low level 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 boiler house relative to outside air pressure.**

The air supplied for boiler house ventilation should be such that the maximum temperatures within the boiler house are as follows:

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

Where natural ventilation is used suitable permanent openings at low level and high level connected directly to the outside air should be provided. These openings must be fitted with grilles that cannot be blocked or flooded. The free area of the grilles should be as follows:

**Low Level (Inlet)**

4cm<sup>2</sup> per kW of net heat input.

**High Level (Outlet)**

2cm<sup>2</sup> per kW of net heat input.

### Ventilation

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 BS6644 for more detailed information.

## The Building Regulations 2000

### Conservation of fuel and power 2006 edition

Approved Document AD L2A New Buildings, other than dwellings

Approved Document AD L2B Existing Buildings, other than dwellings

These new regulations came into force 6 April 2006. Compliance with the latest regulations now requires a whole building approach to reduction in carbon emissions. The 2006 edition requires the use of heat generating plant as detailed in the supporting 2nd tier guide - Non Domestic Heating, Cooling and Ventilation Compliance Guide.

### Seasonal Efficiency

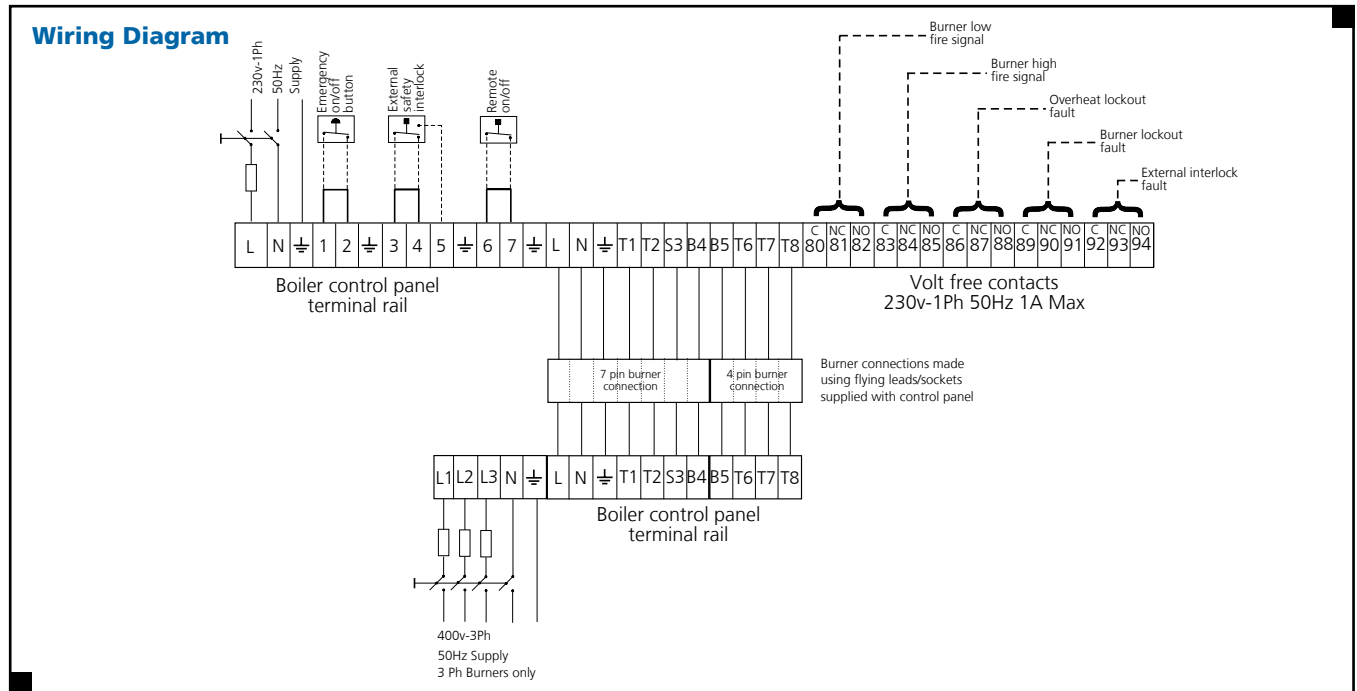
The efficiency data used for evaluating commercial boilers is known as the heat generator seasonal efficiency and this guide states that for new buildings and existing buildings, the minimum heat generating system seasonal efficiency is 84% gross for natural gas.

The heat generator seasonal efficiency for Ensbury boilers exceed the minimum requirement.

Individual boiler figures can be found in the technical data tables on pages 6 & 7.

# Electrical Wiring & Controls

Ensbury LT Boilers



## Electrical Supply

The boiler control panel requires a 230 volts, 50 Hz, single phase electrical supply, via a fused isolator close to the boiler.

Single phase burners derive their power supply from the boiler control panel via the 7 pin burner connection.

Three phase burners require an additional 400 volts, 50 Hz, three phase electrical supply directly to the burner, wired in accordance with the manufacturer's instructions, and via a fused isolator close to the burner.

## External Controls Interface – terminals 1 to 7

Each boiler control panel is supplied with controls interfaces that can be connected to external controls solutions for:

- Emergency on/off circuit
- Safety interlock circuit
- Remote on/off circuit (remote enable)

Emergency on off circuit immediately cuts the electrical supply to the boiler control panel stopping burner operation and heat generation.

Where external controls are used, the hard wired links must be removed. All external wiring carries 230 volts and requires volt free external switches. External switches are not provided with the boiler.

## Burner Wiring

Connections between the boiler control panel and the burner are made using flying leads with plugs and sockets supplied with the boiler and burner.

High Low burners use both the 7 pin and 4 pin burner connections.

Fully Modulating burners only use the 7 pin burner connection.

0-10 volt control of fully modulating burners requires additional wiring dependent on burner selection.

For further details please contact our technical department: Tel: 01202 662500.

## Remote Signalling

Remote signalling is achieved via a set of volt free contacts which indicate the following:

- Burner low fire operation
- Burner high fire operation
- Overheat lockout
- Burner lockout
- External interlock fault

## Volt Free Contacts – terminals 80 to 94

External wiring for volt free contacts is typically connected to the common and normally open contacts. Alternatively wiring may be connected to the common and normally closed contacts.

For the external interlock fault volt free contact to operate, an external interlock fault condition power supply is required to terminal 5, 230 volts.

## External Wiring

Wiring external to the boiler must be installed in accordance with I.E.E regulations. Wiring to the boiler control panel must be completed in heat resistant 3 core cable, (size 1.0mm<sup>2</sup> c.s.a.). An isolator correctly fused at 5 amps should be sited close to each boiler for the control panel.

# System Design

## Ensbury LT Boilers

### Scheme 1

Typical boiler installation with a variable temperature heating circuit. Compensation of the heating circuit must use external mixing control and the minimum boiler flow temperature must be maintained.

### Scheme 2

Typical boiler installation with two heating circuits and domestic hot water. Compensation of the variable temperature heating circuit must use external mixing control.

Boiler operating temperature should be set to meet the demands of the highest temperature circuit but not be set below the minimum boiler flow temperature.

Where all circuits are required to operate below the minimum boiler flow temperature then all circuits should incorporate mixing to lower the temperature from the boiler before being admitted to the circuit.

Due to the thermal mass of the boiler, the flow rate returning from the heating circuits can be low.

For minimum temperature details see technical data tables on pages 6 & 7.

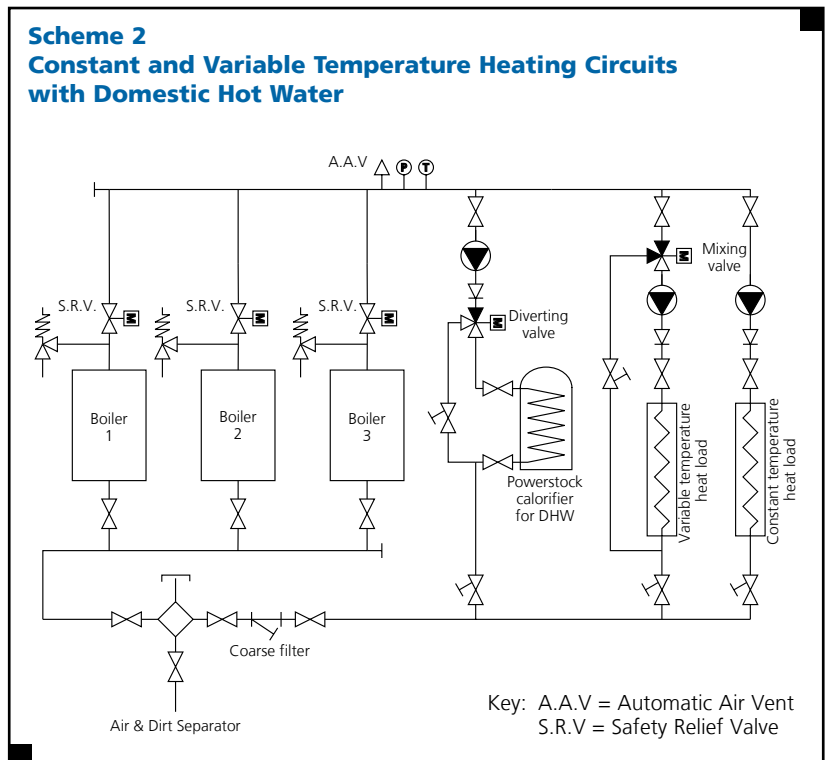
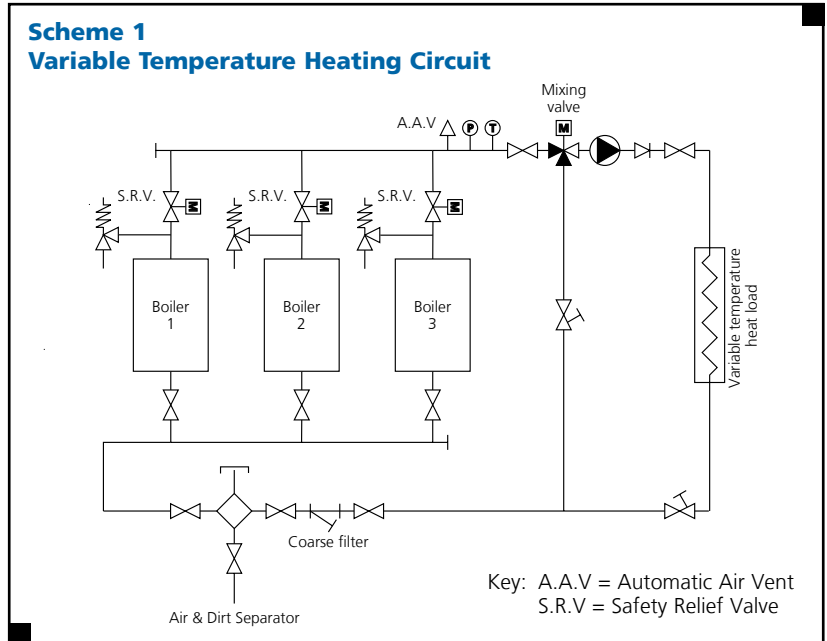
### Dry Cycling

To reduce dry cycling, it is recommended that each boiler is fitted with a motorised isolation valve, to prevent flow from the heating circuits passing through non-firing boilers.

Satisfying the heat load through a reduced number of boilers allows the burner to fire for longer periods, and reduces the number of burner starts.

With high water content boilers, energy will be saved by reducing the number of heat up cycles, and systems will be more responsive.

The motorised valve must be controlled from the boiler enabling circuit, to ensure the valve is opened whenever a boiler is fired.



# Flue System & Flue Gas Economiser

## Ensbury LT Boilers

### Flue System

Hamworthy Ensbury 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.
- Under part load conditions, flue gases leaving the boiler will be at lower temperatures, circa 95°C for gas fired and 120°C for oil fired.
- The flue system should be designed to maintain atmospheric pressure at the boiler flue connection at all times. If at any time a suction condition is likely to arise, then 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.
- Ensbury boilers are suitable for installation in a balanced compartment in accordance with the requirements of BS 6644.

### Flue Gas Economiser

Flue gas economisers are designed for use with boilers, to extract energy that otherwise would be expelled through the flue system. Hamworthy offer the Arne range of flue gas economisers and the free-standing design allows use in new or existing boiler installations, and with virtually any type of non-condensing boiler. Fitted to the flue system, heat is transferred to the heating system return water, further increasing the energy efficiency performance. Dependent on application and return water temperature, it is possible to achieve operating efficiency performance gains up to 18%.



*Hamworthy Arne flue gas economiser.*

Range	Application	No. of Models	Boiler Outputs
Arne Eco	Individual boilers	12	95kW to 6470kW
Arne Eco Turbo	Multiple boilers	4	400kW to 1430kW

There are two ranges of Hamworthy Arne flue gas economiser, each having several models to suit different applications and power requirements. Flue gases enter the economiser at the top and exit from the bottom ensuring condensate flows to the bottom of the sump for draining. Waterways within the Arne flue gas economisers are constructed from grade 316L stainless steel smooth tubes, combining low resistance to the passage of flue gases with tolerance to the acidic nature of flue gas condensate. Heat is recovered from the flue gases by two processes. Firstly, sensible heat is extracted by significantly reducing the flue gas temperature from typically 190°C for Ensbury boilers, or higher from other steel boilers, circa 220°C. Secondly, latent heat is extracted by condensation of the water vapour present in the combustion gases, when the return water temperature is below 55°C. *For further details of Hamworthy Arne flue gas economisers, refer to publication 500002501.*



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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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