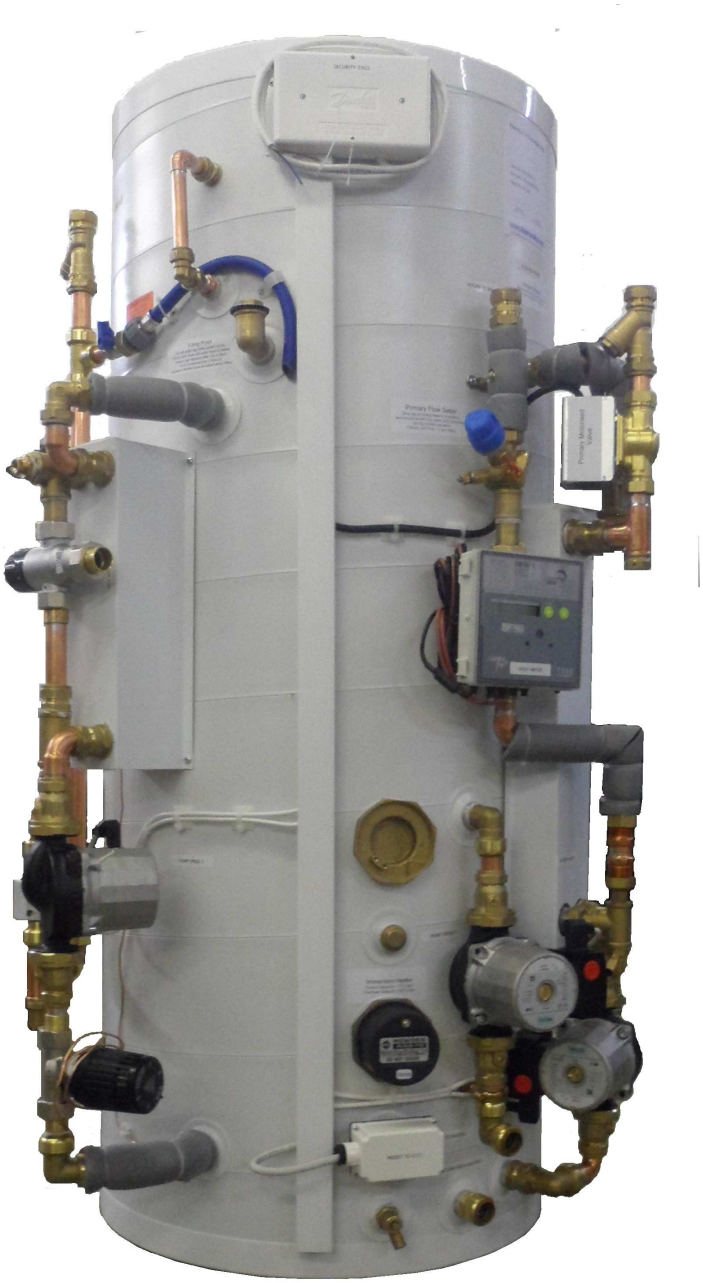
PANDORA HEAT BANKS

Queensland Road, Design 3137

Installation Instructions



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

General Requirements

IMPORTANT General Requirements:

1. **IN ORDER FOR GUARANTEES ON THIS SYSTEM TO START:**
   - **(a) THE INSTALLER MUST FILL IN THE FORM AT THE BACK OF THESE INSTRUCTIONS.**
   - **(b) THE OWNER OR OCCUPANT MUST FILL IN THE FORM AT THE BACK OF THESE INSTRUCTIONS AND RETURN TO:**

Thermal Integration Ltd., 1-3 Wealdstone Road Sutton, Surrey, SM3 9QN

2. PLEASE READ THESE INSTRUCTIONS IN FULL BEFORE PROCEEDING WITH INSTALLATION.
3. THE PANDORA SHOULD BE INSTALLED AND MAINTAINED BY A COMPETENT INSTALLER IN ACCORDANCE WITH G3 BUILDING REGULATION (ENGLAND AND WALES), P3 TECHNICAL STANDARD (SCOTLAND) OR P5 BUILDING REGULATION (NORTHERN IRELAND), AS WELL AS THE WATER FITTING REGULATIONS (ENGLAND AND WALES) OR WATER BYELAWS (SCOTLAND), AND I.E.E. WIRING REGULATIONS.
4. FOLLOWING INSTALLATION AND COMMISSIONING, THE OPERATION OF THE SYSTEM SHOULD BE EXPLAINED TO THE AND THESE INSTRUCTIONS LEFT WITH THEM FOR FUTURE REFERENCE.
5. Read these instructions in conjunction with those of the primary heating appliances (boilers, wood burners etc.) before attempting installation.
6. The Installer should tick sections in these instructions that have been applied to the final installation.
7. Do not attempt to lift the unit using the pre-fabricated pipework.
8. All pre-made connections should be checked & tightened prior to installation.
9. Connections in 22mm to the Heat Bank are provided by a combination of metric compression bosses, supplied with nuts and olives, push-fit connections, and BSP threaded connections.
10. The stored water in the Heat Bank must be protected with a suitable chemical scale & corrosion inhibitor. It is important that this is refreshed at suitable intervals to protect the store and all components.
11. The cylinder must be installed to allow access to all fitted components for maintenance purposes. This should include the removal and replacement of Immersion Heaters.
12. The domestic hot water operates at mains pressure, therefore all pipework and fittings must be suitable for the maximum pressure and temperature duty.

Making Push-Fit Connections:

1. Any soldered joints in adjoining pipework should be made prior to connection to adjoining push-tit connections.
2. Cut tube square using a rotary pipe cutter - do not use a hacksaw to cut the tube.
3. Check that the end of the tube is free from burrs and sharp edges or damage will occur to the O-Ring seals.
4. Allow 27mm of pipe for insertion into the fitting plus 10mm of pipe to allow use of a disconnecting tool.
5. Insert the tube through the release collar of the fitting to rest against the grab ring.
6. Push the tube in firmly until it reaches the tube stop.

Product Specification

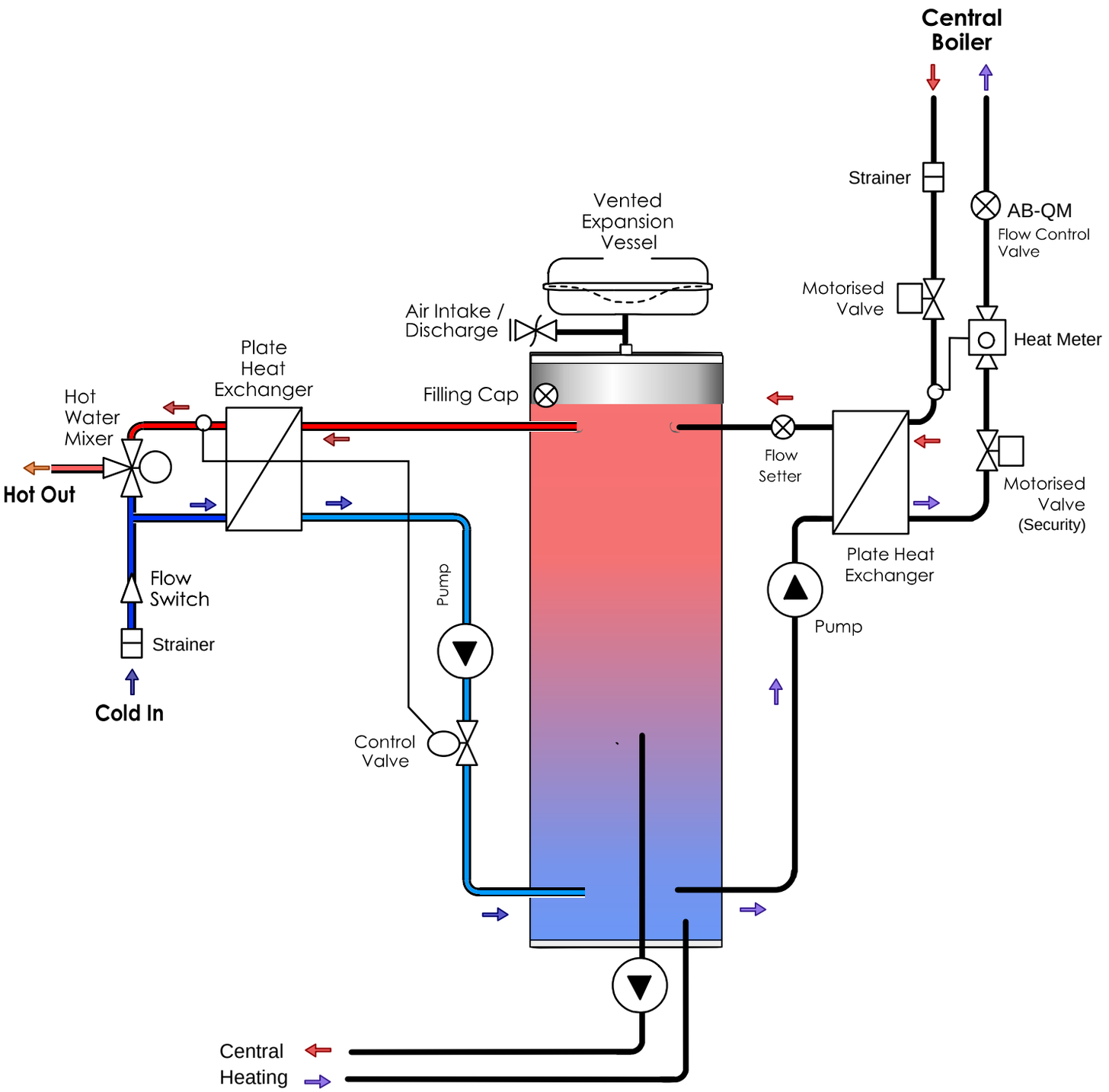
General Specifications:

Material	Duplex Stainless Steel LDX 2101
Base Diameter	450mm
Overall Diameter	533mm
Storage Capacity	150 litres
Store Pressure	Unpressurised
Insulation GWP	4
Heat Input	Plate Heat Exchanger assembly, including 14 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 cylinder thermostat (tamperproof). Heat Meter and Security Isolating Valve factory fitted.
DHw Output	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.
Maximum Mains Pressure:	6 bar
Central Heating	Standard 5m central heating pump, with 22mm flow and retuen connections.
Electric Backup	3kW fitted immersion heater with control thermostat and overheat thermostat. Includes dry-fire protection. Spare 1.3/4" Boss for 2nd Immersion Heater
Feed & Expansion	Integral 12 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	2 litres of corrosion inhibitor to be added.
Servicing Requirements	Refreshing of corrosion inhibitor every two years. Visual checks and operation checks as per client requirements (minimum every 5 years).

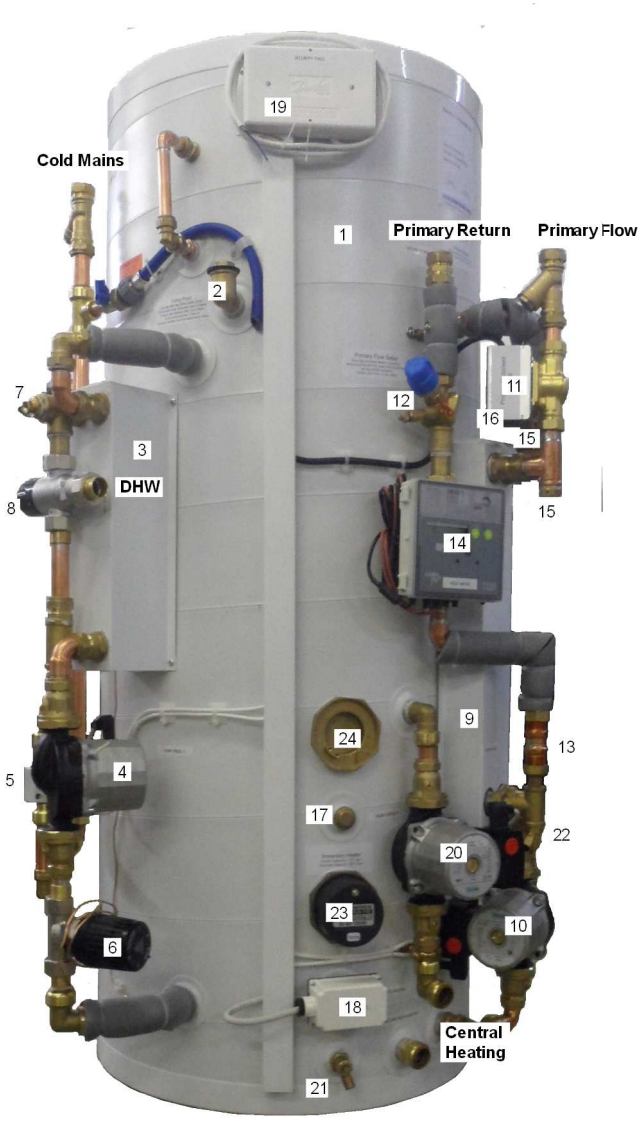
Default Factory Settings:

Store Thermostats	62.5°C
Charge Flow Setter	5 litres/minute *to be reset on installation as per dwelling requirements.
Charge AB-QM	67% (5 litres/minute) *to be reset on installation as per dwelling requirements.
Thermostatic Mixing Valve	60°C (+/-2°C)
Thermostatic Flow Limiting Valve	60°C

Schematic Drawing



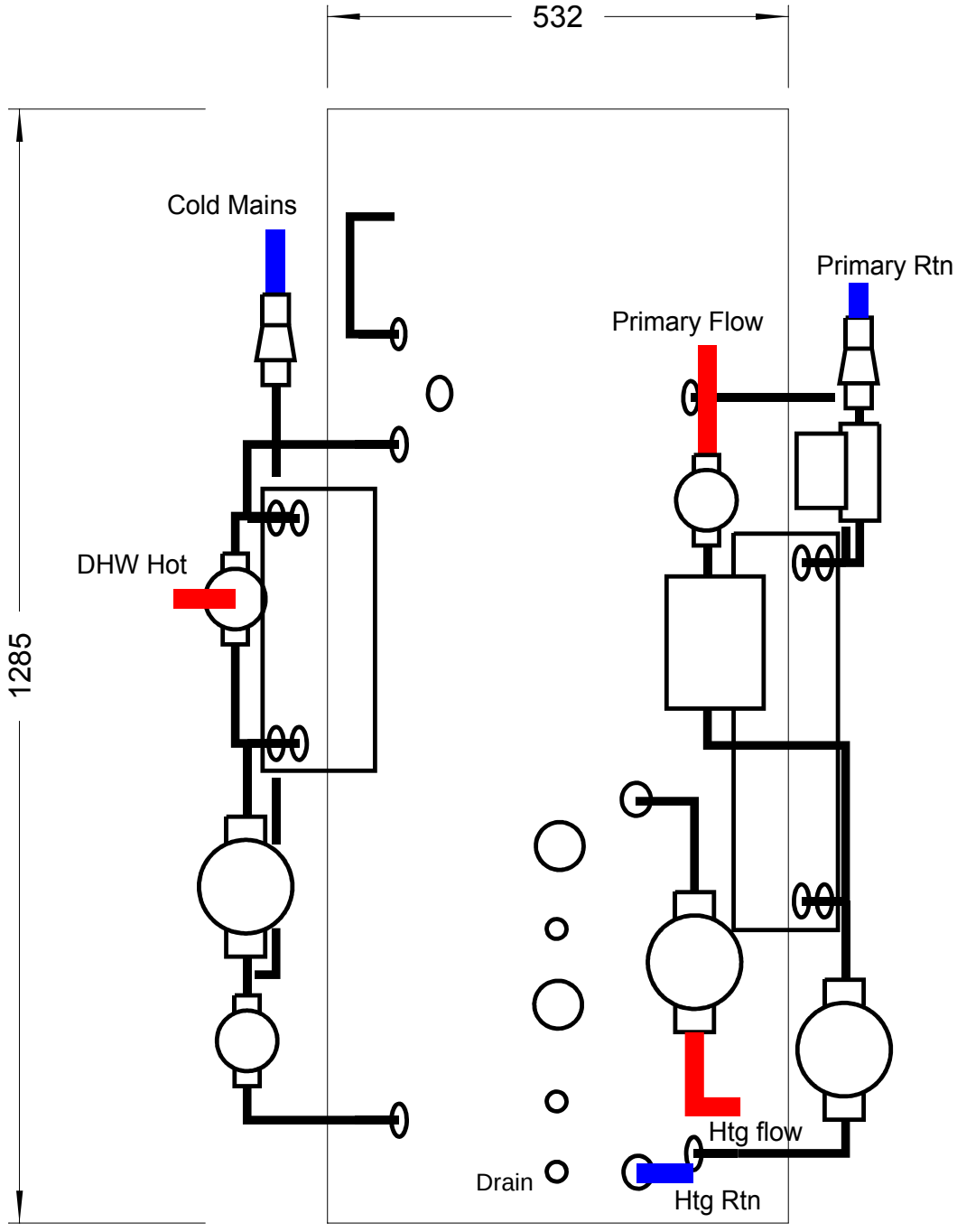
Components



Key:
1. Pandora Heat Bank Cylinder
2. Filling Point
3. Plate Heat Exchanger, DHW
4. Heat Exchanger Pump
5. Flow Switch
6. Thermostatic Flow Regulator
7. DHW Sensor Point
8. Thermostatic Mixing Valve, 22mm
9. Plate Heat Exchanger, Primary
10. Heat Exchanger Pump
11. Motorised Valve
12. AB-QM Flow Regulating Valve
13. Thermoelectric Isolating Actuator (Security)
14. Heat Meter
15. Sensor Point
16. Visual Flow Regulator (behind 11)
17. Spare Boss
18. Control Thermostat 55C
19. Wiring Centre
20. Central Heating Pump
21. Store Drain Point
22. Primary Drain Point
23. Immersion Heater 3kW
24. Spare Boss for 2nd Immersion Heater



Connections



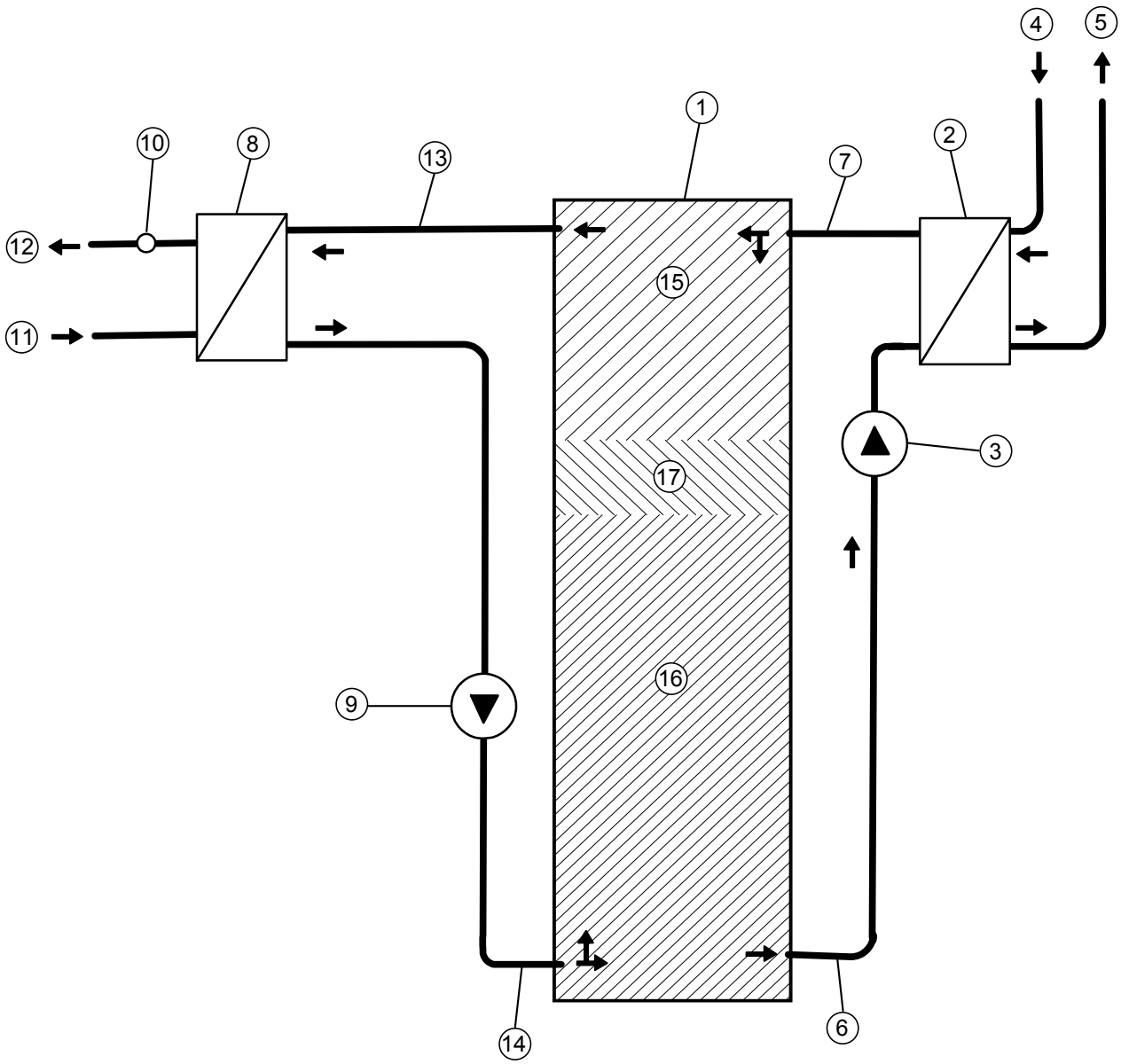
Installation Summary

1. Position Pandora Heat Bank in final position. Ensure positioning allows all pipework to be suitable run within the provided cupboard space, and that there is access for servicing to all ciomponents.
2. Connect Domestic Cold Water inlet. Local Isolating Valve required
3. Connect Domestic Hot Water output.
4. Connect Central Heating Flow. All heating pipework must remain within 1m of floow level.
5. Connect Central Heating Return.
6. Connect Flow from Central Boiler (keep isolated)
7. Connect Return to Central Boiler (keep isolated)
8. Turn on Cold Water Supply and check for any leaks in the hot/cold distribution pipework.
9. Remove the Filling Cap and using the hose provided fill the cylinder with water up to the level indicated. While filling, check all central heating pipework for leaks. Bleed radiators and any other air vents on heating pipework.
10. When filled, refit the Filling Cap and also cap-off the filling hose.
11. Connect Wiring Centre to 3A Fused/Isolating Electrical Supply (using lead provided).
12. Connect Immersion Heater to 16A Fused/Isolating Electrical Supply.
13. Wire in Programmable Room Thermostat to Wiring Centre.
14. Wire up Heat Metering Equipment (this is needed to provide power to Security Valve and allow a feed from Central Boiler).
15. Apply earth bonding as required to all pipework.
16. Turn on Power to Wiring Centre.
17. The Motorised Valve for the Central Boiler should open, and the Primary Heat Exchanger Pump will start.
18. Open up isolating valves on feed from Central Boiler. If the Security Valve for the heat metering is open, then flow from Central Boiler will commence and pipework should become hot.
19. Adjust the Primary Charge Flow Setter and Primary AB-QM valve to appropriate flow rates. A schedule of these flow rates should be available for all dwellings.
20. After a few minutes hot water should be available to hot taps.
21. Once the store has fully heated, the Cylinder Thermostat should turn off the Motorised Valve for the Central Boiler as well as the Primary Heat Exchanger Pump.
22. Turn on the Central Heating using the Programmable Room Thermostat. The Central Heating POump should start and radiators should start to heat up.
23. Drain off around 10 litres using the Drain Cock.
24. Open up the filling cap and add any chemicals required for a hot system flush. Refit cap when added.
25. Run central heating for required time for a hot flush of heating circuits.
26. Turn off power to the system and drain down system fully.
27. Repeat filling procedure (9).
28. Perform cold flush of system, with Central Boiler feed isolated (power can be turned to run central heating).
29. Turn off power to the system and drain down system fully.
30. Add 2 litres of Corrosion Inhibitor to system (such as Sentinel X100).
31. Repeat Filling Procedures (9).
32. Turn on power, and open Central Boiler isolating valves.
33. Test operation of imersion heater.
34. System is now functional.

Operation (patent applied)

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

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

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:

