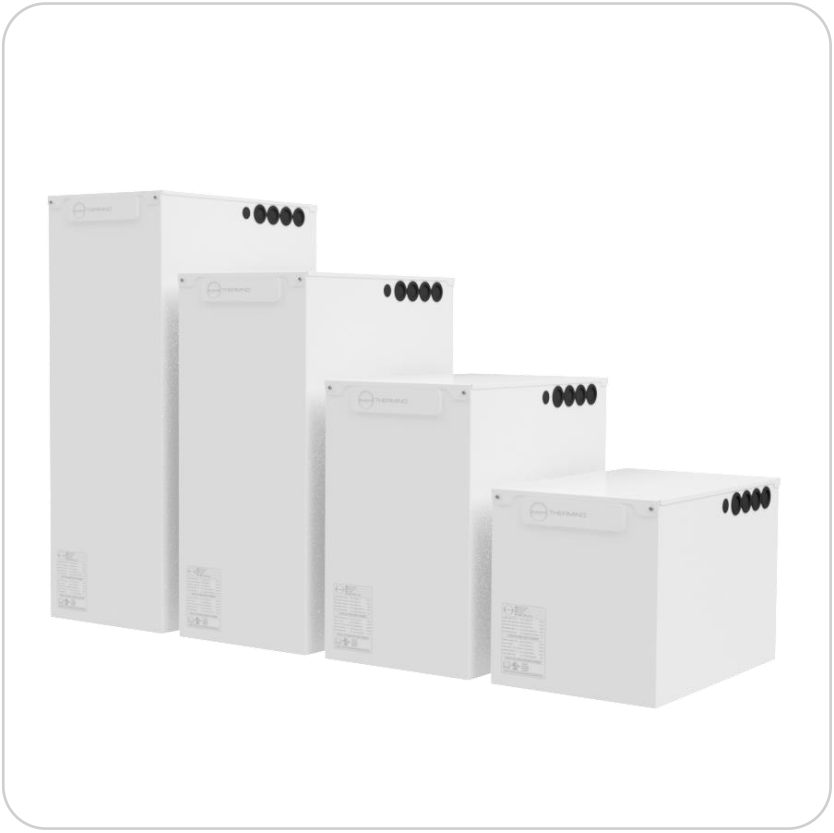
Keep these instructions in a safe place for future reference



Thermino® Heat Battery Installation and User Manual (US/CA)

Safety Notice

⚠WARNING

Read and understand this manual before you install the product.

Symbols and Notices Used and Their Meanings

Symbols			
 Warning	 Electric Hazard	 Notice	 Cross-reference
Warning Notices	**Consequences**		**Likelihood**
⚠WARNING	Death/serious injury (irreversible)		Potential risk
⚠CAUTION	Damage/minor injury (reversible)		Potential risk

DO NOT install outdoors. This product is for indoor use only.

Improper installation, adjustment, alteration, service, or maintenance can cause property damage, injury and death.

ONLY competent persons who are suitably qualified to carry out plumbing and electrical work may undertake installations, repairs or relocations. Product training on the full range of Thermino Heat Batteries is available through Sunamp Ltd or authorised training partners and is recommended.

Only use this product for the intended purpose described in this manual.

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

Document Purpose

To instruct competent persons on how to safely install ***Thermino® Heat Batteries*** for the US and Canadian markets. Competent persons are those suitably qualified to carry out plumbing and electrical work. Product training on the full range of ***Thermino® Heat Batteries*** by Sunamp Projects Inc or an authorised training partner is available.

Contents

1. Safety Instructions

You MUST read the whole manual before installing the product. Sunamp Projects Inc. 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 ***Thermino®*** range of products is for the provision of hot water for domestic purposes using external charging of the Heat Battery. They are equivalent to a reverse indirect water heater/storage tank and can be classified as a ***Primary Thermal Store.***

It is not intended for use with other charging methods or in applications other than the provision of domestic hot water.

1.2 Pre-installation Safety Advice

- Sunamp Ltd is not responsible for the selection, specification or effectiveness of equipment unless stated in writing. The responsibility lies with customers and any experts or consultants involved in the 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.

1.3 Mechanical & Hydronic Safety

⚠WARNING

- DO NOT install outdoors. This product is only suitable for installations indoors in a frost-free environment, to avoid weather damage.
- DO NOT tilt the product more than **45 degrees** during the transportation or installation process.
- Install the product on a **hard, solid, level surface that supports** its weight.
- DO NOT use **detachable hose sets** to connect the system to water mains.
- All soldering, welding or brazing must be performed on tubes detached from the Heat Battery (minimum 1 meter / 3.3 feet away).

- This product is NOT suitable for gravity-fed hot water systems.
- DO NOT immerse this product in water or any other liquid.
- DO NOT use any sharp objects in proximity of the Vacuum Insulation located at the side of the Heat Battery.

DO NOT stack the Heat Batteries directly on top of each other, if using multiple Heat Batteries.

These batteries are not factory fitted with high temperature safety cut-off devices and therefore, if a heat source can deliver hot water greater than **176°F (80°C),** a suitable energy cut-off device set at **176°F (80°C)** maximum must be fitted in the charging circuit to prevent charging above its maximum permitted temperature and damage to the Heat Battery.

The Heat Battery circuits MUST NOT be connected to a direct refrigerant circuit.

1.4 Electrical Safety

⚠WARNING

The product must be grounded correctly in accordance with state and local regulations.

1.5 Water Safety

⚠WARNING

Minimum working pressure of the Heat Battery is 22 PSI / 0.15 MPa / 1.5 Bar. The maximum working pressure of the Heat Battery is 145 PSI / 1.0 MPa / 10 Bar. See Section 4.2.1 for detailed specifications.

Water temperatures over 125°F / 50°C can cause severe burns instantly or death from scalds. The outlet temperature must be set as per this manual.

1.6 User Competence, Qualification, and Approval

⚠WARNING

- ONLY competent persons who are suitably qualified to carry out plumbing and electrical work may undertake installations, repairs or relocations. Product training on the full range of Thermino Heat Batteries is available through Sunamp Projects Inc. or authorised training partners and is recommended.
- DO NOT allow children or any other unqualified or unapproved persons to install, repair, clean, relocate, interfere or tamper with the product.

- 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 a lack of experience or knowledge) should first be given supervision or instruction concerning the use of the product by a person responsible for their safety.

1.7 Compliance with Local Codes and Regulations

⚠CAUTION

- Installations, repairs and relocations must comply with all relevant local codes and regulations, particularly concerning electrics, water supplies, building regulations and manual handling operations, as issued by the relevant bodies.
- Water distribution and central heating installations ('systems') must comply with all obligations and local codes.
- Obligations from local codes always override manufacturer documentation where there is a conflict.

1.8 Post-Installation Safety

- All goods are sold subject to Sunamp Projects Inc.'s Conditions of Sale, as listed on the company website.
- As Sunamp continuously improves products, they may be modified without notice. In such circumstances, this manual and other relevant documentation should be disregarded. 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.

1.9 Repair and Relocation

⚠WARNING

- DO NOT attempt to carry out repairs or maintenance before the system components – including the ***Thermino*** - have cooled down to ambient room temperature. To speed up the process, isolate the external heat source and open hot water taps in the dwelling to draw off hot water and 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.

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

2. Heat Battery Overview

2.1 Introduction

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

Sunamp's decade-long history of research and innovation in PCM technology has made it the world-leading manufacturer in Heat Battery technology – developed, designed and manufactured in the UK.

Sunamp has a wide portfolio of Heat 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

The Sunamp ***Thermino***® Heat Batteries are:

- Designed to produce domestic potable hot water service instantaneously and on demand.
- Charged by an external heat source via a hydronic circuit only.
- Equivalent to a reverse indirect water heater/storage tank.
- Classified as a Primary Thermal store. By transferring heat from the PCM to the mains water flowing through the heat exchanger, they produce hot water instantaneously and on demand.

See the downloads section of our website (www.sunamp.com) for other useful information on Sunamp products.

2.2 Product Overview & General Construction

The ***Thermino®*** range of thermal batteries is designed to be charged by an external heat source only and are used for providing hot potable water instantaneously and on demand.

The construction of the Heat Battery is shown in Figure. 1 & Figure 2. The thermal Energy is stored by changing the state of Sunamp's ***Plentigrade®*** Phase Change Material (PCM) from solid to liquid via a flowing working fluid through the primary circuit of the integrated heat exchanger. The thermal energy is then released by changing the state of the PCM from liquid to solid and by transferring heat from the PCM to the mains water flowing through the secondary circuit of the integrated heat exchanger.

The PCM and the heat exchanger are housed in a sealed container/enclosure called 'the Cell'. Although the Cell is sealed, the pressure inside the Cell is around the ambient atmospheric pressure i.e. about 0.145 PSIG / 1.0 bar absolute (i.e. Approximately atmospheric pressure) and is fitted with a one-way breather valve. The Cell is insulated using highly efficient Vacuum Insulation Panels (VIP).

The heat batteries are fitted with temperature sensors for measuring the charge state and can be used for controlling their operation via an external system and/or Heat Battery controller. Do not remove or replace these sensors with other types unless prior authorization by Sunamp has been received in writing.

The ***Plentigrade® P58*** Phase-Change Material (PCM), has a phase transition temperature **(TPCM-PT) of 136.4°F (58°C).**

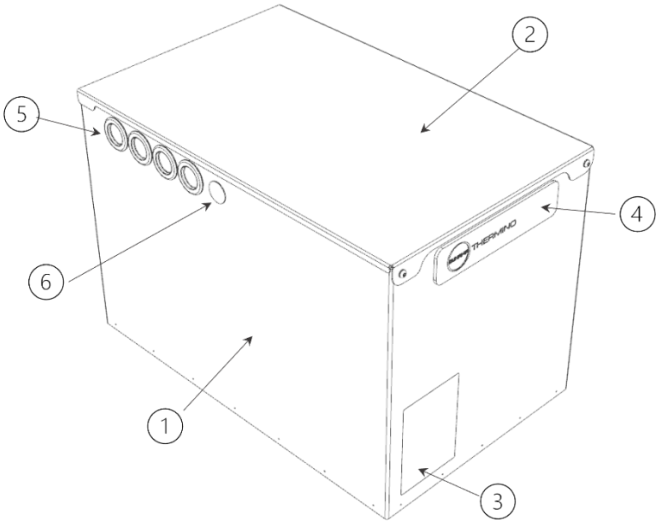


Figure. 1: Heat Battery External

Item	Description
1	Heat Battery – Outer Case Main body
2	Heat Battery – Lid
3	Product Data badge / Serial number
4	Product Branding
5	Tube Entries via Rubber Grommets (3 sides)
6	Cable Entries / Blanks (3 sides)

Table 1: Reference Figure 1 Heat Battery External

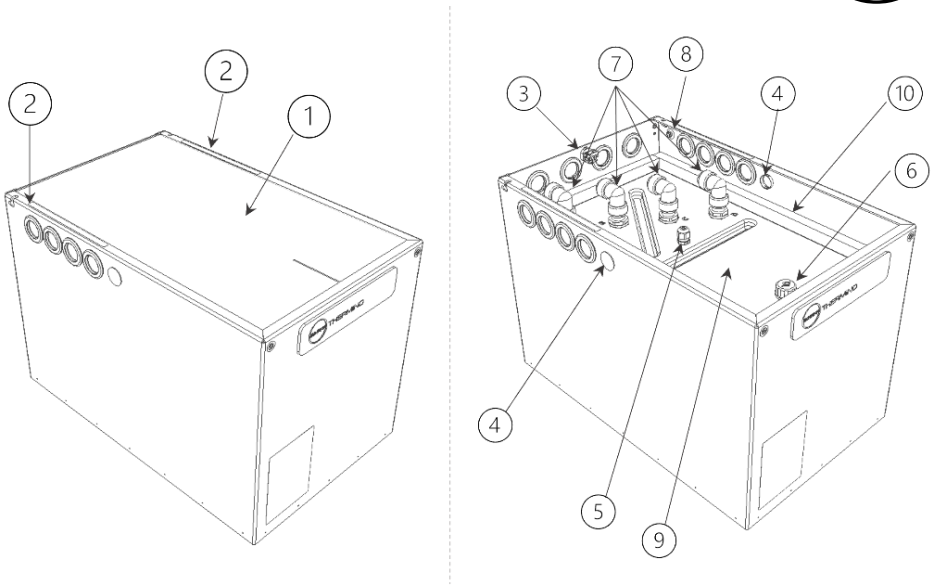


Figure 2: Internal interfaces, lid removed (left), Top insulation removed (right)

Item	Description
1	3 layers of flexible Insulation, 2 layers to be fit around pipe exits.
2	Port identification labels – A B C D.
3	Cable Strain Relief– Interchangeable position with item 4
4	Blanking Bush – Interchangeable position with item 3
5	Temperature Sensor Location
6	PCM Cell One-way Breather Valve – **Do not tamper or defeat!**
7	4 X Port Connections - A B C D - 360 Degree 'push fit' elbows.
8	Ground connection point
9	The 'Cell' contains the PCM and Heat Exchanger.
10	Vacuum Insulation Panels (VIP)

Table 2: Reference Figure 2 Heat Battery internals

2.3 Hydronic Circuits & Connections

The ***Thermino*** range of batteries has two independent hydronic circuits:

1. The **Primary Circuit** for charging the Heat Battery via an **external heat source**. **Ports** are labelled **B and C**.
2. The **Secondary Circuit** for discharging the Heat Battery for **Potable Hot water** production. **Ports** are labelled **A and D**.

The heat is transferred between the PCM and the Primary and Secondary circuits using an integrated heat exchanger inside the cell. The direction of flow through the ports is key to the operation & control of the Heat Battery. See Figure 3 & Table 3 for details.

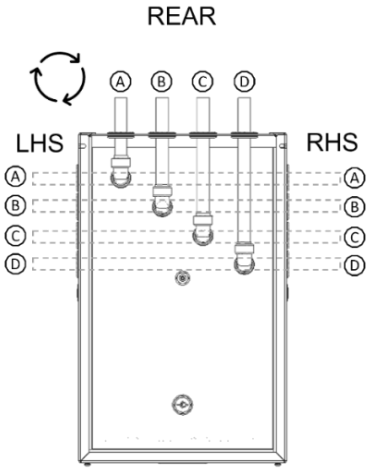


Figure 3: Heat Battery from Above showing the 3 possible tube exits.

Item	Description
A	Secondary Circuit – A – POTABLE HOT WATER
B	Primary Circuit – B – HEAT SOURCE FLOW
C	Primary Circuit – C – HEAT SOURCE RETURN
D	Secondary Circuit – D – POTABLE COLD WATER
	Tube and cable entries are used depending on the installation location

Table 3: Reference Figure 3 Heat Battery entry/exits

2.4 Pressure (Head) Loss Characteristics

The two hydronic circuits within the ***Thermino 20*** heat exchanger are not split evenly, and thus there are two respective curves for pressure loss for the primary and secondary circuits.

The two hydronic circuits within the ***Thermino 40, 60 & 80*** heat exchangers are split evenly and thus both the Primary and Secondary circuit pressure loss (head) values can be read in Figure 4 below respectively.

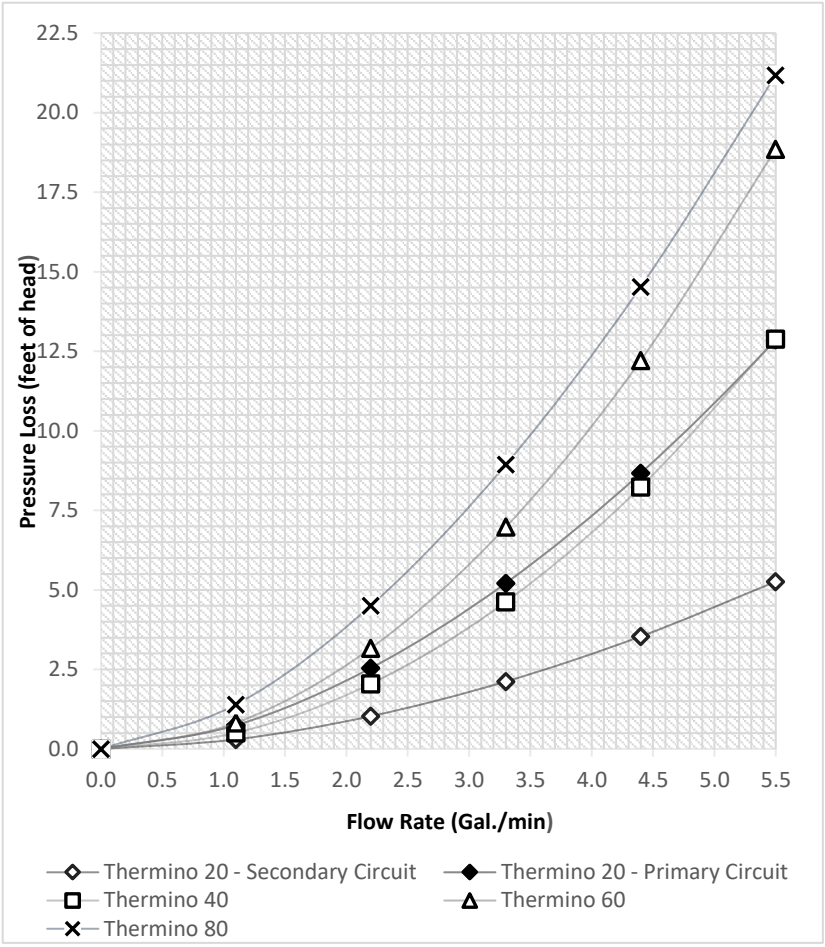


Figure 4: Pressure Loss Characteristics

2.5 Technical Specification, Dimensions & Weight

2.5.1 Net and Gross Weights

The Net and Gross Weights of all models are listed in the following Table 4. The **Gross Weight** refers to the installed weight when the heat exchanger tubes in the Heat Battery are filled with water. The **Net Weight** refers to an empty Heat Battery (i.e., no water in the tubes).

Thermino Model	Gross Weight		Net Weight	
	(kg)	(lb.)	(kg)	(lb.)
Thermino 20	62	137	58	128
Thermino 40	116	256	109	240
Thermino 60	170	375	159	351
Thermino 80	212	467	199	439

Table 4: Model Weights

2.5.2 Nominal Product Dimensions

The following Figure 5 and Table 5 show the product dimensions. The product footprint and port positions are common across the range. The products only differ in overall height.

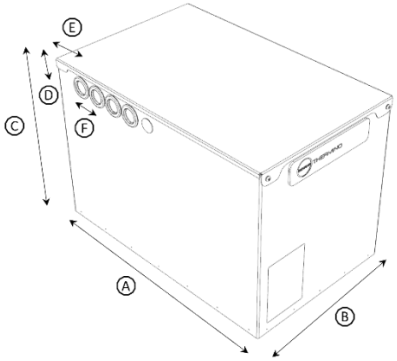


Figure 5: Nominal Product Dimensions

Thermino Model		20	40	60	80
A Length	mm	575			
	In.	22 5/8			
B Width	mm	365			
	In.	14 3/8			
C Height	mm	389	590	816	1001
	In.	15 5/16	23 1/4	32 1/8	39 3/8
D Outlet Position	mm	38			
	In.	1 1/2			
E Outlet Position	mm	78			
	In.	3 1/16			
F Outlet Position	mm	50			
	In.	2			

Table 5: Reference Figure 5 – Nominal Product Dimensions.

2.5.3 Detailed Specifications

The table on the following page details the key technical performance data, operating parameters & specifications for this product range.

Specification	Heat Battery Model (Thermino):	20 (70)	40 (150)	60 (210)	80 (300)
Water Content [Gal (L)]	Primary circuit Port B-C	0.29 (1.3)	0.81 (3.7)	1.17 (5.3)	1.41 (6.4)
	Secondary circuit Port A-D	0.51 (2.3)	0.81 (3.7)	1.17 (5.3)	1.41 (6.4)
	Total	0.80 (3.6))	1.62 (7.4)	2.34 (10.6)	2.82 (12.8)
Thermal Content at rated conditions [BTU (kWh)]		11940 (3.5)	23880 (7)	35820 (10.5)	47770 (14)
Equivalent Hot Water Cylinder Size [Gal (L)]		19 (71)	38 (142)	56 (212)	75 (284)
V_{40}, Volume of Hot water available at 40°C [Gal (L)]		22 (85)	49 (185)	79 (300)	98 (370)
Standby heat loss rate (BTU/hr | (W))		65 (19)	92 (27)	106 (31)	116 (34)
Recommended maximum Hot Water flow rate [Gal/min (L/min)]		1.6 (6)	3.9 (15)	5.3 (20)	6.6 (25)
Minimum mains supply pressure at the inlet of Heat Battery [PSI (Bar)]		22 (1.5)			
Maximum working pressure [PSI (Bar)]		145 (10)			
Pressure loss characteristics		See Figure 4: Pressure Loss Characteristics			
Recommended setting range for Hot Water TMV [˚F (˚C)]		113 - 131 (45 - 55)			
Maximum Charging Flow temperature $\mathbf{T_{CH\text{-}IN\text{-}MAX}}$ [˚F (˚C)]		176 (80)			
Minimum Charging Flow temperature $\mathbf{T_{CH\text{-}IN\text{-}MIN}}$ [˚F (˚C)]		149 (65)			
Phase Change Material Transition Temperature $\mathbf{T_{PCM\text{-}PT}}$ [˚F (˚C)]		136.4 (58)			
Note the US gallon (US gal), defined as 3.785411784 L					

Table 6: Thermino Data Table

3. Temperature Sensors & Control

3.1 Temperature Sensors

The ***Thermino*** range of Heat Batteries is supplied with a factory-fitted sensor cable comprising of three integrated temperature sensors, (S1, S2 & S3).

The sensors measure the internal temperature of the PCM in the centre of the Heat Battery at three heights.

These can be used with a suitable external controller to manage the charging and discharging of the battery. For wiring purposes, the sensor cable color coding is shown in Fig. 6 and the specification of the sensors is given in the section below.

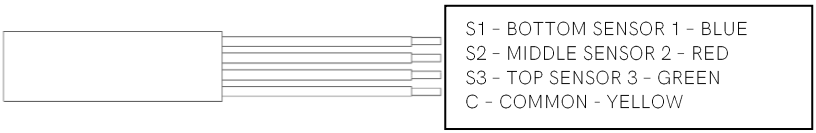


Figure 6: Temperature Sensor colour coding

3.1.1 Heat Battery Sensor Specification

- Sensor type: TDK NTC Thermistor, 10 kΩ, B57863S Series, 3988 K
- Further details are available via the NTC manufacturers' website.

3.2 Generic Control Logic

The technical, performance and operating parameters are listed in Table 6. The function and control strategy will depend upon the application and the external heat source. However, a simple generic control logic based on the functional schematic shown in Figure 7 is described below for guidance.

Note that the following guidance only applies if the Heat Battery ports have been configured as detailed in this manual, Section 2.3:

- Charging Circuit (Primary): Top to Bottom - Port B to Port C
- Discharging Circuit (Secondary): Bottom to Top - Port D to Port A

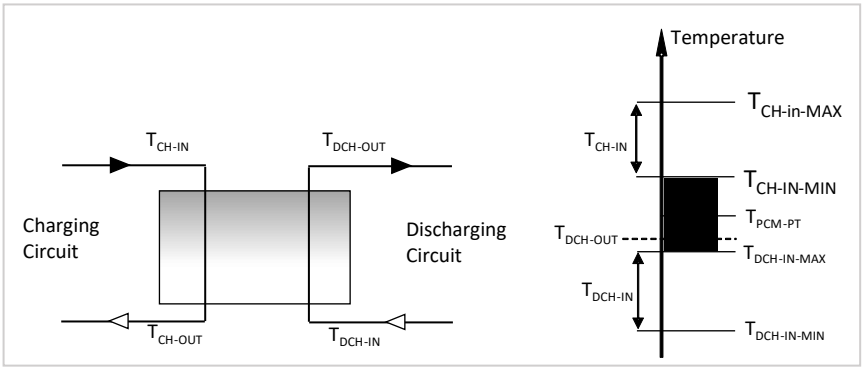


Figure 7: Heat Battery Control logic and hydronic setup

- For efficient charging of the batteries, the charging circuit flow temperature, T_{CH-IN} must be:
  - ≥ $T_{CH-IN-MIN}$
  - ≤ $T_{CH-IN-MAX}$

- To ensure that the battery is fully charged at the end of a charge cycle, the return temperature, T_{CH-OUT}, must be:
  - ≥ T_{PCM-PT} + 9°F (or 5°C)
  - ≤ $T_{CH-IN-MAX}$

- The Heat Battery charging can be activated when:
  - $T_{S2} < T_{PCM-PT}$

- The Heat Battery charging can be deactivated when:
  - $T_{S3} > T_{CH-IN-MIN}$
  - $T_{S2} > T_{CH-IN-MIN}$
  - $T_{S1} > T_{PCM-PT}$ + 9°F (or 5°C)

⚠WARNING

- These batteries are not factory fitted with high temperature safety cut-off devices and therefore if a heat source can deliver hot water greater than **176°F (80°C),** then, a suitable **energy cut-off device** set at **176°F (80°C) maximum** must be fitted in the charging circuit to prevent charging above its maximum permitted temperature and damage to the Heat Battery.

4. Installation

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

4.1 Installation Process

4.1.1 Preparation:

- Assess the location of installation, considering spatial requirements, clearances, cable and hydronic tube runs. See Figure 3 & Figure 10.
- Unpack and recycle packaging according to local disposal or recycling rules.
- Identify which side you wish to make a hydronic tube and cable entries (see Figure 3 in Section 2.3).
- Prepare the system hydronics and electrics.
- Move the unit into position using appropriate lifting methods.

4.1.2 Hydronic Connection:

Note: The configuration of Heat Battery charging and discharging tube connections are described in Figure 3.

  - The **potable cold water** inlet connects to **Port D**;
  - The **potable hot water** outlet connects to **Port A;**
  - The **heat source flow** connects to **Port B;**
  - The **heat source return** connects to **Port C**.
- Remove the lid. The lid is secured by 2 x M5 button head cap screws at the front and two locating pins at the back (Figure 8):
  - Remove 2 x M5 button head cap screws using a 3mm hex head and set aside.
  - Slide the lid forward, then lift the lid and set it aside.
- Remove the top two layers of insulation and set aside.
- Rotate the elbows to the side you wish to connect the hydronics (left, right or back).
- Remove the respective rubber grommets in the outer housing and cut the centres (with a cross) with a knife. Reinsert the cut grommets.
- Cut and prepare the necessary lengths of 3/4" ASTM B88 Type L - Blue copper tube (OD 7/8" (22.2mm)) to suit the rest of the installation/system. Cross-reference the fitting instructions of the push-fit elbows provided.
- Always cut the tube square, using a rotary tube cutter whenever possible. Ensure the cutter wheel is appropriate for the copper tube.
- Deburr the tube end, both internally and externally and create a chamfer on the outside of the tube.

- Check the tube ends are free from damage and clean, wiping away any swarf to avoid damaging the elbows and O-ring on tube insertion.
- Tube end must also be free from stickers, tape and adhesive residues.
- Mark the elbow socket depth (1 1/16in / 27mm) on the tube with a marker.
- Insert the tube firmly with a slight twisting action until it reaches the tube stop with a positive “click”.
- Ensure the depth insertion mark corresponds with the mouth of the fitting, then pull firmly on the tube to ensure the fitting is secure.
- Fit the earth clamp to one of the copper tubes and the earthing stud on the product case (See Figure 2 in Section 2.2).
- Connect to the rest of the fixed system hydronics.
- Fill the system with water, purging any air out of the system. This may take several minutes and can be aided by repeatedly opening and closing the outlet.
- Once finished purging and with the system pressurised, inspect the tubing and joints for any leaks. Take remedial action if necessary.

4.1.3 Temperature Sensor Control Connections:

- Move the cable strain relief fittings to the side you wish to make the entries/exits. Cover all other holes in the enclosure with the supplied blanking bushes (See Figure 2 & Figure 9).
- Feed the sensor cable through the strain relief bushing in the Heat Battery housing.
- Line up the cable strain relief fitting ratchet feature and compress firmly so that the fitting grips the cable.
- Connect the Temperature sensors to the appropriate control terminals. See
-
- Figure 6.

4.1.4 Final Fit After Commissioning:

Commissioning instructions are provided in Section 5 of this manual. Follow the instructions below after commissioning.

- Using the sticker set provided mark with the product hydronic inlets and outlets so that future users can identify the: cold water inlet, hot water outlet, heat source flow & heat source return.
- Cut the 1 1/4in (32mm) thick insulation layer to suit the tube and cable entries. This layer has several perforations for guidance. This can be done with a sharp knife or scissors.

- Replace the newly cut 1 1/4in (32mm) thick insulation layer nesting the insulation around the tube work and cables. Make sure the temperature cable sits above this layer.
- Replace the top 3/8in (10mm) layer of insulation.
- Replace the lid, align the rear pins with the slots in the rear of the unit, slide back, and fit the 2 x M5 button head cap screws using a 3mm hex head.

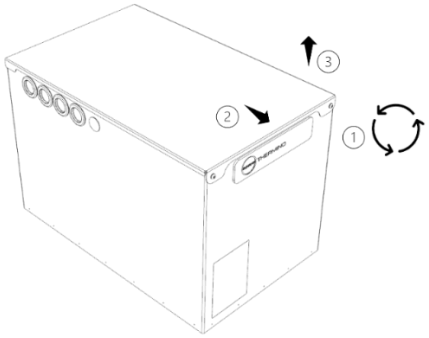


Figure 8: Access to the Heat Battery Connections - lid removal

Order	Description
1	Remove fasteners x2 using a 3mm Allen Key
2	Slide lid forward
3	Lift lid

Table 7: Reference Figure 8: Access to the Heat Battery Connections - lid removal

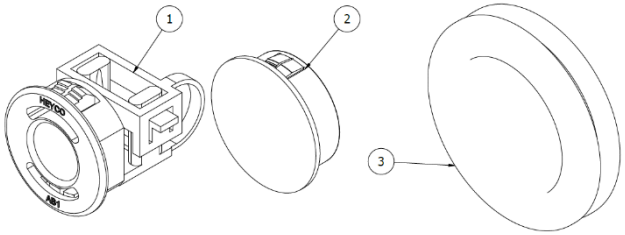


Figure 9: Cable and Pipe / Tube interfaces

Item	Description
1	Cable entry strain relief gland
2	Cable entry blanking bush
3	Tube entry grommet

Table 8: Reference Figure 9: Cable and Pipe / Tube interfaces

4.2 Water Supply Requirements

Important: All components fitted in the water system should comply with local codes.

4.2.1 General

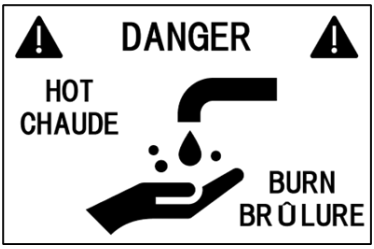
For information regarding expansion vessel sizing and pressure relief valves, refer to the information provided on the product data label regarding water content and industry guidance.

Important: Although the Heat Batteries are designed for **145 PSIG / 1.0MPa / 10 bar maximum** working pressure, it is recommended that if the incoming mains pressure is greater than **73 PSIG / 0.5MPa / 5 bar**, a local code-compliant pressure regulator set at **73 PSIG / 0.5MPa / 5 bar** should be fitted.

- DO NOT use detachable hose sets to connect the product to the water mains.
- Minimum - Maximum dynamic mains water supply pressure: **22-145 PSIG / 0.15MPa** - **1.0MPa / 1.5 bar**- **10 bar**.
- Minimum mains cold and hot water tube sizes: **¾ in copper ASTM B88 Type L.**
- Expansion vessel charge pressure = incoming mains pressure (MPa).
- A potable water expansion relief valve **MUST** be fitted unless it has been established that the water can expand back into the mains. In case of doubt over the presence of non-return valves in the system, a potable water expansion relief valve should be fitted as a precaution.
    - The valve should be fitted in compliance with local codes.
    - The valve should be chosen based on the mains water pressure, with a maximum allowable rating of **145 PSIG / 1MPa / 10 bar**.

- Local code-compliant hot water tempering valves should be fitted at the outlet from the Heat Battery. The tempering valve should be set to deliver hot water between **113°F and 131°F (45°C and 55°C).**

- Water temperatures over **125°F / 50°C** can cause severe burns instantly or death from scalds. The outlet temperature must be set accordingly as per this manual.



4.2.2 Hard Water and Limescale

Where mains water hardness can exceed **150 ppm Total Hardness**, you must install a scale-reducing device in the cold-water supply to the Heat Batteries.

Limescale can be controlled using; chemical limescale inhibitors, polyphosphate dosing, electrolytic scale reducers or water softeners.

4.3 Location and Space Requirements

- The Heat Battery is suitable for indoor use only.
- Install the product in line with the clearance diagram below and Avoid locations close to other building services and sources of excessive heat.
- 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.
- Due to the weight of the Heat Battery, ensure the floor is level, sound and capable of supporting the product's weight (cf Table 4).
  Allow for space around the Heat Battery as per Figure 10 & Table 9 below.

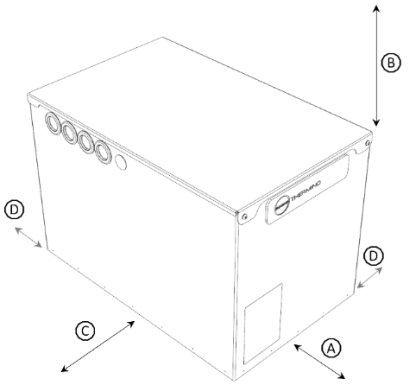


Figure 10: Minimum Installation clearance

Item	Space		Reason
	mm	in	
A	150	6	To ensure visibility of the product label and lid access
B	450	18	To remove the lid and access the internals
C	150	6	To allow for tube and cables entry (side dependent)
D	12	1/2	If no access is required (side dependent)

Table 9: Reference Figure 10: Minimum Installation clearances

4.4 Hydronic Requirements

Sunamp Ltd Heat Batteries are NOT suitable for tank-fed hot water systems.

- All connection tube work inside the Heat Battery casing must be **copper tube**. This is to allow the earth connection between the case, inlet, and outlet tube fittings.
- DO NOT fit Isolation valves between the expansion vessel and the Heat Battery.
- The tube grommets used for the inlet and outlet into the Heat Battery must be cut to allow the passage of the copper tubes by safely using an appropriate cutting tool.

- Plastic tube work must ONLY be used outside the Heat Battery and no plastic tube connections must be made to the Heat Battery inlet or outlet ports/elbows.
- Sizing of the tube work must consider mains water supply pressure, the design flow rates, the size of the Heat Battery and pressure loss.

4.5 Temperature and Insulation Requirements

Applying excessive heat to the system tubes will cause damage to the Heat Battery and its internal components.

- Heat Batteries use the Plentigrade® P58 Phase-Change Material (PCM), which has a **phase transition temperature (T_{PCM-PT}) of 136.4°F (58°C).**
- All connected tubes should be insulated for **at least 1m** from their connection points with the Heat Battery.

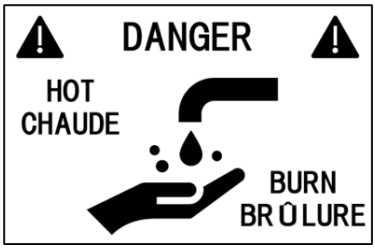
5. Commissioning

Before commissioning the product, first ensure that you have properly reviewed the previous sections, particularly regarding Heat Battery specifications as well as location, electrical supply and water supply requirements.

The Heat Battery and its associated pipework MUST be filled and fully vented along with the heat source and system.

5.1 Process

1. Ensure that the temperature sensor of the Heat Battery is fully inserted into its pocket. The marker should be sitting on top of the copper pocket.
2. Turn on the water supply and ensure that there are no leaks.
3. Fully open any hot water taps in the dwelling and allow it to run for a **minimum time of 4 minutes**. This is for any air to leave the system. This may vary depending on the Heat Battery model size.
4. Turn on the heat source to start charging the thermal battery.
5. Once charged, Check the hot water temperature at all hot water outlets in the dwelling with the customer and advise on temperature settings. Adjust the Hot Water Tempering Valve, so that the output temperature is between **113°F and 131°F (45°C and 55°C)** or as per local codes.



6. Leave all product information and literature with the customer/end user.

6. Operation

Always read the safety instructions in Section 1 of the manual before operating the Thermino Heat Batteries.

There are no operating instructions for this product, as it forms a passive component within the system. See Section 3 for Control logic.

6.1 Troubleshooting

Warning: This product does not contain any user-serviceable or user-settable components. No access to the PCM containment is required at any time. All fault-finding and fault-remediation works, therefore, need to be carried out by a competent person.

6.1.1 During Installation

Fault	Possible Cause(s)	Possible Solution
The appliance does not deliver hot water or insufficient hot water	Fault on an external heat source	Refer to the external heat source manual.
	The external heat source flow temperature is too low	Ensure that the flow temperature from the External heat source is sufficient.
	The external heat source flow temperature is too high	Ensure that the flow temperature from the External heat source is sufficient & check the status of the energy cut-off device.
	The Heat Battery is not charged sufficiently	Ensure that the flow temperature from the external heat source is sufficient.
		Check that the Heat Battery temperature sensor is connected correctly and reads suitably.
	Energy cut-off device activated	Check the status of the energy cut-off device and the flow setting of the external heat source temperature.

Fault	Possible Cause(s)	Possible Solution
		Reinstate the energy cut-off device once the external heat source is within normal working parameters.
	TMV setting too low	Increase the TMV setting to match a temperature output between 113°F and 131°F (45°C and 55°C) or as per local codes.
	The air might be trapped in the system	Check that the mains supply valve is fully opened. Make sure the appliance/system is fully de-aired and purge if necessary.
	The air might still be trapped in the system preventing charging	Check for faults on the external heat source and follow the air purging instructions.
Water leak	Heat Battery elbow joints damaged or not fully engaged	The copper tubes have not been cut and finished properly. This may have damaged the internal O-ring. Remove, check and replace if necessary.
		The copper tubes have not been fully inserted into the elbow. Mark tubes with depth and re-insert.
The flowrate from the The appliance is lower than expected.	The air might still be trapped in the system	Check that the mains supply valve is fully opened. Make sure the appliance is fully de-aired and purged if necessary.
	Incoming water pressure is too low	Measure the incoming pressure from the mains supply.

Table 10: Installation troubleshooting

7. Maintenance

Where undertaking maintenance, repairs or removals, and where necessary, ensure that the system is first disconnected from the local water utility.

- The product does NOT require any regular maintenance.
- In areas, where the mains water hardness can exceed 150 ppm total hardness and a scale-reducing device has been fitted, the service and maintenance requirements of this device (especially re-fill requirements) need to be adhered to.
- The air pressure in the expansion vessel should be checked every 2-3 years and topped up if necessary.
- No access to the PCM container is required in the field under any circumstances. Breaching the PCM containment will void the warranty of the product.

7.1 Removal of Lid

- The lid of the Heat Battery is fixed to the outer case using **2 x M5 Button Head cap screws**. These can be undone by using a **3mm hexagonal Allen key** (Figure 8).

7.2 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 after having been isolated from the electricity supply. Let the product dry before reconnecting.

7.3 Warranty

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

8. Recycling and Disposal

Sunamp recommends that Thermino® products are being recycled. The PCM material is non-toxic and non-flammable and can be disposed of in line with local codes.

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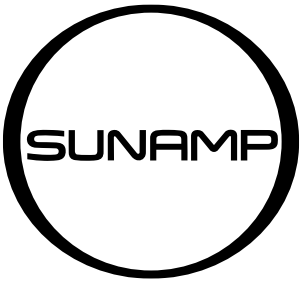

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