Central Bank Mini® (P58) Installation and User Instructions

Keep these instructions in a safe place for future reference

NOTICE

Please read & comply with all these instructions before commencing installation. Failure to store, install and operate this Thermal Battery in accordance with these instructions will invalidate the Manufacturer's warranty. Please leave this manual with the customer for future reference.

SAFETY NOTICE

WARNING

Read and comply with this manual before you install the product.

Symbols and Notices Used and their Meanings

In these instructions the following symbols are being used to draw the user and/or installer's attention to information of particular importance.

WARNING

Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

CAUTION

Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury or material damage.

NOTICE

Signals information that is considered important but not hazard related.

Abbreviations

The following abbreviations are used in this manual:

- DHW – Domestic Hot Water
- dT – delta T (change in temperature)
- HPC – High Power Circuit
- HW – Hot Water
- LPC – Low Power Circuit
- PCM – Phase Change Material
- PLC – Programmable Logic Controller
- RTD – Resistance Temperature Detector
- WWHR – Waste Water Heat Recovery

WARNING

DO NOT install outdoors. The product must be installed in a frost-free environment.
The internal temperature of every part of the product and surrounding system must not be allowed to go below 5°C.

WARNING

Improper storage, installation, adjustment, alteration, service or maintenance can cause property damage, injury and death. This product is designed for commercial and industrial applications and to be installed by suitably qualified contractors working within the commercial and industrial market sectors who are authorised to carry out plumbing and electrical work to a commercial or industrial standard.
Only use this product for the intended purpose described in this manual, failure to do so will invalidate the manufacturer's warranty.

NOTICE

There are no user serviceable, adjustable or settable parts in this product.

DOCUMENT PURPOSE

To instruct suitably qualified persons on how to safely install the ***Central Bank Mini® Thermal Batteries***. Suitably qualified persons are those who are qualified to carry out plumbing and electrical work within the commercial and industrial market sectors. For information on product training for ***Central Bank Mini® (P58) Thermal Battery***, please contact Sunamp Customer Service.

CONTENTS

1 Safety Instructions

NOTICE

You MUST read the whole manual prior to installing the product. Sunamp is not responsible for the failure of components not specified in this manual and/or supplied by other manufacturers.

1.1 INTENDED USE

The intended use of the Central Bank Mini® range of products is to store thermal energy for a wide range of applications by means of external charging of the Thermal Battery. Some typical use cases for the Central Bank Mini (P58) installed as standalone products or configured in series or parallel combinations are listed below:

- Indirect HW generation (external plate heat exchanger required for potable water applications)
- HW production for heating applications
- WWHR or Flue gas heat recovery capture from industrial processes
- Pre-heating for heat generators (e.g. heat pumps)

Each individual Central Bank Mini product can be configured as a dual circuit model (with dedicated charge and discharge circuits) or as a single circuit model (see hydraulic diagrams throughout the manual). For more information on Central Bank Mini (P58) applications, refer to the supplementary Central Bank Mini (P58) applications guide (document D0122).

Pre-installation Safety Advice

- Sunamp is not responsible for the selection, specification or effectiveness of equipment, unless stated in writing. Responsibility lies with customers and any experts or consultants involved in design and/or installation.
- Where applicable, this manual should be read in conjunction with manufacturer documentation for any components specified in the installation requirements of this manual.
- Where necessary, refer to the Sunamp website (www.sunamp.com) for contact and support information.
- Product to be used in static applications only, the product should not be transported when the phase change material (PCM) is in a liquid state.

1.2 MECHANICAL & HYDRONIC SAFETY

WARNING

DO NOT install Central Bank Mini products outdoors. This product is designed for use within a weather protected and frost-free environment. The product will incur damage if exposed to weather conditions including but not limited to rain, snow and extremes of temperature.

- **DO NOT** tilt the product more than 45 degrees during the transportation, storage or installation process.
- Install the product on a hard, solid and level surface that can support its weight, see Table 4 for product weight.
- All soldering, welding or brazing etc, must be performed on tubes detached from the Thermal Battery (minimum 1 metre away).
- **DO NOT** immerse this product in water or any other liquid.
- **DO NOT** stack the Thermal Batteries directly on top of each other, if using multiple Thermal Batteries.
- **DO NOT** use the following heat transfer mediums inside the Thermal Battery
    - Steam
    - Brine
    - Molten Salts
    - Direct Refrigerant

CAUTION

Central Bank Mini Thermal Batteries are not factory fitted with high temperature safety cut-off devices. Therefore, if the Thermal Battery is connected to a heat source which can deliver hot water greater than the maximum permittable values (see Table 4), you must ensure that a suitable energy cut-off device is fitted in the charging circuit to prevent charging above the safe working limit to prevent damage to the Thermal Battery.

NOTICE

When the Thermal Battery is used for potable hot water applications, the product must be connected to mains utility water supply via a suitable external plate heat exchanger for DHW applications.

1.3 USER COMPETENCE, QUALIFICATION, AND APPROVAL

WARNING

Only persons who are suitably qualified to carry out plumbing and electrical work may undertake installations, repairs, or relocations. For installations in commercial applications, the installer must have appropriate experience of working with commercial plant rooms (spaces used to run equipment for building services like electrics, water and heating systems).

WARNING

DO NOT allow children or any other unqualified or unapproved persons to install, repair, clean, relocate, interfere or tamper with the product.

WARNING

This product is not designed for use by children, or persons with reduced physical, sensory or mental capabilities, and should not be used by such persons unless they can do so safely. Where necessary, such persons (or anyone with lack of experience or knowledge) should first be given supervision or instruction concerning use of the product by a person responsible for their safety.

1.4 COMPLIANCE WITH LOCAL CODES OF PRACTICE AND REGULATIONS

CAUTION

Installations, repairs and relocations must comply with all relevant local codes and regulations, particularly concerning electrics, water supply, building regulations and Manual Handling Operations, as issued by the relevant authorities.
Local codes always override manufacturer documentation where there is a conflict.

1.5 POST-INSTALLATION SAFETY

- As Sunamp continuously improves products, they may be modified without notice. Updated documentation will be produced, supplied with new product ranges and made available on request.
- Once installed:
    - Perform a test run to ensure normal operation.
    - Explain all safety precautions to the end user.
    - Provide a copy of this manual to the end user.
- It is the responsibility of the end user to supply this manual to any other subsequent users. We recommend the manual is kept with the product at all times.
- Users should be advised to check the manufacturer's website for the most up to date information

1.6 REPAIR AND RELOCATION

WARNING

DO NOT attempt to carry out repairs or maintenance before the system components – including the Central Bank Mini – have cooled down to ambient room temperature. To speed up the process, isolate the external heat source and activate the heat load to cool the system down.

- **DO NOT** attempt to move an assembled system without using appropriate lifting equipment.
- There are no user serviceable, adjustable or settable parts in this product.
- No access to the Phase Change Material (PCM) container (Cell) is required in the field under any circumstances. Breaching the PCM containment will void the warranty of the product.
- Any relocation of the product should follow the storage and installation instructions set out in this manual.

SAVE THESE INSTRUCTIONS AND
PROVIDE A COPY TO THE END USER.

2 Thermal Battery Overview

2.1 INTRODUCTION

Thank you for choosing a Sunamp Central Bank Mini® Thermal Battery, our innovative, super-compact thermal storage system based on Plentigrade® phase-change materials (PCM). We are sure you will be delighted with the performance, ease of installation and quality of our product.

Sunamp has a decade-long history of research and innovation in PCM technology which has made it the world-leading manufacturer in Thermal Battery technology – developed and designed in the UK.

Sunamp has a wide portfolio of Thermal Batteries for different applications. Please visit our website (www.sunamp.com) or look at our catalogue for more information about our portfolio for:

- Water heating
- Space-heating
- Combined space- and water-heating
- Cooling
- Freezing
- Steam

The Sunamp Central Bank Mini® Thermal Batteries are designed to store thermal energy for a wide range of applications, and are charged by an external heat source via the hydronic circuit only.

2.2 PRODUCT OVERVIEW & GENERAL CONSTRUCTION

The Central Bank Mini® range of thermal batteries are designed to be charged by an external heat source only and are used for storing thermal energy for a wide range of applications.

The construction of the thermal battery is shown in Figure 1 & Figure 2. The thermal energy is stored by changing the state of Sunamp's Plentigrade® PCM from solid to liquid by flowing working fluid through the circuit/s of the integrated heat exchanger. The thermal energy is then released by changing the state of PCM from liquid to solid and by transferring heat from the PCM to the system water flowing through the other circuit/s of the integrated heat exchanger.

The PCM and the heat exchanger are housed in a sealed container / enclosure called 'the Cell'. The Cell is insulated and is finally encased in a painted steel palletised stillage.

2.3 STORAGE & HANDLING

WARNING

Take into account the weight of the Thermal Battery (Table 4) and local Health and Safety Regulations and practices when considering a safe lifting method for moving and installation of the Thermal Battery.

CAUTION

Verify all floors, spaces, storage and installation areas during transportation, storing and installation of the Thermal Battery are suitable for the product weight and size.
The Thermal Battery MUST not be stepped or sat on at any time during storage, handling, installation and use.

CAUTION

The Thermal Battery must be stored in a dry, weather-protected and frost-free environment. The Thermal Battery will incur damage if exposed to weather conditions including but not limited to rain, snow and extremes of temperature.

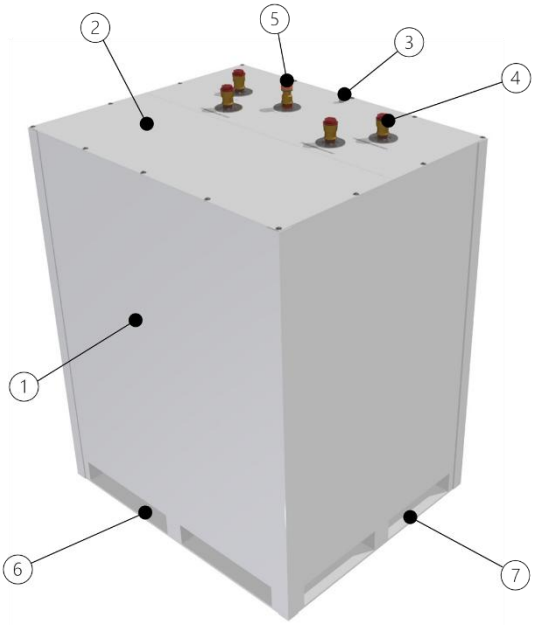

Figure 1: Central Bank Mini External

Item	Description
1	Palletised Stillage including serial data badge, warning labelling, and product name
2	Lid – Including circuit ports & warning labels
3	Cable Gland for internal temperature sensors/instrumentation (if fitted – not standard)
4	Circuit connections / ports x 4 – 1 ¼ BSP Parallel Female brass fittings
5	Breather port

Item	Description
6	Pallet truck entry – Front / Back
7	Pallet truck entry - Sides

Table 1: Reference Figure 1 Thermal Battery External

2.4 HYDRONIC CIRCUITS & CONNECTIONS

The Central Bank Mini range of thermal batteries has two independent hydronic circuits:

- Circuit 1 – High Power Circuit (HPC). Ports are labelled 1 and 3.
- Circuit 2 – Low Power Circuit (LPC). Ports are labelled 2 and 4.

The heat is transferred between the PCM and the two circuits by means of an integrated heat exchanger inside the Cell. The direction of flow through the circuits / ports is key to the operation. See Figure 2 & Table 2. The connections to the product should be flexible to prevent leaks via vibrating equipment.

CAUTION

When connecting either circuit to the heat source, the circuit MUST be protected adequately against corrosion, clogging and fouling from poor system water quality. Note this may include the use of inhibitors or non-inhibitor water treatment solutions, and the installation of suitable filters as required by the external heat source.

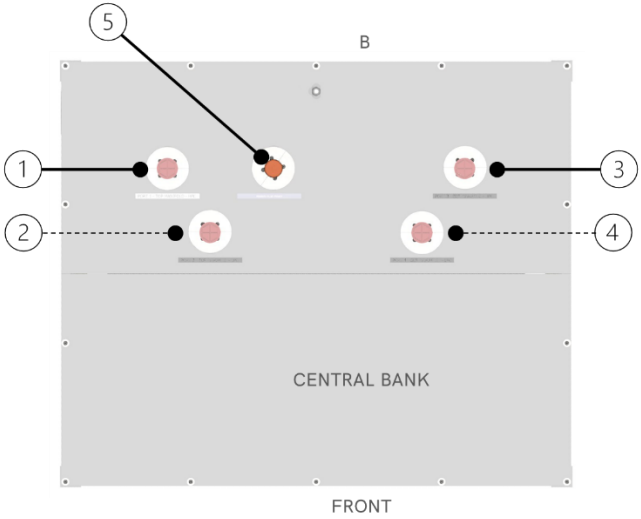

Figure 2: Central Bank Mini from above showing ports.

Item	Description
1	Port 1 - Circuit 1 – High Power Circuit – TOP
2	Port 2 - Circuit 2 – Low Power Circuit – TOP
3	Port 3 - Circuit 1 – High Power Circuit – BOTTOM
4	Port 4 - Circuit 2 – Low Power Circuit – BOTTOM
5	Breather Port (No connection required) – Unless fitting discharge pipe work to cope with fluid discharging from Central Bank Mini during fault condition
NOTE	Ports 1 to 4 Connections are 1 ¼" Female BSP Parallel brass fittings.

Table 2: Reference Figure 2 Thermal Battery entry / exits

2.5 PRESSURE (HEAD) LOSS CHARACTERISTICS

NOTICE

The two circuits within the Central Bank Mini heat exchanger are not split evenly, and thus there are two respective curves for pressure loss for circuit 1 and circuit 2. See Figure 3 and 4 below:

- Circuit 1 – High Power Circuit (HPC). Ports are labelled 1 and 3.
- Circuit 2 – Low Power Circuit (LPC). Ports are labelled 2 and 4.

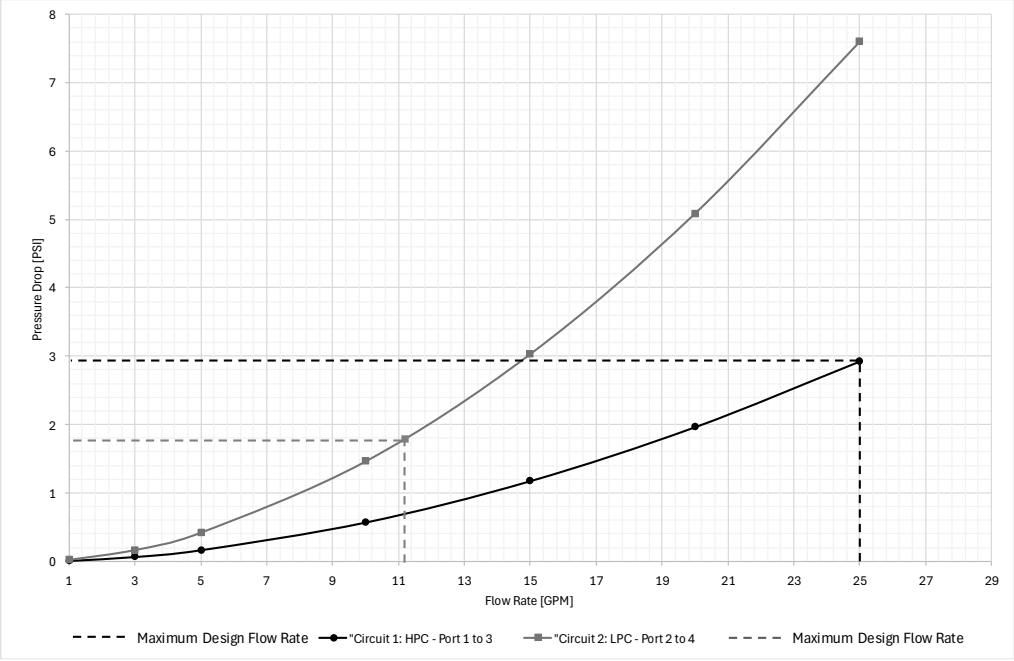

Figure 3: Pressure Loss Characteristics Imperial Units

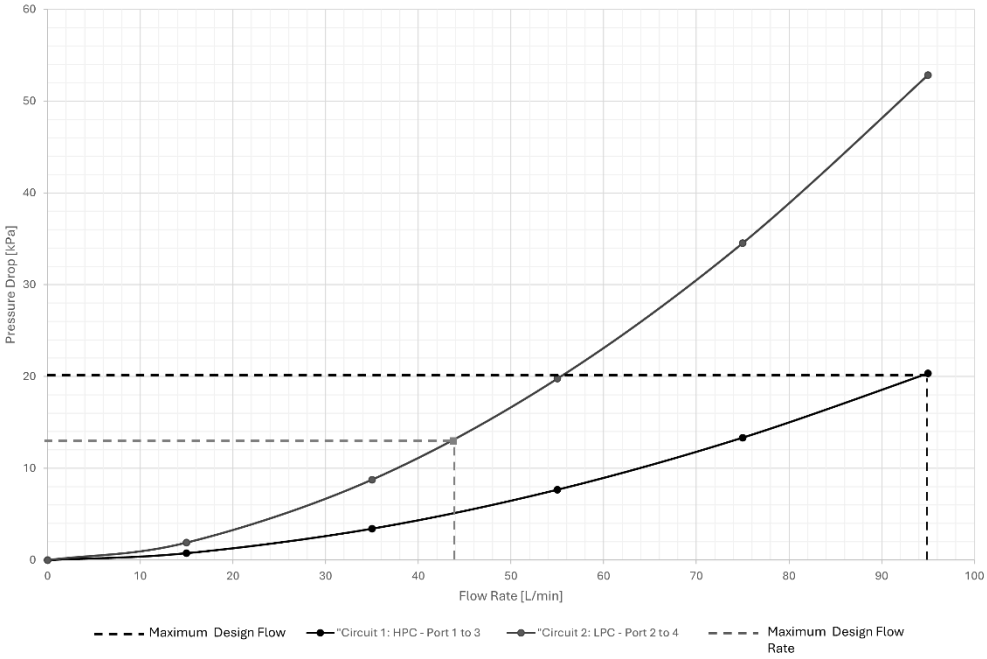

Figure 4: Pressure Loss Characteristic Metric Units

2.6 TECHNICAL SPECIFICATION, DIMENSIONS & WEIGHT

2.6.1 Nominal Product Dimensions

The following items, Figure 5 and Table *3*, show the product dimensions. The product footprint and port positions are common across the range.

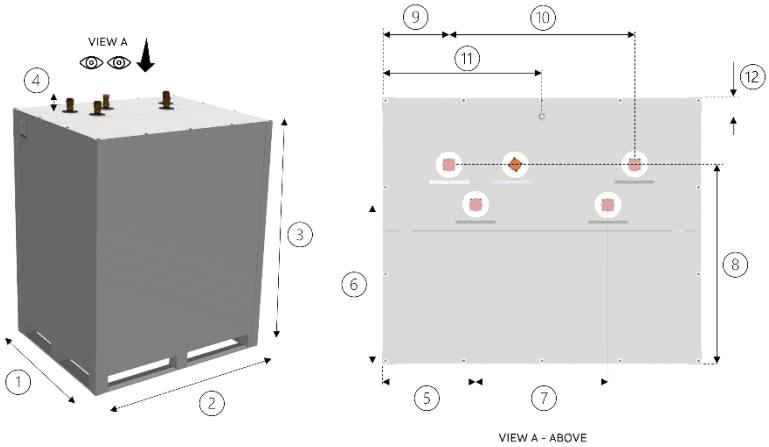

Figure 5: Product Dimensions

Item no	Description	mm	In.
1	Depth	1000	39 3/8
2	Width	1200	47 1/4
3	Height	1470	57 7/8
4	Port Height above top	65	2 9/16
5	Port position	350	13 3/4
6	Port position	595	23 7/16
7	Port position	495	19 1/2
8	Port position	745	29 5/16
9	Port position	250	9 13/16
10	Port position	695	27 3/8
11	Temperature Port Position	600	23 5/8
12	Temperature Port Position	73	2 7/8

Table 3: Reference Figure 5 Nominal Product Dimensions.

2.6.2 Product accessibility

To enable the installation of the Central Bank Mini Thermal Battery, and access during times of maintenance or servicing, suitable clearances must be accounted for to ensure that the product is serviceable and accessible after installation. In addition, reasonable space must be allocated for access with a forklift or pallet truck or any other appropriate moving equipment.

NOTICE

Thought should also be given to the arrangement of Central Bank Mini cascade configurations (series or parallel), to enable installation and access for maintenance or servicing.

NOTICE

It is the responsibility of the suitably qualified installer/system designer to ensure that adequate clearances for serviceability and maintenance access have been accounted for.

2.6.3 Detailed Technical Specification

Table 4 details the key technical performance data, operating parameters & specifications for the product:

Parameter/Specification		Central Bank Mini (P58)	Notes
Nominal Storage Capacity, kWh (BTU)		80 (272,971)	1
Nominal Heat Loss Rate, (BTU/h | kWh/24h)		427 | 3.0	2
Phase Transition Temperature of PCM: TPCM-PT °C (°F)		58 (136)	
Maximum Working Pressure, MPa | Bar (PSI)		1 | 10 (145)	3
Heat Source Temperatures (Charging)	Maximum Flow Temp, T1 °C (°F)	80 (176)	4
	Minimum Flow Temp, T1 °C (°F)	65 (149)	4
	Minimum Return Temp, T3 °F °C (°F) – To fully charge the heat battery	63 (145)	4
Heat Load Temperatures (Discharging)	Maximum Flow Temp transient, T4 °C (°F)	65 – 80 (149 – 176)	4
	Design Flow Temp, T4 °C (°F)	53 – 55 (127 – 131)	4
	Maximum Return Temp, T2 °C (°F)	50 (122)	4
Flow rates	Circuit 1- High Power Circuit, L/min (US Gal/min)	Minimum: 21 (5.6) Maximum: 95 (25.1)	
	Circuit 2- Low Power Circuit, L/min (US Gal/min)	Minimum: 5 (1.3) Maximum: 44 (11.6)	
Circuit Volumes	Circuit 1- High Power Circuit L (US Gal)	51 (13.5)	
	Circuit 2- Low Power Circuit L (US Gal)	22 (5.8)	
Circuit Pressure Loss (head)		See plots in Section 2.5	
Weight	Base Unit, kg (lbs)	1,500 (3,307)	5
	Installed Unit, kg (lbs)	1,573 (3,468)	
Min Power, kW	LPC	5	6
	HPC	20	
Max Power, kW	LPC	16	
	HPC	65	

Table 4: Detailed specifications for Central Bank Mini (P58)

Reference notes for Table 4:

*Note: 1 US Gal (US gallon) has been defined as 3.785411784 L; 1 W has been defined as 3.412141633 BTU/h; 1 BTU has been defined as 0.00029307107017 kWh.

1. Nominal Storage Capacity value is dependent on reference conditions and may differ as they are application specific. Reference condition used is as follows:
   i. P58 between 75°C – 40°C, ΔT = 35°C (167°F – 104°F, ΔT = 63°F)
2. Nominal heat loss/gain rate values are dependent on reference conditions and may differ as they are application specific. Reference conditions used are as follows:
   i. P58 at ΔT 45°C (ΔT 81°F)
3. Circuits 1 and 2 Pressure relief / expansion relief valve must not be set higher than maximum working pressure stated in Table 4.
4. See Figure 6 for temperature sensor locations.
5. The installed weight includes the working fluid in the heat store circuits.
6. Loading calculations based upon technical water. If using other fluids these figures will change and will depend upon the density and specific heat of the fluid used.

3 Temperature Sensors & Control

3.1 TEMPERATURE SENSORS

The Central Bank Mini is fitted with 3 sets of temperature sensor strings as standard. Each string consists of 3 x 3-wire RTD PT100 sensors, at the bottom, middle and top of the heat exchanger. Each sensor in the string is labelled 1, 2 or 3 with the following layout:

1 = Bottom

2 = Middle

3 = Top

These PT100 sensors conform to industry standards and can be connected to a good quality commercial or industrial PLC.

Pipe sensors can be attached to the inlet and outlet port pipework as necessary, but it is recommended that a sensor is installed inline with the working fluid for more accurate results. Examples of the positions are shown in Figure 6, labelled T1, T2, T3 and T4.

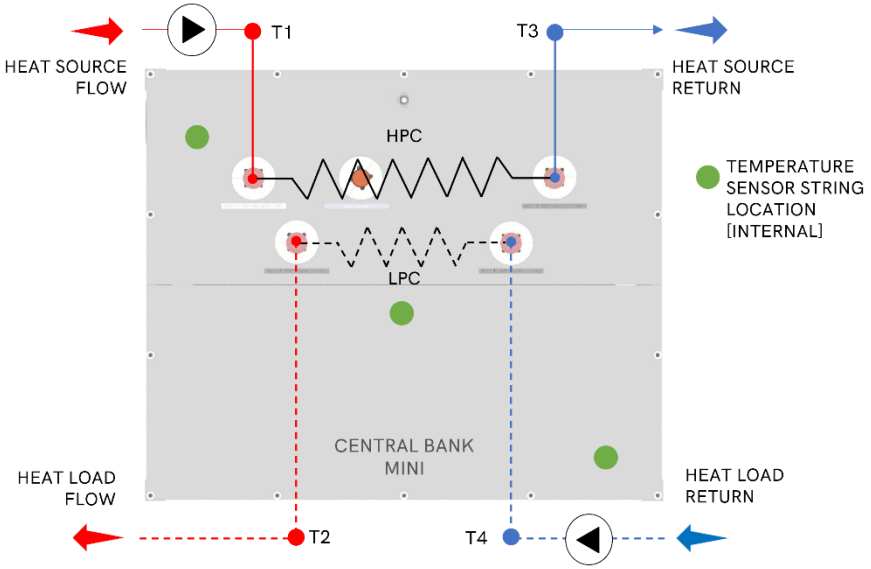

Figure 6: Thermal battery Control logic and hydronic setup

4 Installation

WARNING

Always read the safety instructions in Section 1 of this manual before installing the product.

CAUTION

Before installing the Thermal Battery, please ensure that the storage and installation location chosen for the Thermal Battery is appropriately weather protected and a frost-free environment.

Ensure that spatial clearances for serviceability and access purposes have been accounted for.

- Unpack and recycle packing according to local disposal or recycling rules.
- Lift product into position using appropriate mechanical lifting methods. Due to the weight and size of the Thermal Battery, ensure the floor is level, sound and capable of supporting the product's weight. Information regarding the weight of the product is available in **Table** 4.
- Identify the appropriate installation method for Hydraulic requirements listed in Section 4.1, Figures 6, 7 and 8.
- Identify which side you wish to make hydronic pipe and cable entries (Figure 5)

CAUTION

Store and install the product in a location that avoids being near other building services and sources of excessive heat.
Activities such as soldering, welding or brazing must ONLY be undertaken at a minimum distance of 3ft (1m) from the system, and by using cooling clips or other heat absorbent materials.

- Once the hydronics are in place, fill the system and pressurise, please ensure that the system pressure does not exceed the Maximum Pressure listed in (Table 4), and purge any air that might be present in the pipework.
- Once finished purging and with the system pressurised, inspect the piping and joints for any leaks. Take remedial action if necessary.
- Connect all temperature sensors, T1, T2, T3 & T4 in their appropriate locations as detailed in (Figure 6).

4.1 HYDRONIC REQUIREMENTS

NOTICE

The Central Bank Mini can be installed with and without hydronic separation, depending on the application:

- The hydronic connection arrangement shown in Figure 7, should be considered when either a) hydronic separation between the heat source and heat load is required, or b) simultaneous charging and discharging of the heat battery is required.

  In this configuration, if the power rating of the heat source is greater than the load, i.e. demand, power rating, then the heat source should be connected to the HPC (Circuit 1) and vice versa.

- The hydronic connection arrangement shown in Figure8 should be considered when either a) hydronic separation between the heat source and the heat load is not required, or b) simultaneous charging and discharging of the heat battery is not required.

  In this configuration, the power rating of the heat battery for both charging and discharging will be higher than the power rating of the HPC (Circuit 1).

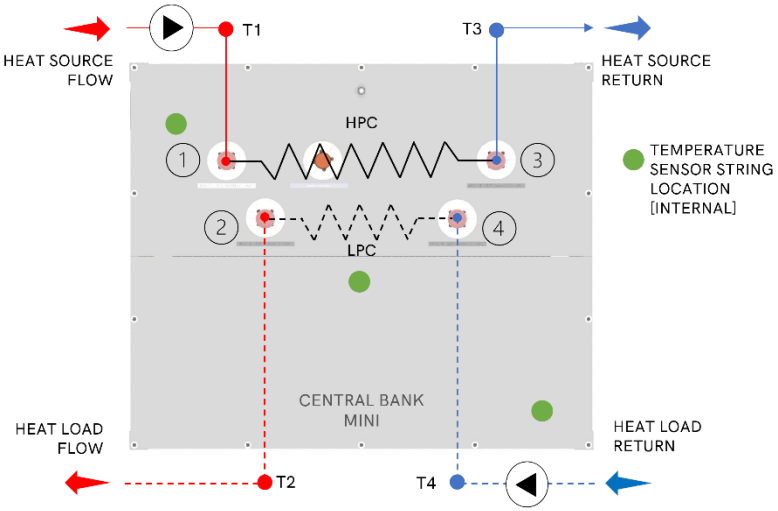

Figure 7: Central Bank Mini configured as a heat buffer with hydronic separation

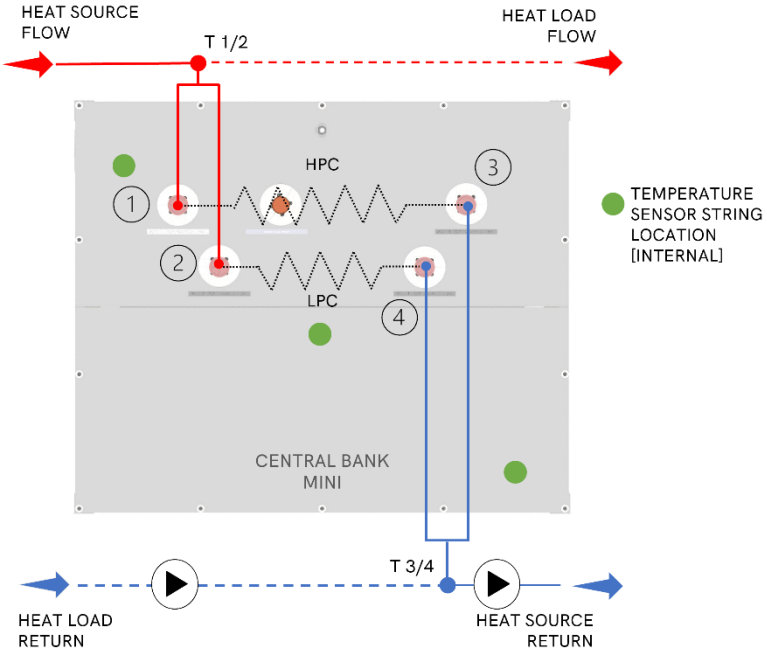

Figure 8: Central Bank Mini configured as a heat buffer without hydronic separation

5 Commissioning

WARNING

Before commissioning the Thermal Battery, first ensure that you have properly reviewed the previous sections of this document, particularly the Thermal Battery specifications as well as location, weight loading and hydronic supply requirement.

5.1 PREPARATION (PRE COMMISSIONING CHECKLIST)

- Ensure all packaging material has been removed.
- Ensure all components are clean and undamaged.

5.2 COMMISSIONING PROCESS

- Turn on the heat transfer fluid supply and ensure that there are no leaks.
- Ensure all the temperature sensors T1, T2, T3 & T4 have been located in their appropriate positions on the pipework, as detailed in Figures 6, 7 & 8.
- Ensure that the hydronic system is fully purged and there are no air locks in the system.
- Ensure that the flow rate for both charging and discharging the system are above the minimum flow rate as detailed in Table 4. Ensure that the pressure drops detailed in Figure 3 and 4 are within the working capabilities of the circulators used in the hydronic system.
- Ensure that the heat source and hydronic system temperatures are achieved as listed in the supplementary Central Bank Mini (P58) applications guide (document D0122).
- Leave all product information and literature with the customer / end user.
- The Central Bank Mini and surrounding system must be commissioned in accordance with local practices and regulations, as outlined by the

suitably qualified installer/system designer. A copy of all documentation should be taken and kept with the product.

6 Operation

WARNING

Always read the safety instructions in Section 1 of the manual before operating the Central Bank Mini® Thermal Batteries.

6.1 TROUBLESHOOTING

6.1.1 During Installation

Fault	Possible Cause(s)	Possible Solution
The Thermal Battery does not deliver service required to appropriate temperatures.	Issue with Supply External Heat Source	Refer to Supply External Heat Source manual, and check if there are any issues displayed on the External Heat Source controller/s.
	Issue with Circulator/ low flow rate	Check operation of circulator and ensure the flow rate is above the minimum requirement for the circuit. Remove any air locks by purging.
	Ratio between supply and demand is unbalanced	If the demand is greater than the supply, then the load should be reduced on the Thermal Battery to allow for the correct supply of service.
Water Leak	Various	Isolate water supplies and identify location of water leak. Contact Sunamp Customer Service if a leak is present on the Thermal Battery piping.

Table 5: Installation troubleshooting

6.1.2 After Installation or During Use

WARNING

This product does not contain any user-serviceable or user-settable components. All fault-finding and fault-remediation works therefore need to be carried out by a person suitably qualified to carry out electrical and plumbing work within the commercial & industrial sector.

Fault	Possible Cause(s)	Possible Solution
Discharge temperatures too low	Issue with External Heat Source	Refer to External Heat Source manual, and check if there are any issues displayed on the External Heat Source controller/s.
		Monitor the charging temperatures (T1 & T3) and ensure that they are satisfying the control logic requirements.
	Issue with Circulator/ low flow rate	Check operation of circulator and ensure the flow rate is above the minimum requirement for the circuit. Remove any air locks by purging. Check if the connections are connected in the correct configuration. The heat exchanger could have a scale build (only applied to DHW circuit). Contact Sunamp Customer Service for descaling guidance.
	Unsuitable PCM	The PCM inside the Thermal Battery is not suitable for the application or damaged. Please contact Sunamp Customer Service.
Water Leak	Various	Isolate water supplies and identify location of water leak. Make sure connections to the product are flexible to allow for dampening of vibrating equipment. Check system gauge pressure and reference to see if it is within maximum operational limits.

Table 6: Post-installation troubleshooting

7 Maintenance

The product does NOT require any regular maintenance, however, please take notice of the following minimum requirements:

- This product should NOT be connected directly to mains water, it is NOT certified for direct potable hot water production, an appropriate plate heat exchanger must be used for DHW applications.
- All pressure relief and circuit fluid expansion safety components on the connected pipework to the Central Bank Mini must be serviced and maintained to ensure the pressure is kept within the Central Bank Mini's operational limits (see Table 4).
- All auxiliary equipment that has been installed with the product must adhere to the maintenance and/or servicing requirements as set out by the manufacturer and/or the design engineer responsible for the system.

7.1 CLEANING

- The product does not require any regular cleaning.
- Should the product exterior become dirty it can be wiped down with a damp cloth and a mild detergent (such as soap).

7.2 WARRANTY

NOTICE

Information regarding product warranty can be found on the Sunamp website: www.sunamp.com/warranty or from the supplier of the product.

8 Recycling and Disposal

8.1 DECOMMISSIONING

This section details the process for preparing the product for removal and disposal. When the product is ready to be removed from its installation site, make sure that the following has been completed:

- The product has been fully cooled down and the PCM inside has solidified (internal temperature <58°C). Refer to the supplementary Central Bank Mini (P58) applications guide (document D0122) for details on how to cool down and decommission a Central Bank Mini (P58) product.

- The heat exchanger has been purged of any liquid and there is no liquid in the system connecting the Central Bank Mini.

8.2 DISPOSAL

This symbol on the product and accompanying documents means the product should not be mixed with general household waste at the end of its life.

Please contact Sunamp prior to arranging disposal via a registered designated waste management company.

Disposing of this product correctly will help save valuable resources and prevent any potential negative effects on human health and the environment, which could otherwise arise from inappropriate waste handling.

Please contact your local authority or national waste management body for further details of your nearest registered waste management company. Penalties may be applicable for incorrect disposal of this waste, in accordance with your national or local legislation.

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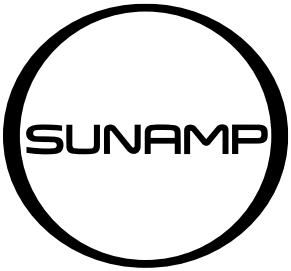

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