

# HR Calorifier

## Design Installation and User Guide



July 2001

# Contents

## General specifications

Specifications . . . . .	3
Shipping Contents . . . . .	3
Location and Clearance . . . . .	3
Design Considerations . . . . .	3
Figure 1 Basic Outline . . . . .	3

## Dimensions and Capacity

Table 1 Input & Output . . . . .	4
Table 2 Dimensions . . . . .	4
Figure 2 Dimensions. . . . .	4
Table 3 Flow & Return . . . . .	5
Table 4 Capacity & Output . . . . .	5
Table 5 Hydraulic Operation . . . . .	5

## Connections and Arrangement

Modular Arrangement. . . . .	6
Figure 3 Primary Connections . . . . .	6

## Installation

General. . . . .	7
Figure 4 In Series . . . . .	7
Figure 5 In Parallel . . . . .	7
Figure 6 Mains Connection HR140 - 230 . . . . .	8
Figure 7 Mains Connection HR320 - 600 . . . . .	9

## Electrical Assembly

Figure 8 Installation to Pump . . . . .	10
Figure 9 To 2 Motor Diverting Valve . . . . .	10

## Commissioning

Commissioning. . . . .	11
------------------------	----

## Maintenance

Maintenance of Unit . . . . .	11
-------------------------------	----

## Spare Parts

Components List . . . . .	11
---------------------------	----

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### Brief Specifications

HR Calorifiers consist of two concentric tanks.

The inner tank is manufactured in chrome nickel 18/10 (304) stainless steel and contains the domestic hot water (secondary). The outer tank is manufactured in mild steel.

To heat the domestic water (secondary) water from the boiler (primary) is circulated between the two tanks. The extensive surface area of the corrugated inner tank ensures rapid heat transfer and has the added advantage of flexing to prevent hard water scale build up on the internal surface thus eliminating the need for regular maintenance associated with sacrificial anodes.

The HR 140 to 600 calorifiers are pre-insulated with 30mm of C.F.C. free polyurethane insulation. Whilst the HR 800 and 1000 are insulated with 50mm glass fibre blanket. The jackets are made of steel and stove enamelled for a first class, long lasting finish and pre-fitted at works to the HR 140 to 600.

The control panel includes a thermometer for stored water temperature and a thermostat to control a pump or twin motor diverting valve. The calorifier is suitable for generating domestic hot water by direct mains connection as well as being tank fed or fed by a boosted water mains.

**IMPORTANT-** When the unit is tank fed the static height must be enough to overcome the resistance of the unit and any associated downstream secondary pipe work. For direct mains connection an optional unvented kit is available for fitting by qualified persons only. The unit is suitable for a primary pressure of 3 bar and a secondary pressure of 10 bar. A secondary recirculation connection is available on the HR230 and in all cases secondary recirculation or trace heating should be installed to minimise legionella risk, (bronze Biral secondary pumps available from Beeston).

### Shipping Contents

Calorifiers are supplied individually shrink wrapped onto their base, for handling by sling, sack barrow, 4 wheel bogie or special fork lift probe.

Close coupled pipework sets for multiple applications are packed separately in shrink wrapped tubes.

### Location and Clearance

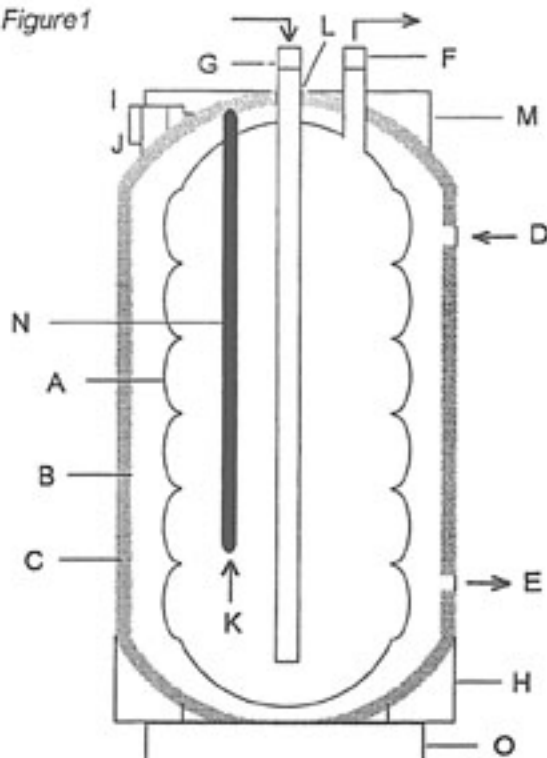
The calorifier should be positioned on a level base capable of supporting the weight of the full unit.

A 50mm raised concrete plinth is recommended though not essential.

A 50mm clearance is required at the sides and 300mm is required at the rear to make the primary water and the electrical connections and to access the primary draincock.

A clearance of 300mm is recommended at the front and 300mm above the unit to make the secondary connections.

Figure 1



- A. Inner corrugated tank in stainless steel
- B. Outer mild steel tank
- C. Polyurethane foam insulation
- D. Hot water from boiler (primary circuit)
- E. Water return to boiler (primary circuit)
- F. Domestic hot water flow (secondary circuit)
- G. Cold water inlet (secondary circuit)
- H. Metal Jacket
- I. Thermostat
- J. Thermometer
- K. Thermostat bulb
- L. Air vent
- M. Electric socket
- N. Thermometer bulb
- O. Metal base

### Design Considerations General

The HR 140 to 600 is Water Council Listed on W.R.C. No.8909066.

The installation should be in accordance with :-

Local Authority Building Regulations

CP342 Centralised hot water supply

Model Water Bye-Laws

BS 6700 Domestic Water Supplies

I.E.E. Regulations - 16th Edition

Bye-Laws of Local Water Authority

National Building Regulations

The Building Standards (Scotland) (Consolidation) Regulations

It is the law that unvented direct mains connection to a fired or unfired calorifier requires an application and approval from the local Building Control Officer. It is the installers responsibility to obtain this and such an installer must also be specifically qualified to install such systems.

Table 1

MODEL	MAXIMUM CONTINUOUS OUTPUT AT:-			
	*45°C		*60°C	
	kW	Flow l/hr	kW	Flow l/hr
HR 140	33	807	27	459
HR 230	55	1354	45	770
HR 320	76	1862	63	1077
HR 600	88	2152	72	1232

\*Based on cold inlet of 10 degrees C

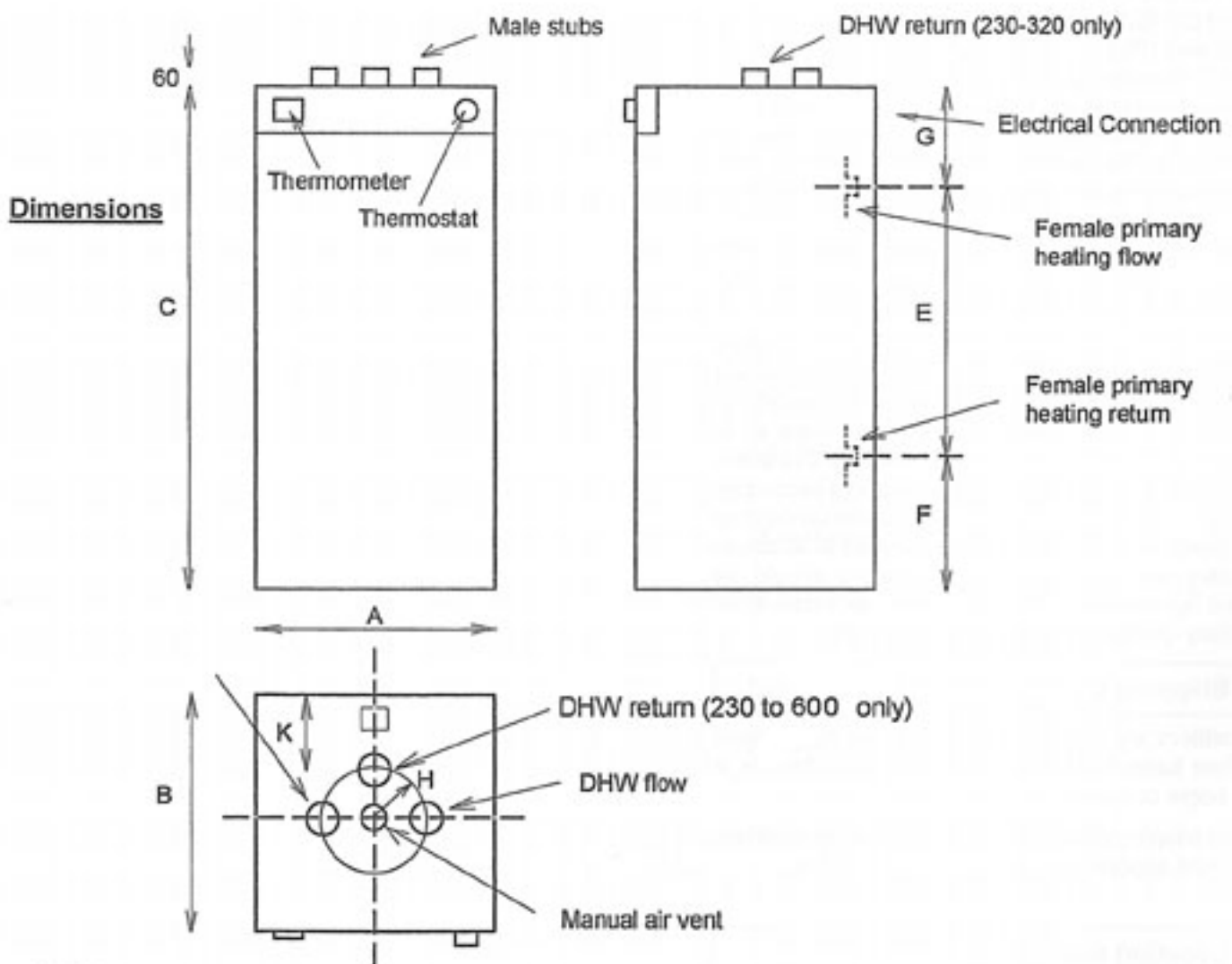


Table 2

MODEL	WIDTH OVERALL	DEPTH	HEIGHT OVERALL	WEIGHT (EMPTY)		TANK CONNECTION POSITION			
	A	B	C	Kg	Lbs	E	F	G	H
HR 140	475	500	1213	69	130	830	240	143	100
HR 230	610	610	1217	82	180	700	350	167	135
HR 320	610	610	1575	160	352	1060	290	225	135
HR 600	750	750	1838	225	495	1330	290	218	135

Table 3

MODEL	TANK CONNECTION SIZES			
	PRIMARY FLOW AND RETURN	DHW FLOW AND COLD FEED	SECONDARY RETURN	RECOMMENDED BIRAL PRIMARY PUMP*
HR 140	R 3/4"	R 3/4"	R 3/4"	M12-3 (min speed)
HR 230	R 1-1/4"	R 1"	R 1"	M13-3
HR 320	R 2"	R 1-1/2"	R 1-1/2"	LX401 or LXD401
HR 600	R 2"	R 1-1/2"	R 1-1/2"	LX401 or LXD401

\* Based on volume flow rate equivalent to a 10K differential across the primary connections at the minimum kW input to the calorifier to achieve 60 Degrees continuous output at a 50 Degree temperature rise. Bronze secondary pumps also available - Talk To Beeston !

Limitations of use:      Maximum Temperature:      95 °C  
 Maximum Working Pressure:      Primary 3 bar, Secondary (DHW) 10 bar

Table 4

MODEL	CAPACITY				* PEAK OUTPUT				** CONTINUOUS OUTPUT			
	DOMESTIC HOT WATER		TOTAL WATER		PER 10 MINUTES				OUTPUT PER 1hr ONLY			
					45 C		60 C		45 C		60 C	
	L	GAL	L	GAL	L	GAL	L	GAL	L	GAL	L	GAL
HR 140	105	23.3	140	31.1	307	68.3	186	41.3	980	217.8	569	126.5
HR 230	170	37.8	227	50.5	512	113.8	305	67.8	1640	364.5	847	188.3
HR 320	263	58.4	318	70.7	790	175.6	504	112.0	2342	520.5	1402	311.6
HR 600	445	98.9	606	134.7	1153	256.3	706	156.9	2946	654.7	1733	385.2

\* All based on a cold inlet temp of 10 C.    \*\* Starting from a fully charged tank at 45 C or 60 C

Table 5

MODEL	^ MINIMUM INPUT	** RECOVERY TIME		* PRIMARY CIRCUIT PRESSURE DROP		HEATING SURFACE
	kW	45°C	60°C	ln w.g.	mbar	sq mtr
HR 140	27.0	12	16	5.9	15	1.42
HR 230	45.0	11	16	11.8	30	2.10
HR 320	63.0	12	17	23.6	60	2.65
HR 600	72.0	18	26	27.6	70	3.60

^ To achieve 60°C output continuously.      \*\* All based on cold inlet temperature of 10°C (50°F).

\* Based on a volume flow equivalent to a 10K differential across the primaries at a minimum input to the CALORIFIER, to achieve 60°C continuous output.

Note. Pressure drop in secondary circuit is negligible.

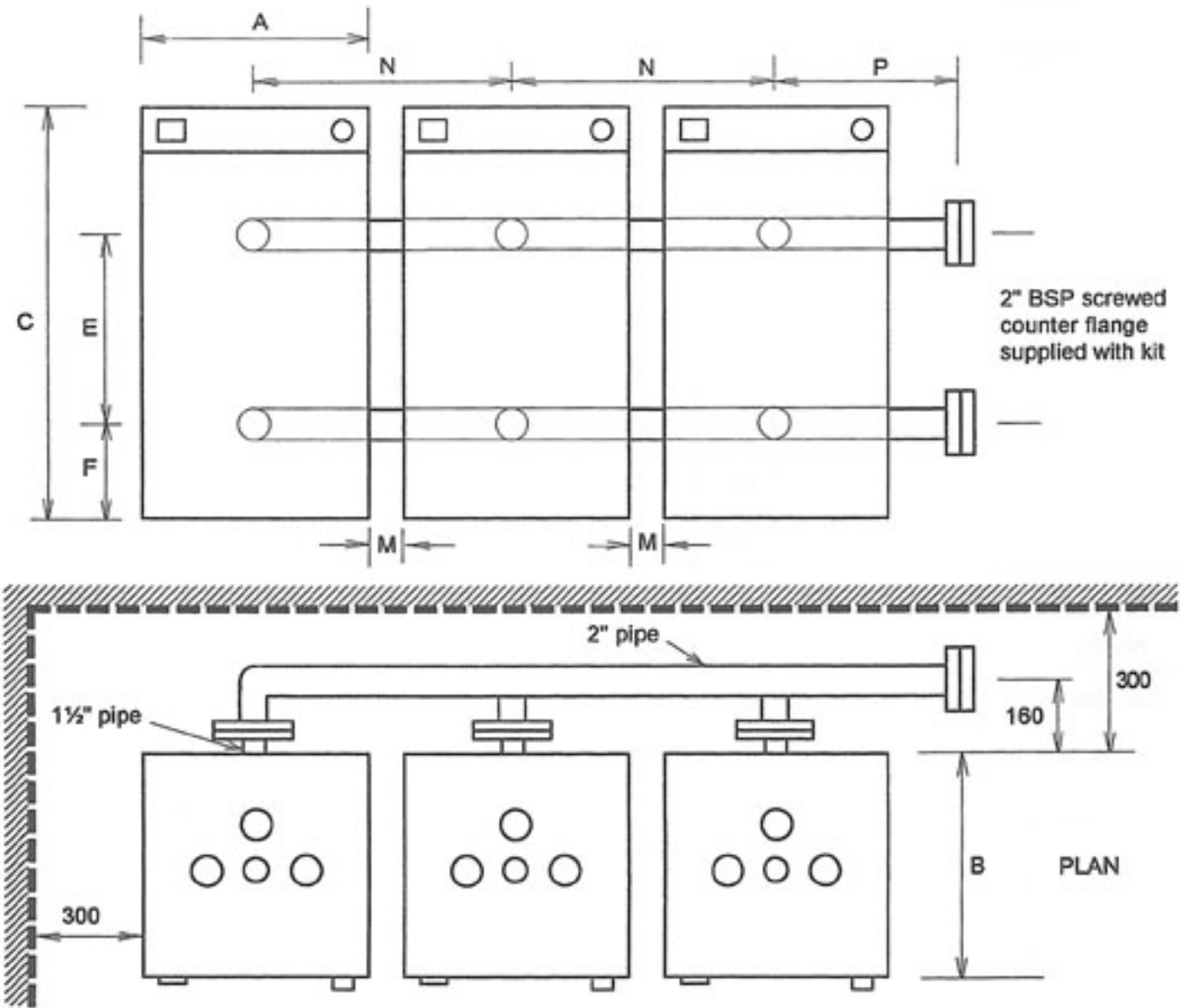
**Modular Arrangement**

HR units can be coupled together, in a maximum of 3 tanks per battery, to give the following performance. The following table gives typical performance figures for models HR320 and HR600 arranged in modular form, but other sizes can be coupled together as well in a similar manner to give high flow rates where required.

MODEL	MINIMUM INPUT	LITRES/Hr FLOW
	KW	AT 60°C
1- 320	63.0	1077
2- 320	126.0	2154
3- 320	189.0	3231
1- 600	72.0	1232
2- 600	144.0	2464
3- 600	216.0	3696

Figure 3

**HR 320 or HR 600 Primary Connections**



DIMENSIONS								
MODEL	A	B	C	E	F	M	N	P
HR 320	610	610	1575	1060	290	40	650	164
HR 600	750	750	1838	1330	290	50	800	164

**Installation**

**Important:**

Do not fill the primary or secondary side of the unit before reading "Commissioning" for the correct procedure.

**General**

The calorifier primary connections are steel and may be connected to steel, iron or copper systems with a maximum pressure of 3 bar. Isolating valves and unions should be fitted so that it is possible to isolate the calorifier from the system.

The calorifier secondary connections are stainless steel and may be connected to galvanised steel or copper primary systems.

If the calorifier is located in a high level plant room with domestic water draw off at a lower level a syphon break must be included or it may be possible to damage the unit.

In all cases the secondary hot water pressure must be regulated to 4.5 bar maximum for domestic systems.

A secondary recirculation system with a bronze pump should always be installed and connected to the secondary return connection on the HR 230 or teed into the cold secondary inlet with a pitcher tee for the HR 140. The secondary recirculation should be so installed that no dead legs are left in the system and mixer systems should be included at point of use.

In order to descale and chemically clean the secondary inner tank quick release fittings and isolating valves should be fitted to the secondary connections so that it can be filled and drained during maintenance.

For multiple calorifier installations the secondary connections should be connected as:

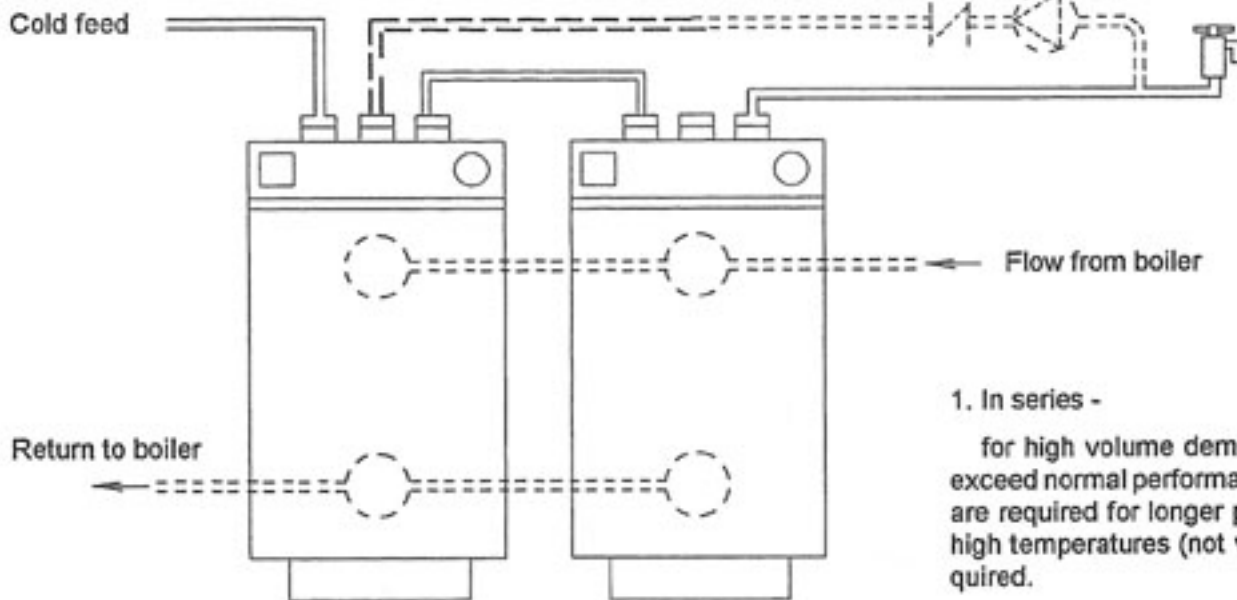


Figure 4

**1. In series -**

for high volume demands that just exceed normal performance but which are required for longer periods where high temperatures (not volume) is required.

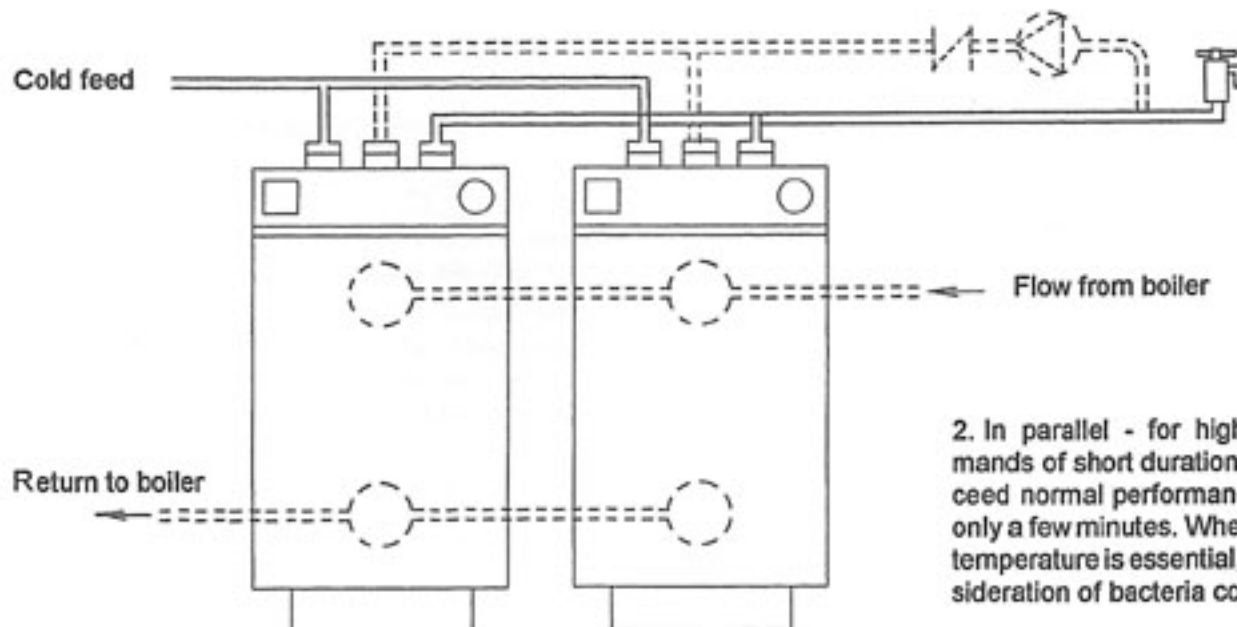


Figure 5

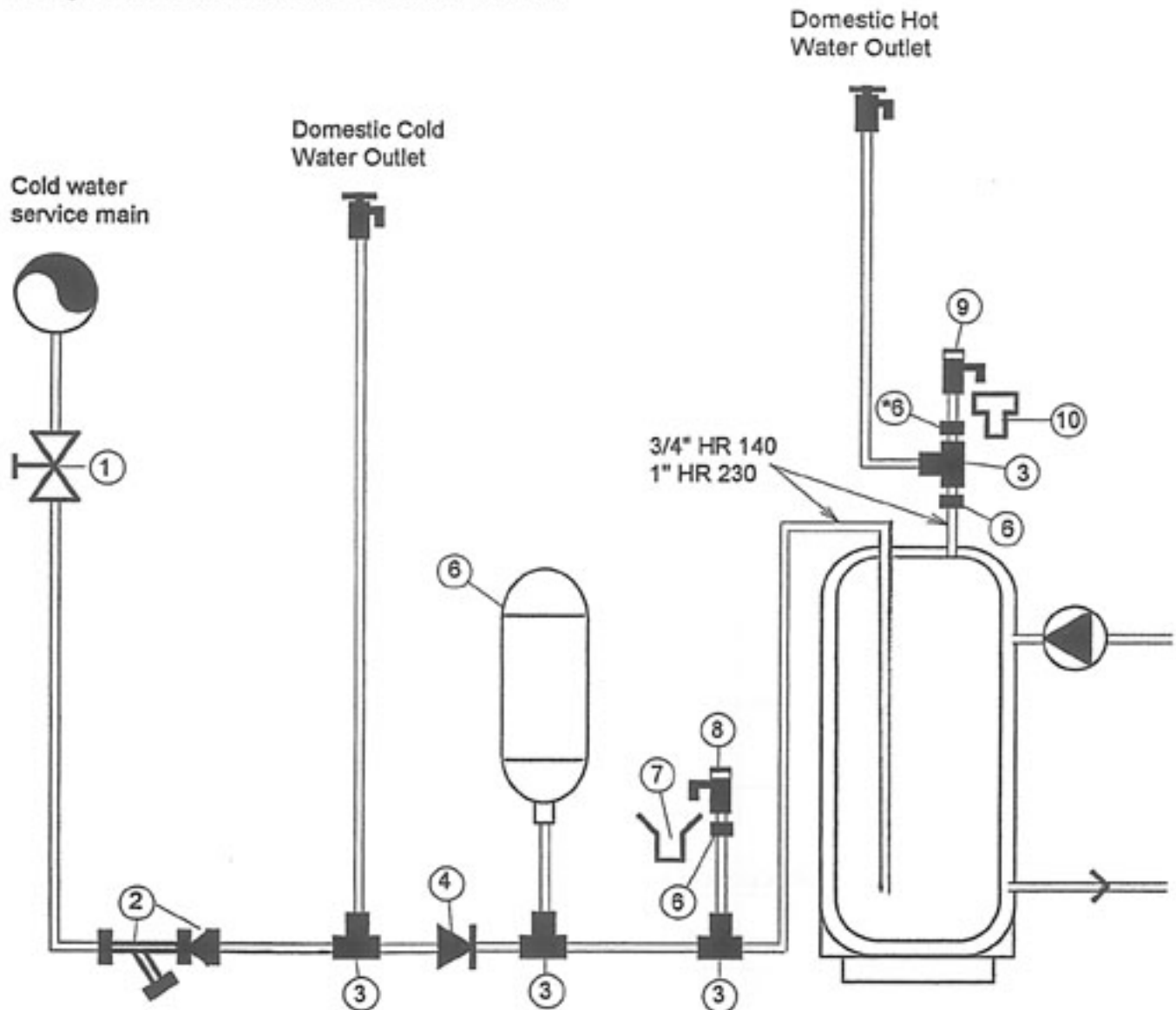
**2. In parallel -** for high volume demands of short duration which far exceed normal performance but last for only a few minutes. Where volume not temperature is essential, subject to consideration of bacteria control.



Direct Mains Connection HR 140 and HR 230

The following optional kit is available but may only be installed by a qualified installer and it is the Law that a Building Control Officer is notified of such installations.

Figure 6



NOTES:

Discharge pipes must be connected to the funnels or sockets and routed to a safe visible discharge point and drain. The discharge of water or steam must not be a hazard to persons or property and must route away from electrical installations.

Externally routed pipes must be protected from frost.

The expansion vessel should be above the cold inlet level and connected by the shortest possible vertical pipe so that the cold water in it is purged. A 24 ltr expansion vessel is suitable for a total system volume of about 600 ltr rising from 10°C to 60°C.

The vessel should be precharged to 3.5 bar cold.

Maximum secondary working temperature of 75°C.

The pressure control valve is preset to 3.5 bar.

Parts List

QTY

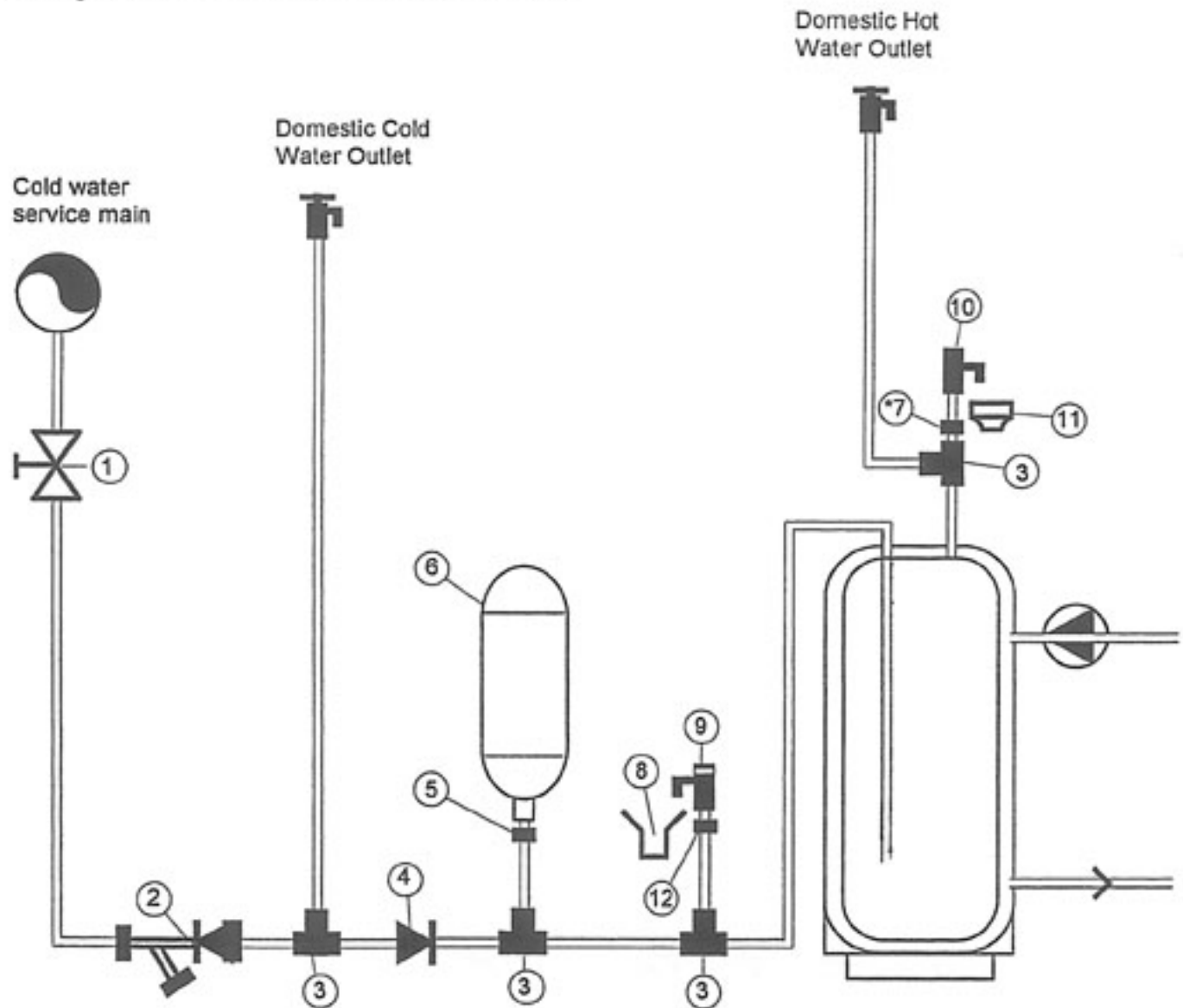
1.	Gate valve 1"	1
2.	Comb. Pressure control valve/strainer 1"	1
3.	Tee 1"	1
4.	Non return valve 1"	4
5.	Expansion vessel 24 ltr x 3/4"	1
6.	1" x 3/4" reducing bush	1
7.	Discharge funnel 3/4"	1 or *3
8.	Expansion relief valve 3/4" @ 6 bar	1
9.	Temperature and Pressure relief valve (HR 140 3/4") (HR 230 1") @ 6 bar 95°C	1
10.	Discharge funnel 3/4" (HR 140)	1
	Reducing socket 1 1/2" x 1 1/2" (HR 230) (to act as tundish)	1
*	Model 140 only	



Direct Mains Connection HR 320 and HR 600

The following optional kit is available but may only be installed by a qualified installer and it is the Law that a Building Control Officer is notified of such installations.

Figure 7



NOTES:

Discharge pipes must be connected to the funnels or sockets and routed to a safe visible discharge point and drain. The discharge of water or steam must not be a hazard to persons or property and must route away from electrical installations.

Externally routed pipes must be protected from frost.

The expansion vessel should be above the cold inlet level and connected by the shortest possible vertical pipe so that the cold water in it is purged. A 60 ltr expansion vessel is suitable for a total system volume of about 1500 ltr rising from 10°C to 60°C.

The vessel should be precharged to 3.5 bar cold.

Maximum secondary working temperature of 75°C.

The pressure control valve to be set on site to 3.5 bar.

Parts List

		QTY
1.	Gate valve 1½"	1
2.	Comb. Pressure control valve/strainer 1½"	1
3.	Tee 1½"	4
4.	Non return valve 1½"	1
5.	1½" x 1" reducing bush	1
6.	Expansion vessel 60 ltr x 1"	1
7.	1½" x 1¼" reducing bush HR 320	*1
8.	Discharge funnel ¾"	1
9.	Expansion relief valve ¾" @ 6 bar	1
10.	Temperature and Pressure relief valve (HR 320 1½" ) \ (HR 600 1½" ) @ 6 bar 95°C	1
11.	Reducing socket (*HR320 1½" x 1¼" ) (HR 600 2" x 1½")	1
12.	Reducing bush 1½" x ¾"	1
*	HR 320 only	

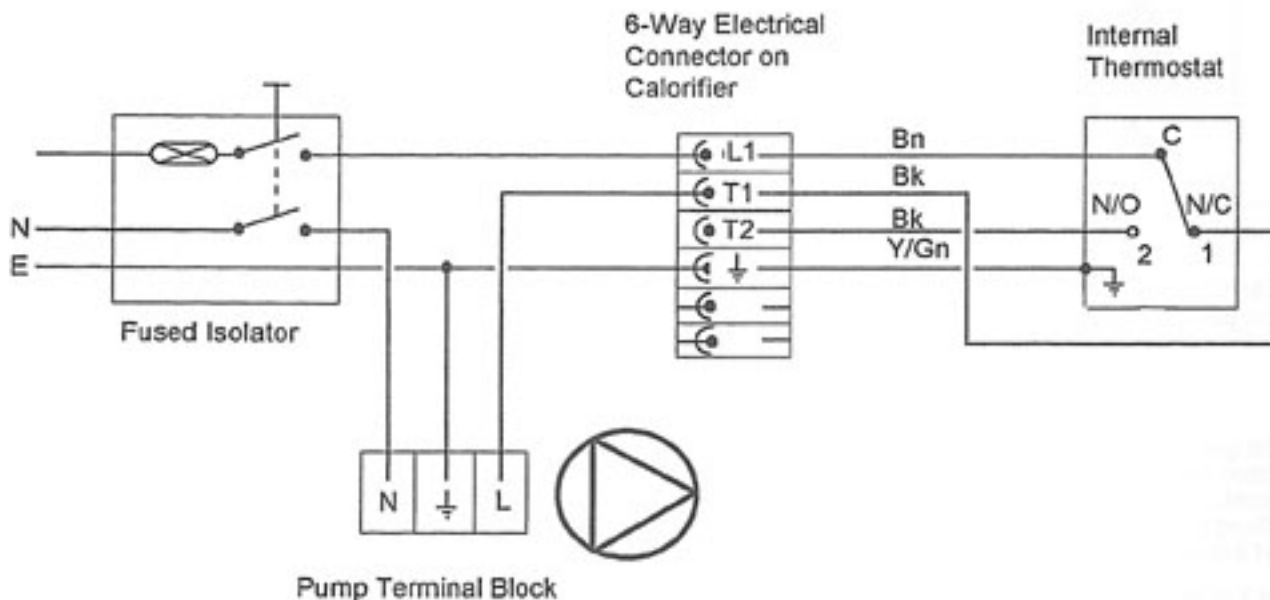
**Electrical Installation**

All electrical installations should be in accordance with I.E.E Regulations.

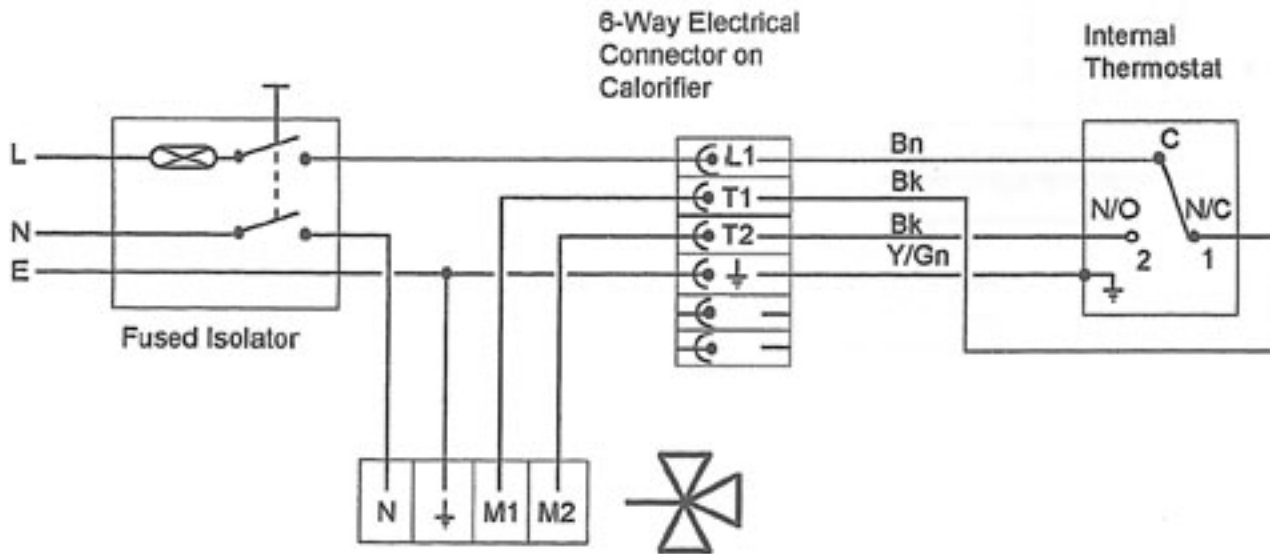
A supply to a pump or diverting valve may be made through the calorifier's internal thermostat via a suitable fused isolator adjacent to the unit. The thermostat contacts are rated at 10A resistive, 6A inductive.

**THIS APPLIANCE MUST BE EARTHED**

**Electrical Installation to Pump**



**Electrical Installation to 2 Motor Diverting Valve**



## Commissioning

### Warning:

The domestic hot water tank (secondary) must be pressurised before filling the heating circuit (primary).

### Important:

**THIS UNIT MUST BE EARTHED.**

In all cases the secondary domestic hot water pressure must be less than 4.5 bar and we recommend pressure reducing valves be set to 3.5 bar. (The unit is suitable for secondary pressures of 10 bar but this would only be used in industrial process applications and never for domestic hot water.)

The primary boiler pressure should be 3 bar maximum.

After filling it is necessary to purge both the heating (primary) and domestic hot water (secondary) circuits.

The domestic hot water circuit can be purged simply by opening the hot water taps. The heating circuit (primary) can be purged by using the air vent fitted on top of the unit (be sure to check the tightness of the vent after use).

The control thermostat should be set to 60°C minimum to ensure that bacteria cannot exist and the secondary recirculation pump put into operation.

The thermostat knob may be locked into position with a special clip available free of charge from Beeston Heating.

The boiler should provide primary water at typically 80°C and its high-limit thermostat should be set to 95°C maximum.

For direct mains connection the notes on *Figures 6, 7 and 8* should be observed.

If an energy management system is used consideration may be given to programming it to raise the whole secondary system to 70°C, typically at midnight on Sunday to destroy bacteria, particularly if the system is used at low temperatures.

## Maintenance

HR Calorifiers are designed for minimum maintenance, however it may be desirable to chemically de-scale the secondary vessel in areas where particularly hard water is supplied or where higher operating temperatures are required.

Only chemicals suitable for use with stainless steel type 304 should be used for de-scaling and specialist advice should be sought from manufacturers of de-scaling chemicals, e.g. FERNOX Ds3.

Once a year it is recommended that the unit be disconnected from the secondary system with the fittings installed by others for this purpose. The primary circuit should be emptied first!!

The secondary vessel should be cleaned by manually filling with a proprietary cleaning solution and pumping it out with a pipe introduced through the domestic water inlet connection right down to the bottom of the secondary tank.

The calorifier should be refilled with the secondary first and thoroughly flushed to remove all traces of cleaning solutions.

It is important that all safety valves and thermostats should be functionally checked at least every twelve months.

If expansion vessels are fitted to the system the charge should be checked and if secondary recirculation pumps are fitted their operation should be checked.

## Components List

	<u>HR 140</u>	<u>HR 230</u>	<u>HR 320</u>	<u>HR 600</u>
Thermometer	B441012	B441012	B441012	B441012
Thermostat, adjustable 30/90°C	B442045	B442045	B442045	B442045
Pocket, thermostat, stainless steel R½"	B438022	B438022	B438022	B438022
Air Vent	B445001	B445001	B445001	B445001
Control panel	B427577	B427639	B427594	B427595
Front panel	B427693	B427560	B427585	B427590
Rear panel	B427694	B427561	B427586	B427591
Right side panel	B427695	B427559	B427583	B427588
Left side panel	B427697	B427563	B427584	B427589
Top cover	B427581	B427562	B427587	B427592
Corner panel	-----	-----	-----	-----
Pipe set HR***/2	-----	-----	B320102	B600002
Pipe set HR***/3	-----	-----	B320003	B600003



## Our Promise

### Customers will find that:

- They get value for money
- They can communicate with us easily
- We are reliable and do what we say we will do
- Our products are reliable and do what we claim for them
- We deliver the right product on time, every time
- We aim to have zero defects in our products, services, systems, information and advice
- It is easy to be our customer

Quality for Beeston means that we aim to meet and exceed our customers' expectations of both product and service all the time, every time and in every way - at a competitive price.

Beeston Heating maintain a policy of continuous research and development, and reserve the right to alter specifications when necessary.

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