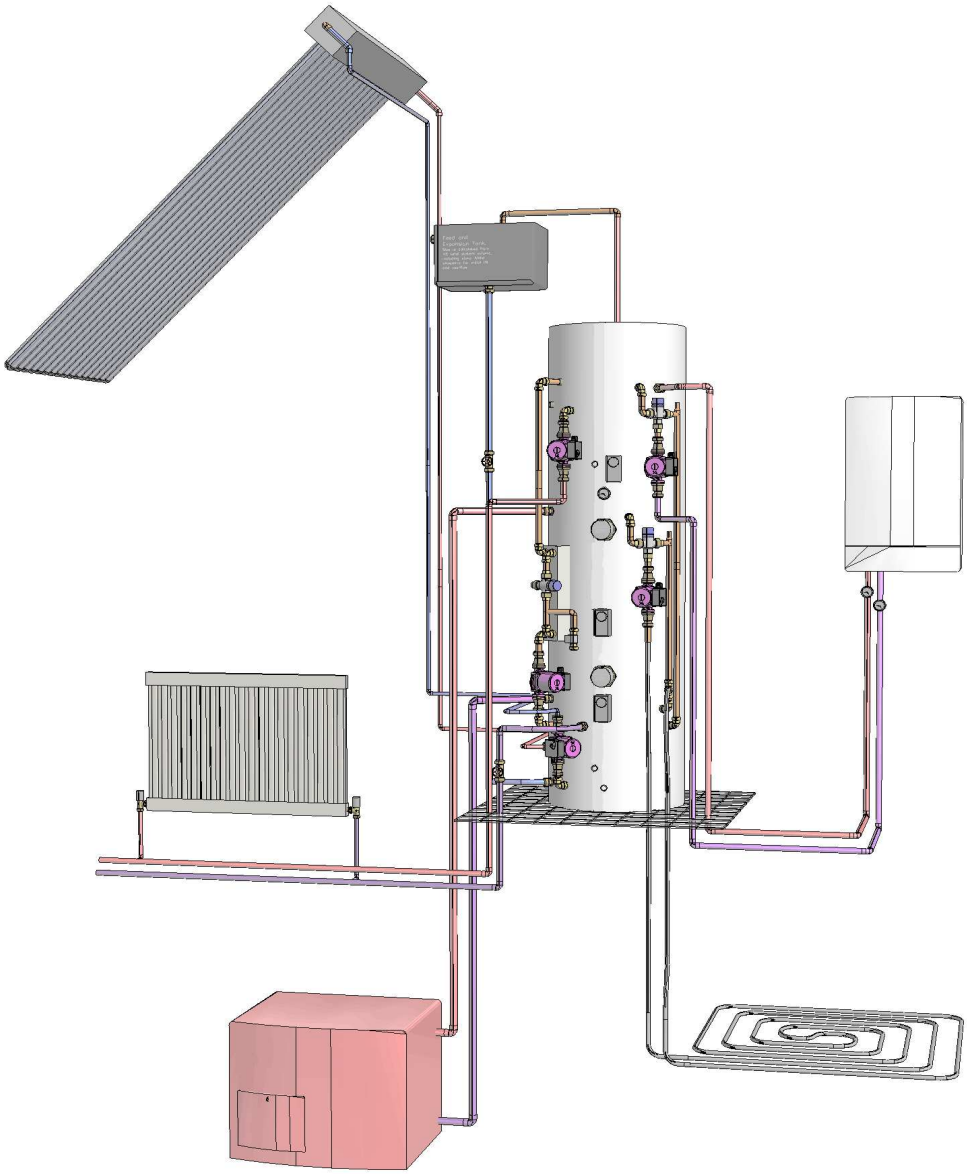
PANDORA HEAT BANKS
OXFORD BROOKES, HARCOURT HILL

Operation and Maintenance



THERMAL INTEGRATION LTD.
Tel: 0845 2411441 Internet: www.heatweb.com

Introduction

The District Pandora Heat Bank provides hot water for properties connected to central boiler plants.

The system is supplied factory assembled with all the controls needed for efficient operation, drawing heat energy from the central boiler plant, and using this energy to generate mains pressure domestic hot water.

The Pandora Heat Bank is a thermal store, storing heat within primary water. This means that the water in the store is not the water that comes out of taps, but rather it is the water that is pumped around radiators. Hot water for taps is generated as it is used via a heat exchanger fitted on the system.

The Pandora Heat Banks is filled up with water during installation, and the same water remains in the cylinder permanently (unless drained for servicing). The system is protected against loss of water through evaporation, and as such should not require regular topping up. It is however also protected from corrosion using standard central heating Corrosion Inhibitor, available from any plumbers merchants, and this does need refreshing every 2 to 4 years. This should be done by a competent person, when the cylinder is cold.

All controls are factory set and should not be tampered with. The only setting that is user adjustable is the temperature of water supplied to taps. This can be adjusted on the thermostatic mixing valve feeding the hot supplies. The setting can be locked to prevent tampering, and will typically be locked during installation to a temperature suitable for most users.

Product Specification

X2009-250-OB1: Pandora Heat Bank, 250 litres, 530mm diameter x 2m tall, Single DHW Heat Exchanger
X2009-250-OB2: Pandora Heat Bank, 250 litres, 530mm diameter x 2m tall, Twin DHW Heat Exchanger

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General Specifications:

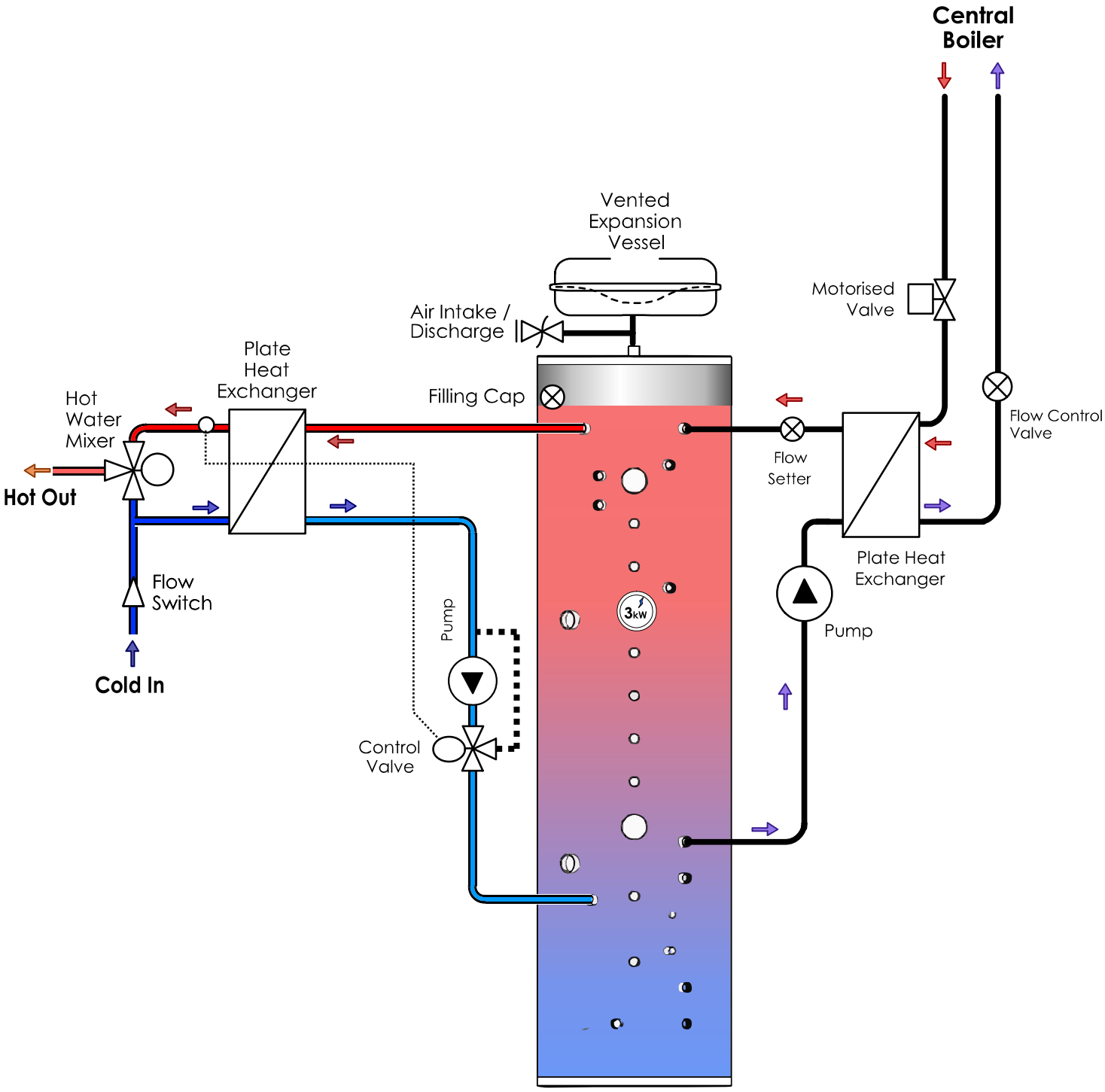
Material	Duplex Stainless Steel LDX 2101
Base Diameter	450mm
Overall Diameter	533mm
Storage Capacity	250 litres
Store Pressure	Unpressurised
GWP	4
Heat Input	Plate Heat Exchanger assembly, including 20 plate heat exchanger, charge pump with fitted isolating valves, visual flow regulating valve (2-8 litres/minute) for store-side circuit, Danfoss AB-QM DN15 (1.5 - 7.5 litres/minute) for primary side flow regulation, two port motorised valve, and twin cylinders thermostats (4°C differential, tamperproof) linked to provide buffered operation.
Heat Output (OB1)	Plate Heat Exchanger assembly, including 40 plate heat exchanger, store circuit pump with fitted isolating valves, thermostatic mixing valve, 1" (22mm) for high flow and high temperatures, and thermostatic flow limiting valve.
Heat Output (OB2)	Twin Plate Heat Exchanger assembly, including 2 x 40 plate heat exchangers, store circuit pump with fitted isolating valves, thermostatic mixing valve, 1" (22mm) for high flow and high temperatures, and high flow thermostatic flow limiting valve.
Maximum Mains Pressure:	10 bar
Secondary Return	Wilo SB30 Bronze Pump, immersion pipe thermostat, and control relay.
Electric Backup	3kW fitted immersion heater with control thermostat and overheat thermostat. Includes dry-fire protection.
Feed & Expansion	Integral 18 litre vented expansion vessel, air vent with evaporation protection, anti-vacuum valve, filling point, and filling hose. No discharge pipe required from store. No seperate feed and expansion tank required.
Chemical Protection	3 litres of corrosion inhibitor factory added. N.B. If units are drained down after initial filling, inhibitor will need replenishing.
Servicing Requirements	Refreshing of corrosion inhibitor every two years. Visual checks and operation checks as per client requirements (minimum every 5 years).

Default Factory Settings:

Store Thermostats	62.5°C
Return Thermostat	55°C
Charge Flow Setter	5 litres/minute
Charge AB-QM	67% (5 litres/minute)
Thermostatic Mixing Valve	60°C (+/-2°C)
Thermostatic Flow Limiting Valve	60°C

Schematic Drawing

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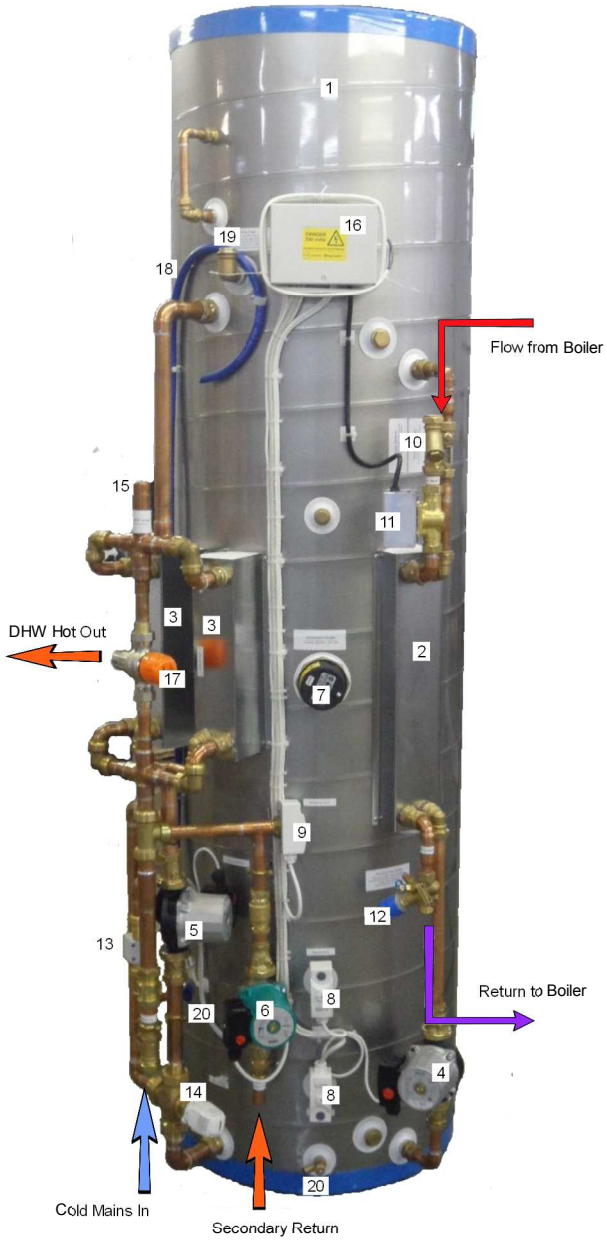


Connections

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1 250 litre Pandora Cylinder
2 Primary Plate Heat Exchanger
3 DHW Plate Heat Exchanger
4 Primary Heat Exchanger Pump
5 DHW Heat Exchanger Pump
6 Secondary Return Pump
7 3kW Immersion Heater
8 Cylinder Thermostats
9 Secondary Return Thermostat
10 Primary Strainer
11 Primary Motorised Valve
12 Primary Balancing Valve, AB-QM
13 Flow Switch
14 Thermostatic Regulating Valve
15 Sensor Housing
16 Wiring Centre
17 Thermostatic Mixing Valve
18 Filling Hose
19 Filling Point
20 Mains Filling Connection and Valve
21 Drain Cock



Maintenance Requirements

Procedure for Topping up Water Level and Refreshing Corrosion Inhibitor

1. Ensure that the system is cooled down before filling. This can be done by isolating the hot feed from the central boiler pipework, and then running hot water outlets until the water temperature starts to go cold.

2. Using a suitable spanner, carefully loosen the filling cap, checking that no water is discharged. If water does start to discharge from the filling cap as it is loosened then replace the cap as the system is full of water and will not need topping up. If adding corrosion inhibitor then it will ne necessary to drain a few litres of water from the system using the drain cock provided at the bottom of the Pandora.

3. Once the filling cap is loosened and no water is discharged, fully remove the filing cap.

4. Visually inspect within the filling elbow for water. If the system is filled up properly there will be approximately 1cm of water visible within the elbow.

5. Pour corrosion inhibitor into the filling elbow carefully to add to system. Typically one litre of inhibitor should be used for every 100 litres of stored water. Two litres will typically be required, as most District Pandora Heat Banks store approximately 150 litres of water, with some additional water in radiators.

6. Slowly top up the water level using a jug or the hose provided, until water can be clearly seen in the filling elbow.

7. Replace and fully tighten the filling cap.

8. ⚠ IMPORTANT: If the supplied hose was used to top up the system, ensure that the hose is diconnected from the mains water supply and the mains connection is capped off.

9. If the primary supply was isolated prior to filling, turn back on to commence normal operation.

10. If corrosion inhibitor is added to system, ensure that this is recorded by filling out and dating the adhesive label that is supplied with the inhibitor, and sticking to the casing of the Panora where it will be clearly visible.

Periodiodic Maintenance Requirements:

Every 2-3 years:

Check water level within store, and refresh corrosion inhibitor.
Check strainers on incoming mains supply, and incoming boiler supply.

Every 5 years:

Remove and service thermostatic mixing valve, checking for limescale and, applying silicone grease to o-rings.

Every 10 years:

Replace circulating pumps.
Descale DHW plate heat exchanger.
Service heat meters (must be performed by authorised personnel only)

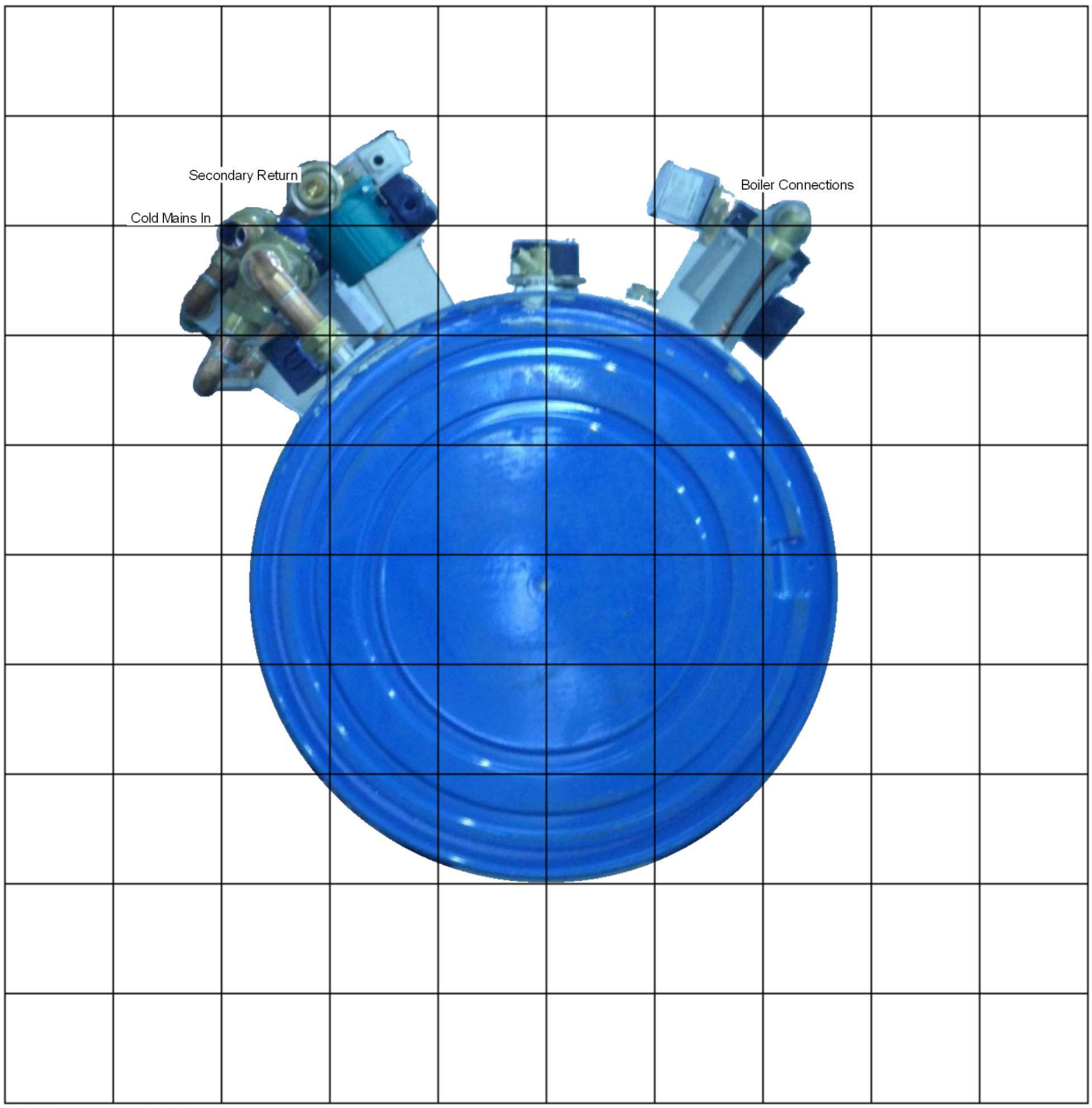
Dimensions

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Oxford Brookes, Harcourt Hill, Bottom View
Oct.2011, ID: 3138

Overall Dimensions: 620mm wide, 690mm deep



100mm x 100mm

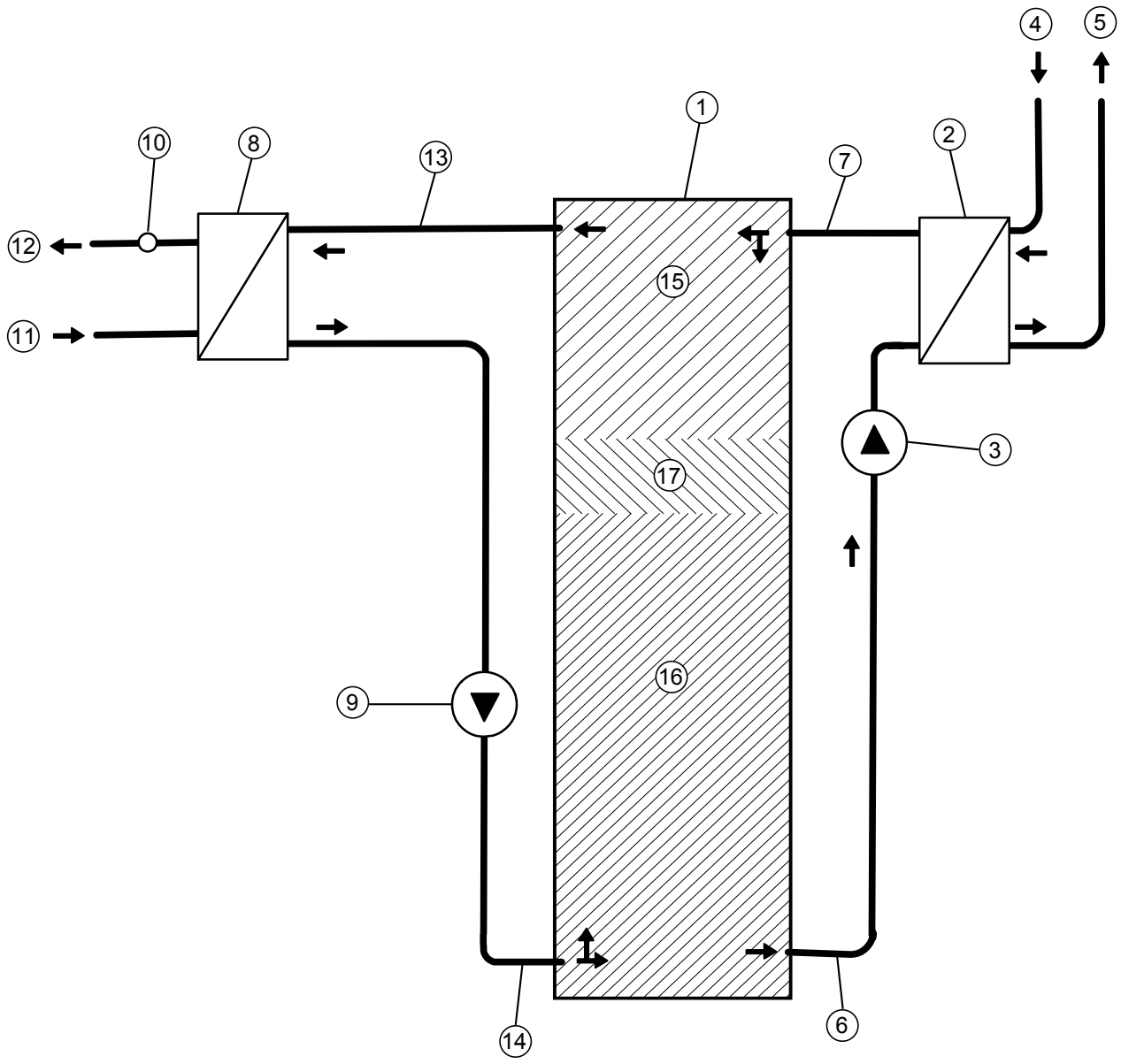
Operation (patent applied)

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Unique Principle: The use of two heat exchangers (2,8) in combination with a thermal store (1), to store heat energy provided by a boiler (4), for the provision of domestic hot water (12) at varying loads, while ensuring that return temperatures to the boiler system (5) remain low throughout operation. In turn this maximises the efficiency of central boiler and CHP operation.

Operation: Heat is delivered from a boiler system via pipe (4) into heat exchanger (2), where the heat is transferred into stored water before returning to the boiler via pipe (5). The cold stored water (16) is delivered to the heat exchanger (2) by pump (3) via pipe (6) and returns fully heated to target temperature into the top of the store (15) via pipe (7). The flow rate of stored water through the heat exchanger (2) is set to ensure target temperature is achieved in one pass. As the stored water is heated the seperation layer between the hot and cold stored water (17) moves down the store until a sufficient volume of stored water is heated. When a hot water tap fed from pipe (12) is opened, the flow of water to taps is detected by flow sensor (10), which in turn turns on the pump (9) to deliver hot stored water (15) via pipe (13) into the heat exchanger (8). The heat is exchanged into the incoming cold water (11) through the heat exchanger to provide the heated domestic water (12). The flow rate of stored water through the heat exchanger (8) is modulated (either by the use of a control valve or through pump speed controls) to ensure that the temperature of water delivered to taps (12) is at target temperature, and that stored water returning to the base of the thermal store (1) via pipe (14) is cooled enough to ensure the colder stored water (16) remains low enough in temperature to ensure return temperatures to the boiler (5) are likewise kept low.



Primary Heat Exchanger

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HEAT EXCHANGER CALCULATION

Performance Calculation - GBS240H- 14

Design Duty :

			Side 1	Side 2
Fluid Name		:	Water	Water
Inlet Temperature	°C	:	78	40
Outlet Temperature	°C	:	47	70
Mass Flow Rate	LPM	:	5	5.18
Pressure	bar	:	-	-
Max. Acceptable Pressure Drop	kPa	:		

Physical Properties of Fluid :

Reference Temperature	°C	:	62.5	55
Viscosity	mPas	:	0.448	0.503
Viscosity Wall	mPas	:	0.471	0.474
Density	kg/m³	:	981	984.5
Specific Heat Capacity	kJ/kg,°C	:	4.175	4.173
Thermal Conductivity	W/m,°C	:	0.655	0.648

Designed Plate Heat Exchanger :

Heat Load	kW	:	10.6	
Total Heat Transfer Area	m²	:	0.53	
Log Mean Temperature Difference	°C	:	7.49	
Overall H.T.C.	W/m²,°C	:	2768/2684	
Calculated Pressure Drop	kPa	:	2.2	1.8
Number of Channels		:	1*6	1*7
Connection Diameter	mm	:	27	27
Number of Heat Transfer Units	NTU	:	4.139	4.006
Total Number of Plates		:	14	
Oversurfacing	%	:	3	
Fouling Factor	m²,°C/kW	:	0.0113	

Extra Parameters :

Reynolds Number		:	685	541
Film Coefficient	W/m²,°C	:	6444	5761
Average Wall Temperature	°C	:	59.14	58.76
Connection Pressure Drop	kPa	:	0.0147	0.0157
Port Velocity	m/s	:	0.165	0.17
Channel Velocity	m/s	:	0.078	0.069

Wiring

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Electrical Supplies:

1. The Heat Bank (when fitted with any controls) requires a 3 Amp, 230v AC power supply, via a fused switched spur.
2. Power supplies to boilers and other equipment that has wiring connections, should be taken from the wiring centre on the Heat Bank.
3. The unit can be optionally supplied with 3kW, 6kW, or 9kW electric elements . Power supplies should be as follows:

    (a) For 3kW elements, a 16 Amp , 230v AC power supply, via a double-pole wall switch. 2.5mm^2 heat resistant cable to be used. Standard immersion heater controllers may be used as required.
    (b) For 6kW elements, a 30 Amp , 230v AC power supply, via a double-pole wall switch and double-pole contactor linked to thermostats, low water switch, and timer (if required). 4mm^2 heat resistant cable to be used.
    (c) For 9kW elements, a 45 Amp , 230v AC power supply, via a double-pole wall switch and double-pole contactor linked to thermostats, low water switch, and timer. 6mm^2 heat resistant cable to be used.

4. RCD/RCBO protection should be provided on all immersion heater supplies.
5. All supplies must be earthed, as well as all connections to immersion heaters.
6. Do not turn on power supplies to the controls or immersion heaters until the system has been filled with water.
7. When connecting to immersion heaters, press the reset button on the fitted overheat thermostat, and check that control thermostats are set to 63°C (unless the design of the system calls for different temperature settings).

Wiring Diagram:

Ensure Earth continuity throughout.

