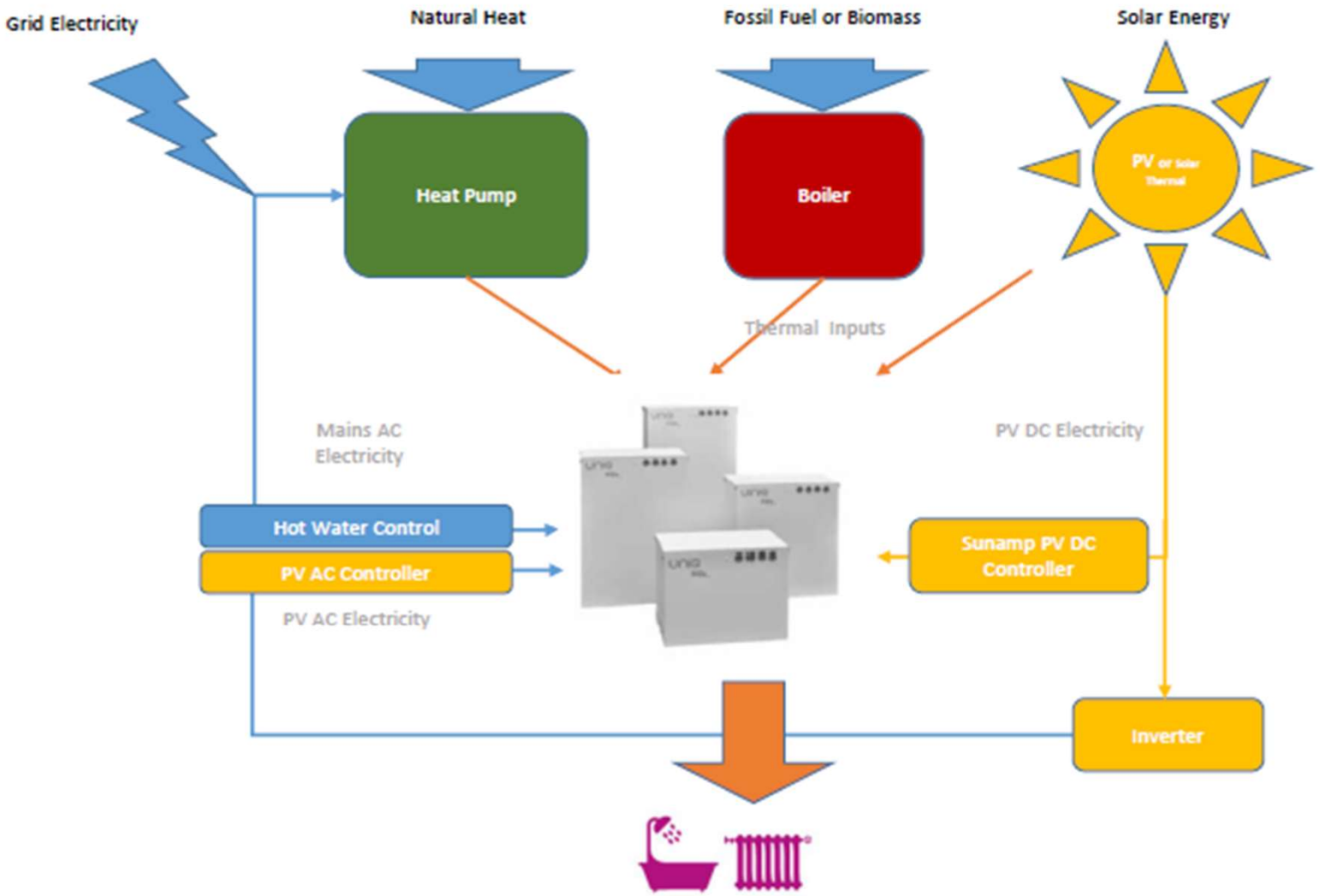
Sunamp Applications

The Product


Grid Electricity
Natural Heat
Fossil Fuel or Biomass
Solar Energy
Heat Pump
Boiler
PV or Solar Thermal
Thermal Inputs
Mains AC Electricity
PV DC Electricity
Hot Water Control
PV AC Controller
Sunamp PV DC Controller
PV AC Electricity
Inverter

Standing on the shoulders of giants

Sunamp

Sunamp

1762
Joseph Black becomes the first person to describe latent heat, marking the beginning of the study of thermodynamics.

1948
The Dover Sun House, designed by Maria Telkes to showcase the power of solar energy, includes a prototype of a PCM heat battery. The system fails after 3 years of successful operation due to instability of the PCM.

2006
Concerned about climate change and fuel poverty, Andrew Bissell creates Sunamp to reduce our reliance on fossil-powered heat and drive down fuel costs for everyone and files a first patent application.

2010
Sunamp begins collaboration with the University of Edinburgh School of Chemistry to advance its new thermal storage technology and quickly achieves the breakthrough that would have made the Telkes prototype reliable.

2013
The first Sunamp heat battery is installed in an Edinburgh home, heated by a heat pump the system delivers significant savings over the existing gas boiler to this day.

2016
Scottish Government funds EastHeat, the largest residential heat storage project in Europe, which saw Sunamp heat batteries installed in 650 homes, marking the beginning of mass production at Sunamp's factory.

2018
Sunamp launches the UniQ range of super compact heat batteries, the company's 3rd generation of phase change thermal storage units.

2019
Sunamp becomes the first heat battery manufacturer in the world to be awarded A Grade RAL Certification, the independent quality mark and only global standard for Phase Change Materials (PCM) and PCM products.

2020
The 10,000th heat battery is dispatched from Sunamp's factory in Scotland and the company's UK order book grows 67-fold in one year, despite economic disruption caused by the global pandemic.

The Future

Sunamp

PCM
Phase Changing Material

Phase Change Material Technology

Sunamp

Phase Change Materials (PCMs) are substances that absorb and release thermal energy during the process of freezing and melting

1761 - Joseph Black discovered latent heat at the university of Edinburgh

Early 1900s – Alan Tower Waterman wrote about PCMs at Yale University

2010 – Sunamp developed the first PCM heat battery, using Sodium Acetate

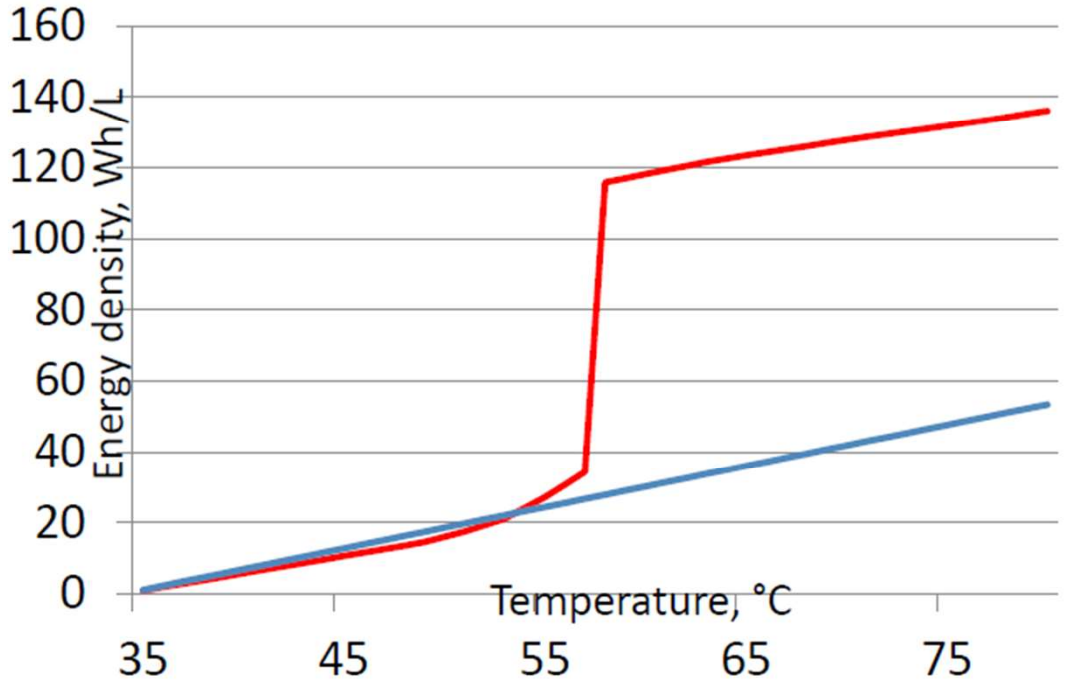
Sodium Acetate is readily available and in common use in dishwasher tablets and as a flavouring for salt and vinegar crisps. It is sustainable, can be recycled and has a very long life, we have tested to over 41,000 cycles

Sunamp has taken well developed and understood learnings from the past to create the products of the future

Phase Change Material Technology

Sunamp

Ice (phase change at 0°C)



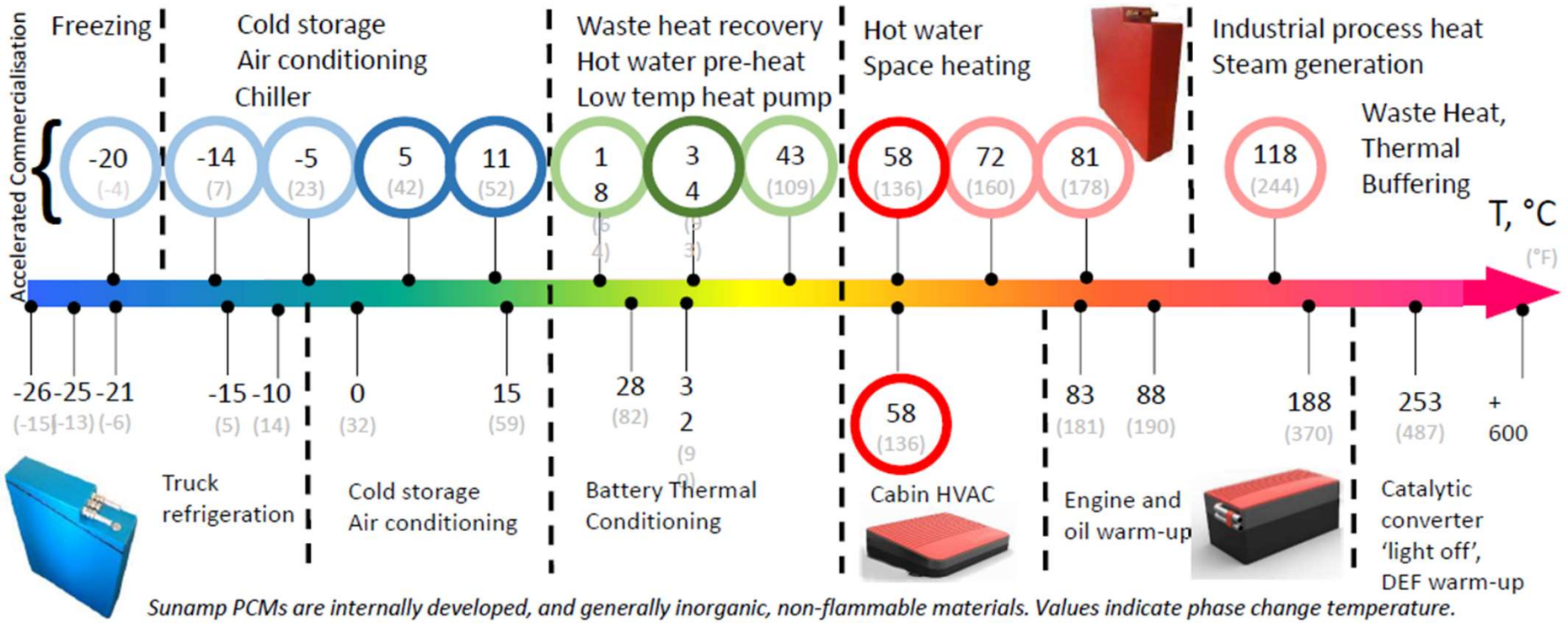
- **Sunamp Phase Change Material (PCM)**
- Stable – We can control how we charge and release
- High Energy density
- Non-flammable
- Sunamp have industrialised PCM energy storage for space heating and hot water

Hand warmer (melts at 58°C)

Wide Range of Storage Temperatures

Sunamp

Sunamp Heat and Cool Batteries can be filled with different PCMs to optimise each application



Sunamp PCMs are internally developed, and generally inorganic, non-flammable materials. Values indicate phase change temperature.
Operating temperature range typically 40 ... >100 °C (90 ... >200 °F) around phase change temperature - consult Sunamp.

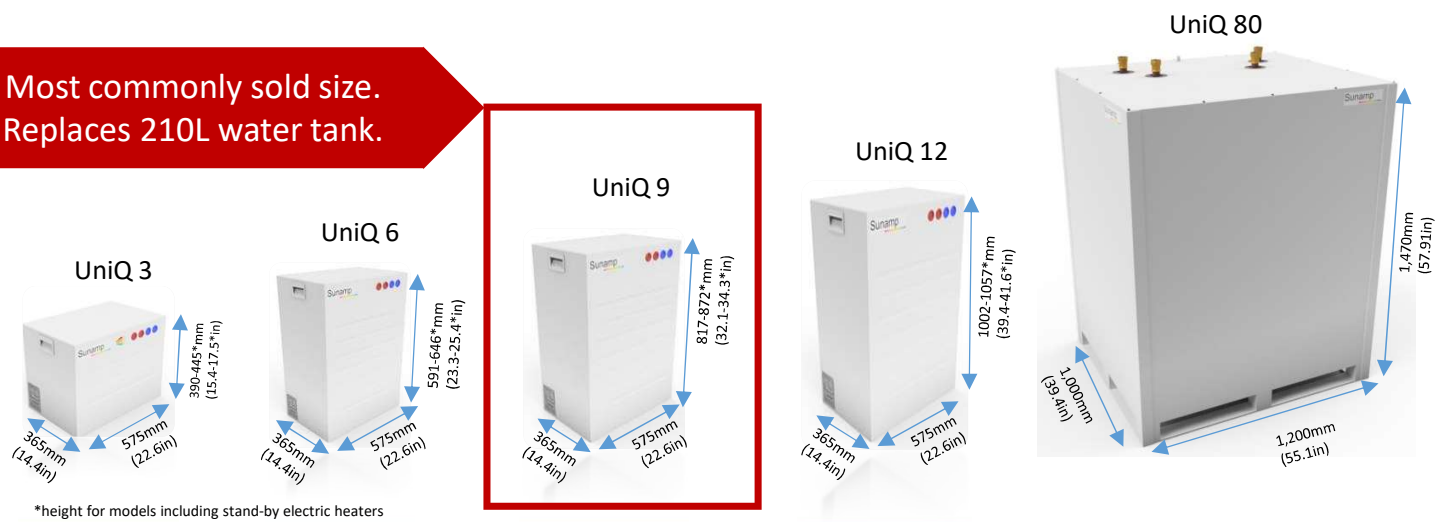
Current commercial products (Space Heat & Hot Water)

Near-term introduction (Q2 ... Q4 2019)

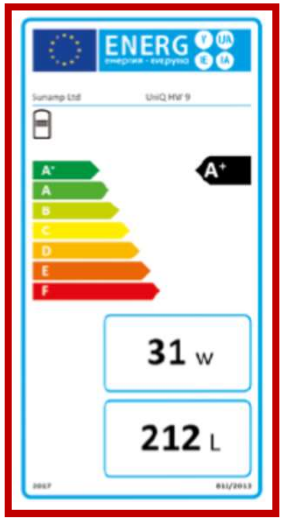
Note: PCMs at different level of development and not all commercially available today

Product Line (Residential, Commercial)

Most commonly sold size.
Replaces 210L water tank.



*height for models including stand-by electric heaters



Model Example	Measured kWh	Equivalent cylinder (L)	Heat Loss (kWh/24h)	Comments	ErP Rating
UniQ HW 3	3.5	70	0.449		A+
UniQ Heat 6	7	140	0.649	Stackable two high	A+
UniQ HW 9	10.5	210	0.738	for larger storage	A+
UniQ Dual 12	14	280	0.809		A+
UniQ Heat 80	90	1800	2.2 (provisional)	Palletised, 1.5 Tonnes	Non ErP

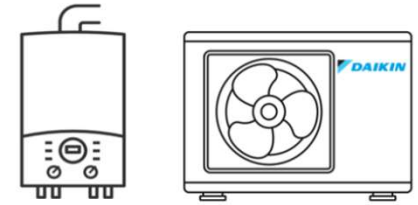
- Price comparable to hot water storage
- Lower installation cost
- Zero Routine Maintenance
- Lower Total Cost of Ownership

Published Worldwide PCT Applications:
WO 2009/138771, WO 2011/058383, WO 2014/202974,
WO 2014/195691, WO 2014/191778, WO 2015/025175, WO 2017/221025

Estimated Battery Size for Hot Water

How do I choose which model to purchase?

What will be the primary power source for your battery?



Heating boiler or High temperature Heat pump

Off Peak Grid Power and

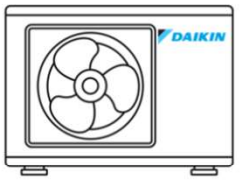
Photovoltaic System

Off Peak Grid Power only

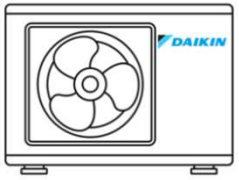
Heating boiler or High temperature Heat pump

Grid Power Back up

Photovoltaic System



Heating boiler or High temperature Heat pump



Low temperature Heat pump

Grid Power Backup

Product Overview

Sunamp

	Page No.	Heat Source: Grid Supply 24/7	Heat Source: Off Peak Timer/ Variable Tariff	Heat Source: PV	Heat Source: Boiler	Heat Source: Heat Pump	Use for: Hot Water	Use for: Heating
eHW	6–7	●	○				●	
HW	8–9				●	●[1]	●	
HW +i	8–9	○			●	●[1]	●	
eHW +iPV	10–11		○	●			●[3]	
HW +iPV	10–11			○	●	●[1]	●	
HW +iLTHP	12–13	○				●[4]	●	
Heat	14–15				●	●[1]		●
Heat +i	14-15	○			●	●[1]		●
CPSU Package[2]	16–17	○	●				●	●
HTHP Package[2]	16–17		●			●[1]	●	●

1 Only compatible with selected heat pumps.
Check product page or manual for more information.

2 These packages are only currently available for large scale development projects.
Contact Sunamp for information

3 Can be used as a pre-heat to suitable combi-boilers, reducing gas demand for hot water.

4 Compatible with selected R32 heat pumps from Samsung and Daikin.

● Primary Energy Source
○ Secondary / Optional / Back-up

Technical Spec

Sunamp

Without and with Immersion heater

Table 2.1. Overall dimensions and weights of UniQ heat battery range				
	Overall dimensions [mm]			Weight [1]
	Width	Depth	Height	[kg]
UniQ HW 3, UniQ Heat 3, UniQ Dual 3	365	575	410	55
UniQ HW 6, UniQ Heat 6, UniQ Dual 6	365	575	605	105
UniQ HW 9, UniQ Heat 9, UniQ Dual 9	365	575	815	155
UniQ HW 12, UniQ Heat 12, UniQ Dual 12	365	575	1,025	205
UniQ HW 3+i, UniQ HW 3+iPV, UniQ eHW 3, UniQ dPV 3	365	575	455	61
UniQ HW 6+i, UniQ HW 6+iPV, UniQ eHW 6, UniQ eDual 6	365	575	650	111
UniQ HW 9+i, UniQ HW 9+iPV, UniQ eHW 9, UniQ eDual 9	365	575	860	161
UniQ HW 12+i, UniQ HW 12+iPV, UniQ eHW 12	365	575	1,070	211
[1] The PCM in standard heat batteries has a phase transition temperature of 58°C				

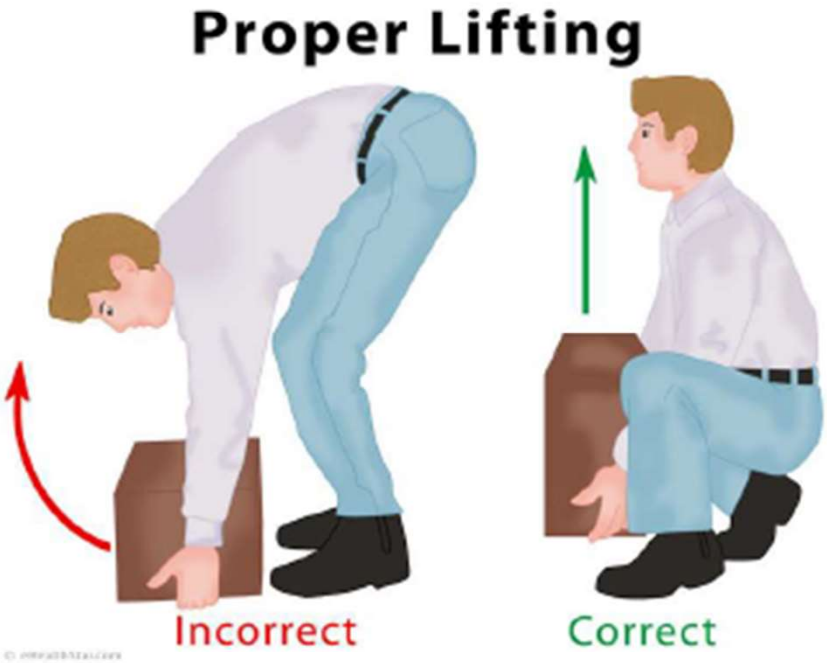
Technical Spec

Sunamp

Table 2.2: Technical specification of UniQ heat battery range					
		Size 3	Size 6	Size 9	Size 12
Storage capacity – Standard batteries with PCM58 [1]	[kWh]	3.5	7.0	10.5	14.0
Water content – Low power circuit (LPC) [3] Water content – High power circuit (HPC) [4]	[L] [L]	1.30 2.24	2.36 4.48	3.46 6.76	4.56 9.04
Equivalent hot water cylinder size [5]	[L]	71	142	212	284
V_{40}, Volume of hot water available at 40°C [6]	[L]	85	185	300	370
• Heat loss rate • Heat loss rate • ErP Rating class – Hot water storage vessel	[kWh/24h] [W] [-]	0.449 18.7 A+	0.649 27.0 A+	0.738 30.7 A+	0.809 33.7 A+
Recommended maximum HW flow rate	[L/min]	6	15	20	25
Minimum cold water supply pressure at inlet to the heat battery	[bar] [MPa]	1.00 0.10	1.50 0.15	1.50 0.15	1.50 0.15
Maximum working pressure: High power (HPC) and Low power (LPC) circuits	[bar] [MPa]	10.0 1.0	10.0 1.0	10.0 1.0	10.0 1.0
Pressure loss characteristics (See tables 2.3) ▪ K_V Value for the Low power circuit (LPC) ▪ K_V Value for the High power circuit (HPC)	 [-] [-]	 1.623 2.871	 1.255 2.356	 1.066 1.951	 0.963 1.451
Minimum heat source flow temperature [7]	[°C]	65	65	65	65
Maximum heat source flow temperature [8]	[°C]	85	85	85	85
Hot water outlet temperature at design flow rate [9]	[°C]	50 - 55	50 - 55	50 - 55	50 - 55
Heat battery controller • CC power supply rating at 230V, AC, 50Hz [10] • Electric heater supply rating at 230V, AC, 50Hz [11] • Standby power consumption – All models • Power rating of the heater at 230V, AC, 50Hz ('e' models only)	 [A] [A] [W] [W]	 6 16 7 2,800	 6 16 7 2,800	 6 16 7 2,800	 6 32 7 2,800

Weight caution !!

Sunamp



Battery stair climber available to rent can lift 300 kg up a stair case

Product Range

Sunamp

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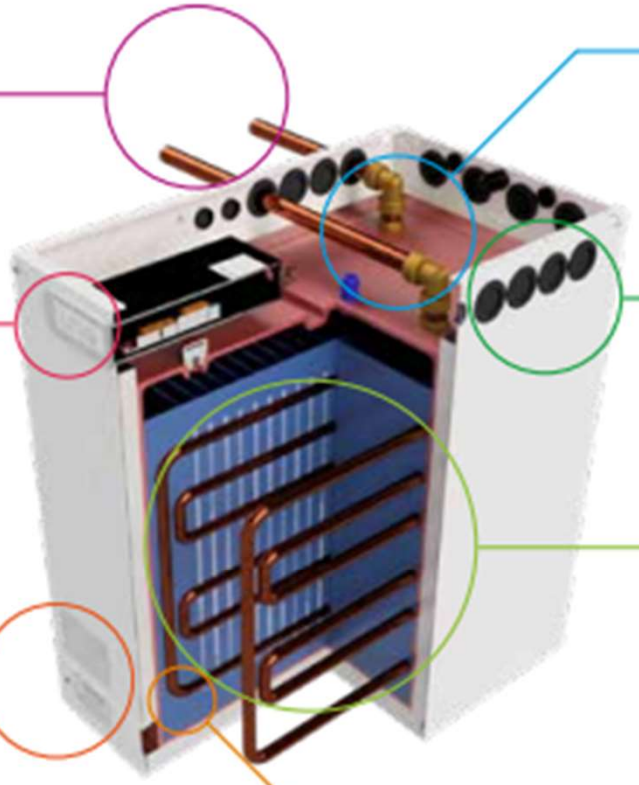
Works With Any Energy Source



Single and dual circuit models work with any energy source (electricity, PV, heat pumps and boilers)

Simple user interface shows heat battery state of charge and operation

Embedded heating element with 10 year warranty as a primary heat source or back-up

Quick and easy to install, with high quality brass push fit connectors supplied

Flexibility of orientation, with exits on three sides of the product

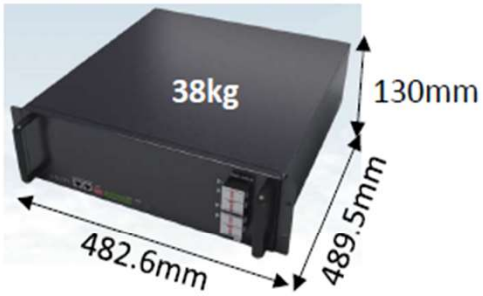
High powered heat exchanger for high quality, mains pressure showers

Sunamp's patented phase change material formulation – storing 4 x more energy than water

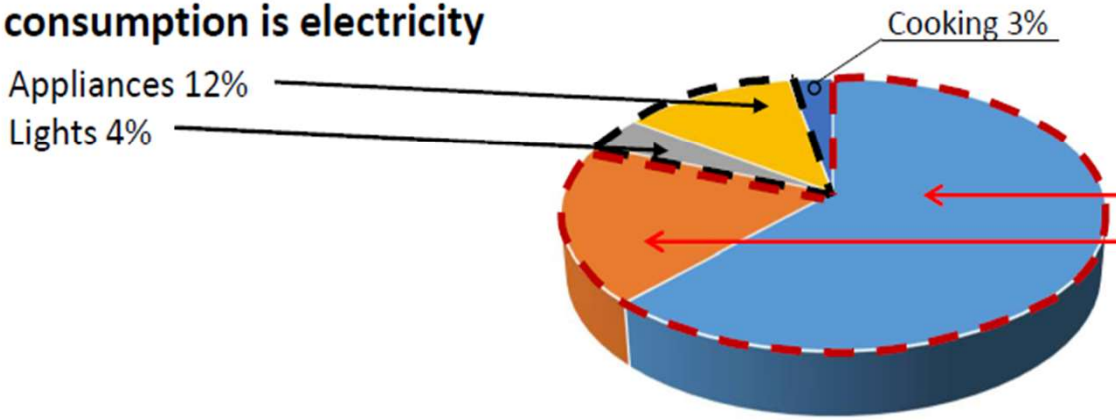
Electric Battery vs. Heat Battery

Sunamp

	BYD Lithium-ion battery	Sunamp Heat Battery
Volume	30.7dm^3	26.5dm^3
Energy	2.5kWh	2.5kWh
Power	2.5kW	35kW
Cycle life	6,000 cycle life (to 70% capacity)	>41,000 cycle life (to >95% capacity)



16% final household energy consumption is electricity



81% final household energy consumption is heat

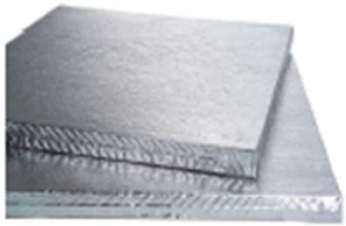
Space heating 62%

Hot water 19%

What is a heat Battery?

Sunamp

A high-powered, high flow-rate heat exchanger is immersed in phase change material and encapsulated in a red moulded, polypropylene cell



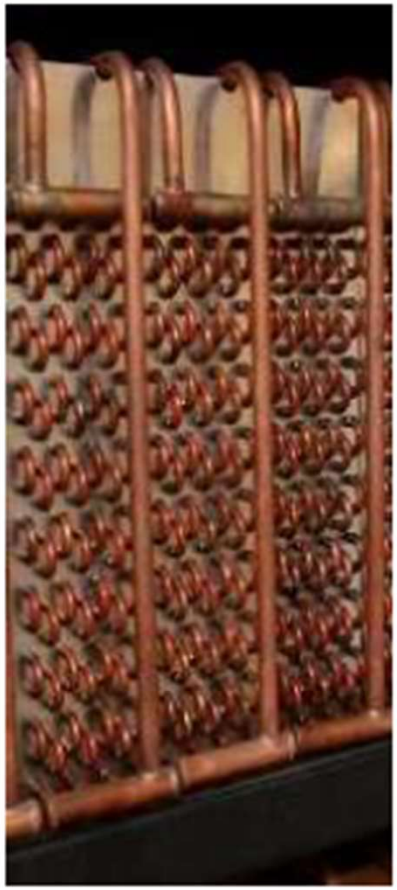
The red cell is surrounded by non-flammable vacuum insulation panels. These offer superior insulation, in minimal space. As a result the *whole* range is ErP A or A+ with SAP benefits

Finished in a cuboid, white powder-coated aluminium case, which offers pipework knockouts on any face for very easy installation

Our new factory facility enables us to ramp up our current production quickly

Heat Battery Cont.

Sunamp



High Energy Density

Melting and freezing a PCM (Phase Change Material) stores 3-4 times as much energy as heating up water

High Power

High power heat exchanger inside, so heat can be rapidly charged into the heat battery and equally quickly extracted – high rate discharge

Modular

Cuboid and able to stack like Lego®

Cost-Effective

Comparable price to Hot Water Tanks
High efficiency, low heat loss (A+)
Zero Routine Maintenance
Lower Total Cost of Ownership

The Heat Exchanger

Sunamp

Cylinders Vs Heat battery

Albin Trotter ATI E-305L

UniQ eHW 12

-71% in volume

Equal energy stored

Greater amount of usable hot water.

→ ½ →

½ in both height and depth

→ ½ →

Solar Input combination boiler

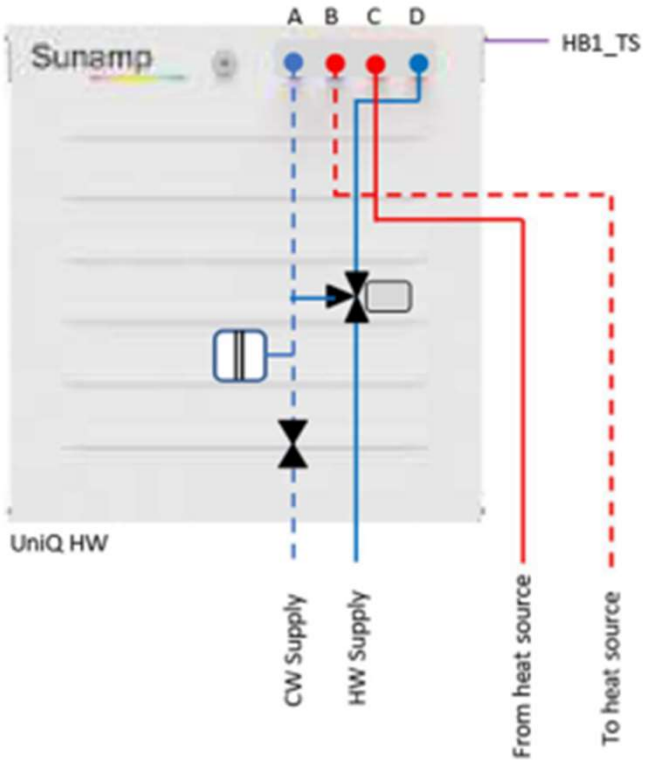
Sunamp

UniQ 3 under sink application

Sunamp

Drawings

Basic Hot water battery schematic drawing
The Heat Source would be either boiler or high temperature heat pump



Cold water mains = A
Hot water out = D
Boiler Flow = C
Boiler Return - B

Drawings

Sunamp

Secondary circulation or trace heating should be provided when the length of hot water pipe work and its water content becomes such that it would take an unreasonable length of time for hot water to reach the terminal fitting.

The Government guidance recommends that when opening a tap, or other outlet, the water should reach 50°C within 30 seconds.

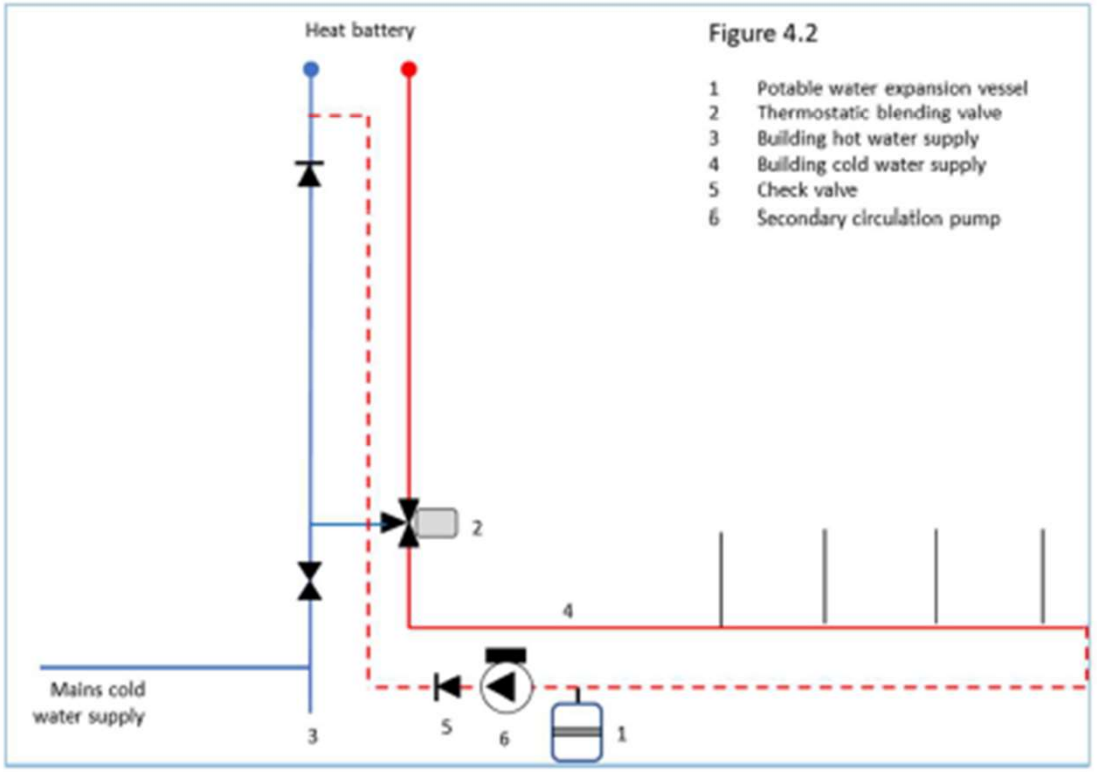


Figure 4.2

1 Potable water expansion vessel
2 Thermostatic blending valve
3 Building hot water supply
4 Building cold water supply
5 Check valve
6 Secondary circulation pump

Expansion vessel

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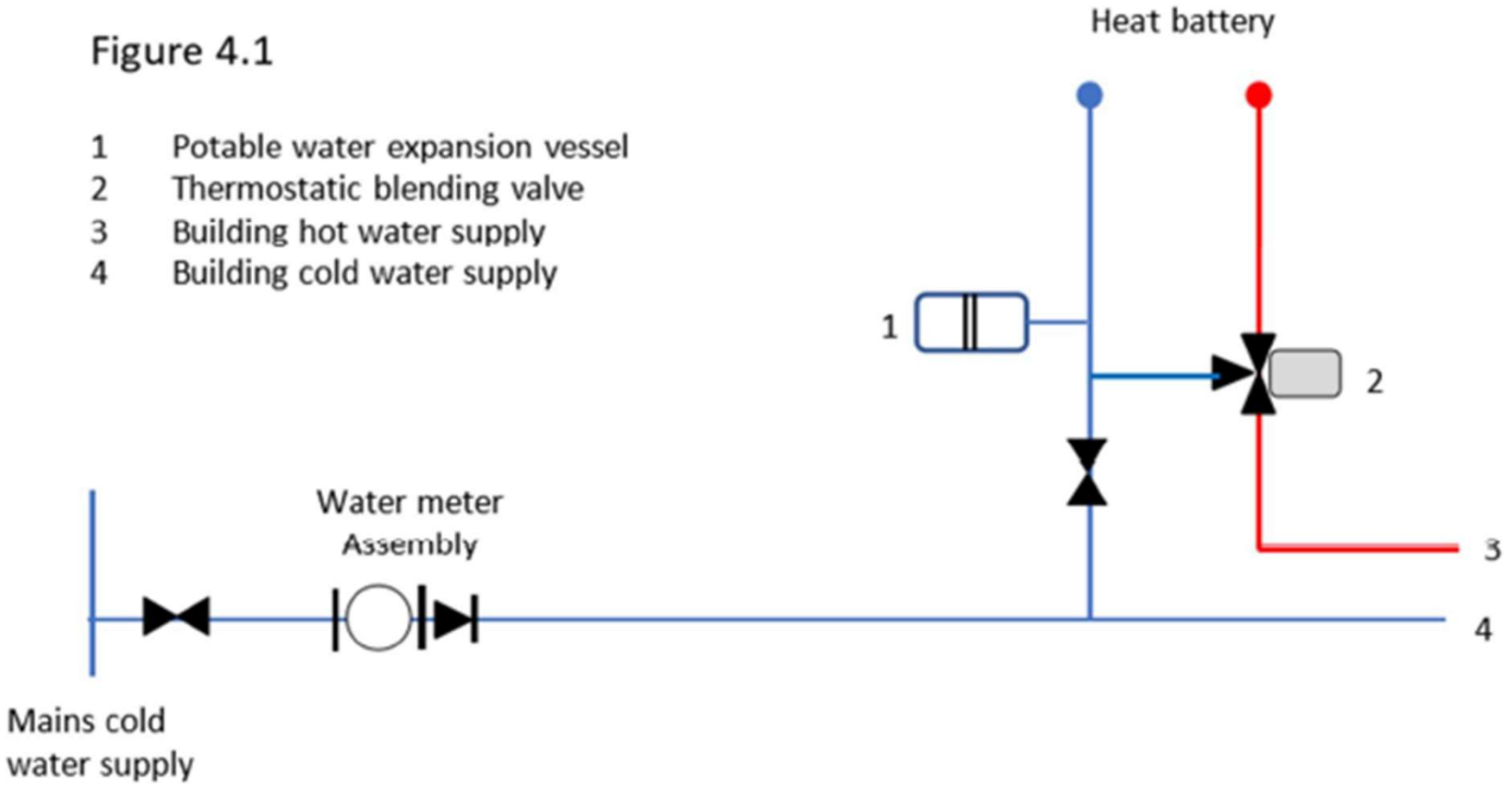
Unlike the vented and unvented cylinders, the hot water in the heat batteries is heated instantaneously on demand just like a gas combination boiler and the stored water content is very low (Less than 15 litres in most models – See technical specification section 4 in this manual). Therefore, the expansion vessel is not normally required.

Figure 4.1

1 Potable water expansion vessel
2 Thermostatic blending valve
3 Building hot water supply
4 Building cold water supply



Expansion vessel

Sunamp

However, the expansion vessel should be sized and fitted as shown schematically in figure 4.1 if the cold water mains coming into the building is fitted with a non-return valve which would prevent the water from the heat battery expanding back into the cold water mains during the heating phase.

The expansion vessel for the DHW heating batteries can be sized using equations 1 – 3.

$VE = (VHB \times EC) / (1 - P1/P2)$ ----- [1]

$P1 = PI + 1.014$ ----- [2]

$P2 = PF + 1.014$ ----- [3]

Where

VE = Total volume of the expansion vessel, [L]

VHB = Water content of the heat battery circuit used for DHW heating - From technical data tables, [L]

EC = Hot water expansion factor for standard heat batteries, EC = 0.03

P1 = Absolute initial expansion vessel charge pressure, [bar]

P2 = Maximum absolute working pressure of the heat battery water circuit, [bar]

PI = Initial expansion vessel charge pressure = CW mains pressure, [bar]

PF = Maximum working pressure of heat battery water circuits = 10.0, [bar]

General requirements

Sunamp

General requirements

1. Minimum dynamic mains water supply pressure = 1.5bar
2. Maximum dynamic mains water supply pressure = 10.0bar
3. Minimum mains cold and hot water pipe sizes (Up to UniQ HW 9, UniQ Dual 9 models) = 22mm copper or equivalent
4. Minimum mains cold and hot water pipe sizes (Above UniQ HW 9, UniQ Dual 9 models) = 28mm copper or equivalent
5. Expansion vessel charge pressure (If fitted) = Incoming mains pressure (bar) .
6. Pipe connections – All model in this range: 22mm copper.
7. The UniQ batteries are not suitable for tank fed hot water systems.

Hot water blending/mixing valve is required on the Uni-Q HW models, as the battery start temperature will be over 65°C

We recommend a 35°C - 65°C valve

Hard Water

Sunamp

In hard water areas 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 to reduce the rate of accumulation of limescale.
The limescale can be controlled using one of the following devices:

a) Chemical limescale inhibitors
b) Polyphosphate dosing
c) Electrolytic scale reducers
d) Water softeners

Charge with

Heat pump

Electric back-up

Use for

Hot Water

Energy Label

A+

UniQ HW +iLTHP

- Optimised controls for operation with selected R32 low temperature heat pumps
- Currently compatible with Daikin Altherma 3 & Samsung Generation 6 models listed below
- HP performance, in a quarter of the space

		UniQ HW +iLTHP Heat Battery			
		Size 3	Size 6	Size 9	Size 12
Samsung Heat Pumps	AE050RXYDEG/EU + MIM-E03CN	✓	✓	✓	✓
	AE080RXYDEG/EU + MIM-E03CN	✓	✓	✓	✓
	AE120RXYDEG/EU + MIM-E03CN	✓	*		
Daikin Heat Pumps	ERGA04DVA + EHBH04D6V	✓	✓	✓	✓
	ERGA06DVA + EHBH08D6V	✓	✓	✓	✓
	ERGA08DVA + EHBH08D6V	✓	✓	✓	*

Table 10: Sunamp Heat Battery, Samsung & Daikin Heat pump product compatibility

*Contact Sunamp for further information

Type	Order Code
UniQ HW 3 +iLTHP-DN	DGP-EDW-AYZ
UniQ HW 6 +iLTHP-DN	DKP-EDW-AYZ
UniQ HW 9 +iLTHP-DN	DNP-EDW-AYZ
UniQ HW 12 +iLTHP-DN	DRP-EDW-AYZ
UniQ HW 3 +iLTHP-SG	DGP-ECW-AXZ
UniQ HW 6 +iLTHP-SG	DKP-ECW-AXZ
UniQ HW 9 +iLTHP-SG	DNP-ECW-AXZ
UniQ HW 12 +iLTHP-SG	DRP-ECW-AXZ

UniQ +iLTHP Heat battery

Sunamp

1.1 Intended Use

The intended use of the **UniQ HW +iLTHP** range of products is for the provision of hot water for domestic purposes by means of using a low temperature heat pump as a main heat source. The heat battery can also be electrically charged when receiving a boost signal from the Low Temperature Heat Pump. Its internal element will also operate as an automatic backup if the heat pump is not able to deliver a satisfactory high temperature to charge the heat batteries (Note: Only if Link 3 is present (Factory Setting)).

This range of products is **NOT** intended for direct connection of the heat batteries with PV systems.

The Sunamp Ltd **UniQ HW +iLTHP** Heat Batteries are:

- Designed to produce domestic hot water heating by using a Low Temperature Heat Pump as a main source of heat, the range of heat batteries have a standby heating element built in to act as a backup if the main heat source fails.
- Equivalent to indirectly heated hot water cylinders and hot water only thermal stores.
- Able to replace indirect vented and unvented hot water cylinders for heat pumps.
- 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.
- Class I stationary appliances that use a single-phase electrical supply.

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

UniQ +iLTHP Compatibility

Sunamp

Product Compatibility

For the correct operation of the Sunamp heat batteries with the Samsung and Daikin Low Temperature heat pumps, please ensure that the correct combination displayed in (Table 10) below is used.

		UniQ HW +iLTHP Heat Battery			
		Size 3	Size 6	Size 9	Size 12
Samsung Heat Pumps	AE050RXYDEG/EU + MIM-E03CN	✓	✓	✓	✓
	AE080RXYDEG/EU + MIM-E03CN	✓	✓	✓	✓
	AE120RXYDEG/EU + MIM-E03CN	✓	*		
Daikin Heat Pumps	ERGA04DVA + EHBH04D6V	✓	✓	✓	✓
	ERGA06DVA + EHBH08D6V	✓	✓	✓	✓
	ERGA08DVA + EHBH08D6V	✓	✓	✓	*

Table 10: Sunamp Heat Battery, Samsung & Daikin Heat pump product compatibility

*Contact Sunamp for further information

Accessories and Parts

Part Number	Description
C5388	Thermostatic Mixing Valve (TMV)
C5034	Expansion Vessel 0.5L
C5381	Water conditioner
C5377*	22mm Tectite Pro Elbow TX12 65524
C5379	22mm Tectite Pro Tee TX24 65676
C5412*	Conex BM8090 0220000 22mm >B< Push elbow
A1135	Daikin Low Temperature Heat Pump Connection Kit Consisting of: - C2291 - Relay Interface, Easy Relay 240VAC - C2292 - Back box - C2293 - Daikin X13A connector Booster cable - C2294 - Daikin X9A connector Tank sensor cable - C2295 - 2 Core 0.5mm² Cable - C2296 - M12 Cable gland (x2)
A1136	Samsung Low Temperature Heat Pump Connection Kit Consisting of: - C2291 - Relay Interface, Easy Relay 240VAC - C2292 - Back box - C2295 - 2 Core 0.5mm² Cable - C2296 - M12 Cable gland (x2)

Table 5: Accessories.

* 4 x C5377 or C5412 and A1135 or A1136 are supplied with the product as standard.

UniQ +iLTHP external overview

Sunamp

Sunamp

2.2 Product Overview

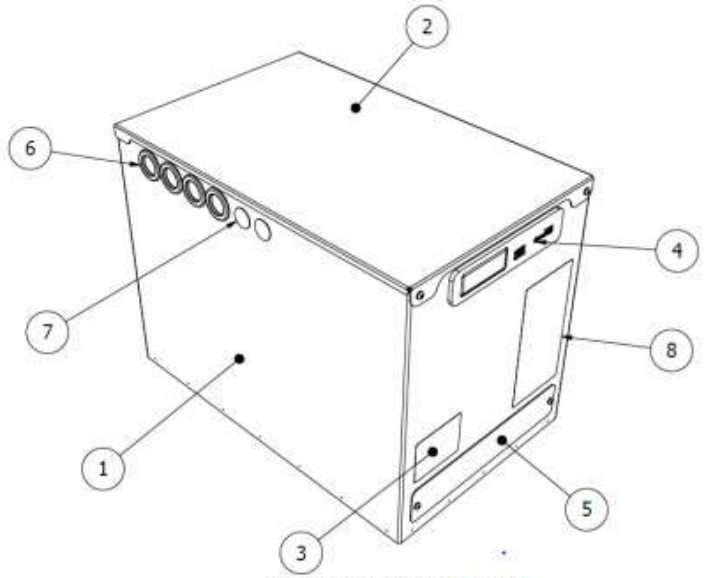


Figure 1: Heat Battery (external)

Item	Description
1	Heat Battery – main body
2	Heat Battery – lid
3	Data badge / serial number
4	Controller interface
5	Terminal cover plate
6	Tube entries (3 sides)
7	Cable entries (3 sides)
8	Energy label – to be applied by installer (if applicable)

Table 1: Product overview (external)

UniQ +iLTHP internal overview

Sunamp

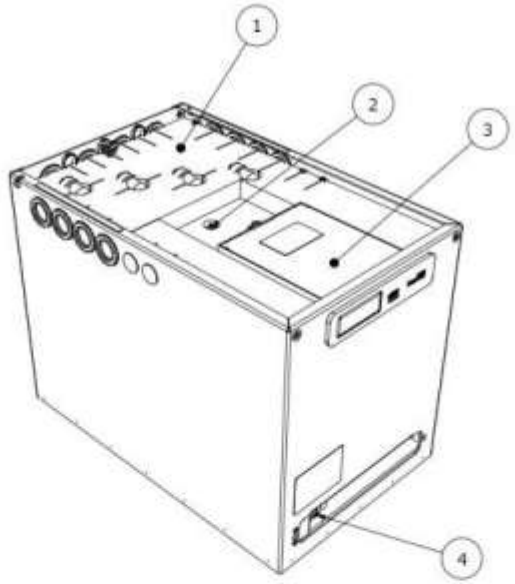


Figure 2: Heat Battery (internal)

Item	Description
1	Insulation layers – to be cut to suit copper tube and cable entries
2	Temperature sensor
3	Electrical control box – PCB, relays, terminal block
4	Non-self-resetting overheat thermostat (OHT)

Table 2: Product overview (internal)

LED user interface

Sunamp

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2.3.1 LED Interface

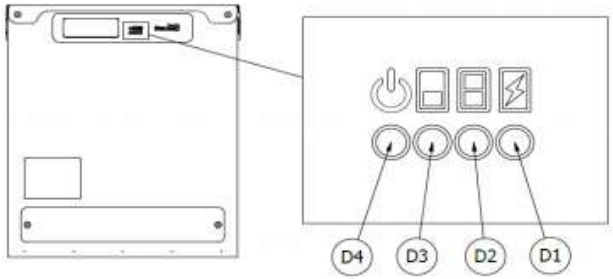

Figure 4: LED interface

Item	Description
D4	Mains power LED
D3	Charge level status LED
D2	Charge level status LED
D1	Heater 'Active' LED

Table 4: LED interface

2.4 Accessories and Parts

Part Number	Description
C5388	Thermostatic Mixing Valve (TMV)
C5034	Expansion Vessel 0.5L
C5381	Water conditioner
C5377	22mm Tectite Pro Elbow TX12 65524 (see note)
C5379	22mm Tectite Pro Tee TX24 65676
C5412	Conex BM8090 0220000 22mm >B<Push elbow

Table 5: Accessories

Note: 2 x C5377/C5412 are supplied with the product as standard. Visit our website (www.sunamp.com) for all the latest accessories and spare parts.

+iLTHP operations

Sunamp

5 Operation

Always read the safety instructions in Section 1 of the manual before operating the **UniQ eHW** Heat Batteries.

5.1 Switch On/Off

Power is supplied to the Heat Battery via the 2-pole Isolator Switch. The Heat Battery will remain in operation whilst it is connected to the mains. The Heat Battery will switch off if you disconnect it from the mains.

5.2 LED Indicators and Status

LED Indicators are available to observe the status of the UniQ eHW Heat Battery installed.

	Status	Meaning
	OFF	Power OFF
	ON	Power ON
	Pulsing	Heat Battery charging from 0 - 50%
	ON	Heat Battery charge level >50%
	Off	Heat Battery charge level 0 - 50%
	Pulsing	Heat Battery charging from 50 - 100%
	Solid	Heat Battery charge level 100%
	Off	Heating element INACTIVE
	Solid	Heating element ACTIVE

Table 17: LED indicators

UniQ +iLTHP heat battery spec.

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2.5.2 Detailed Specifications

Specification		Size 3	Size 6	Size 9	Size 12	See Note
Heat Storage Capacity (kWh)	Hot Water Heating with Low Temperature Heat Pump	3.2	6.3	9.5	12.6	1
Water Content (L)	LPC (C→B)	1.3	2.4	3.5	4.6	2
	HPC (A→D)	2.3	4.5	6.8	9.1	
	Combined	3.6	6.9	10.3	13.7	
Equivalent Hot Water Cylinder Size (L)		65	128	192	256	3
V_{40}, Volume of Hot water available at 40°C (L)		78	167	271	333	4
Standby heat loss rate (kWh / 24h (W))		0.48 / (20)	0.67 / (28.1)	0.77 / (32.1)	0.84 / (34.9)	
ErP Rating class		A+				6
Recommended maximum HW flow rate (L/Min)		6	15	20	25	
Minimum heat source flow temperature (°C)		65				7
Maximum heat source flow temperature (°C)		80				8
Minimum mains supply pressure at inlet of Heat Battery (MPa / (Bar))		0.15 / (1.5)				
Maximum working pressure (MPa / (Bar))		1.0 (10)				
Pressure loss characteristics K_V Values		Figure 6.1 & 6.2 (Section 2.6)				
Hot water outlet temperature at design flow rate (°C)		45-55				5
Back-up Heater - Connected load at ~ 230 V, 50Hz (W)		2,800				
Power supply / Standby consumption (W)		1 PH ~ 230 V / 7				

Table 8: Detailed specifications for **UniQ HW +iLTHP** Heat Battery models

Typical +iLTHP Daikin schematic

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3.8.3 Controller Wiring Schematic and Diagram

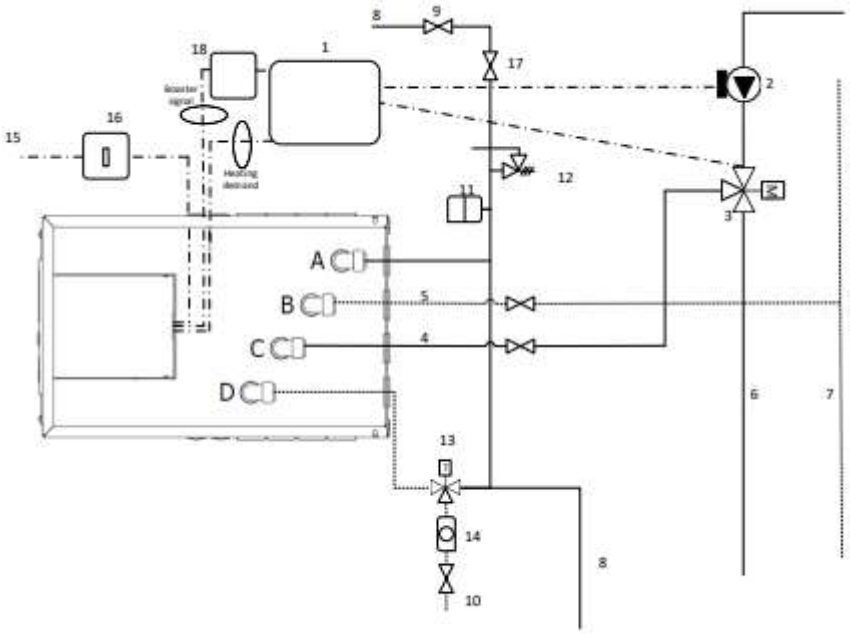


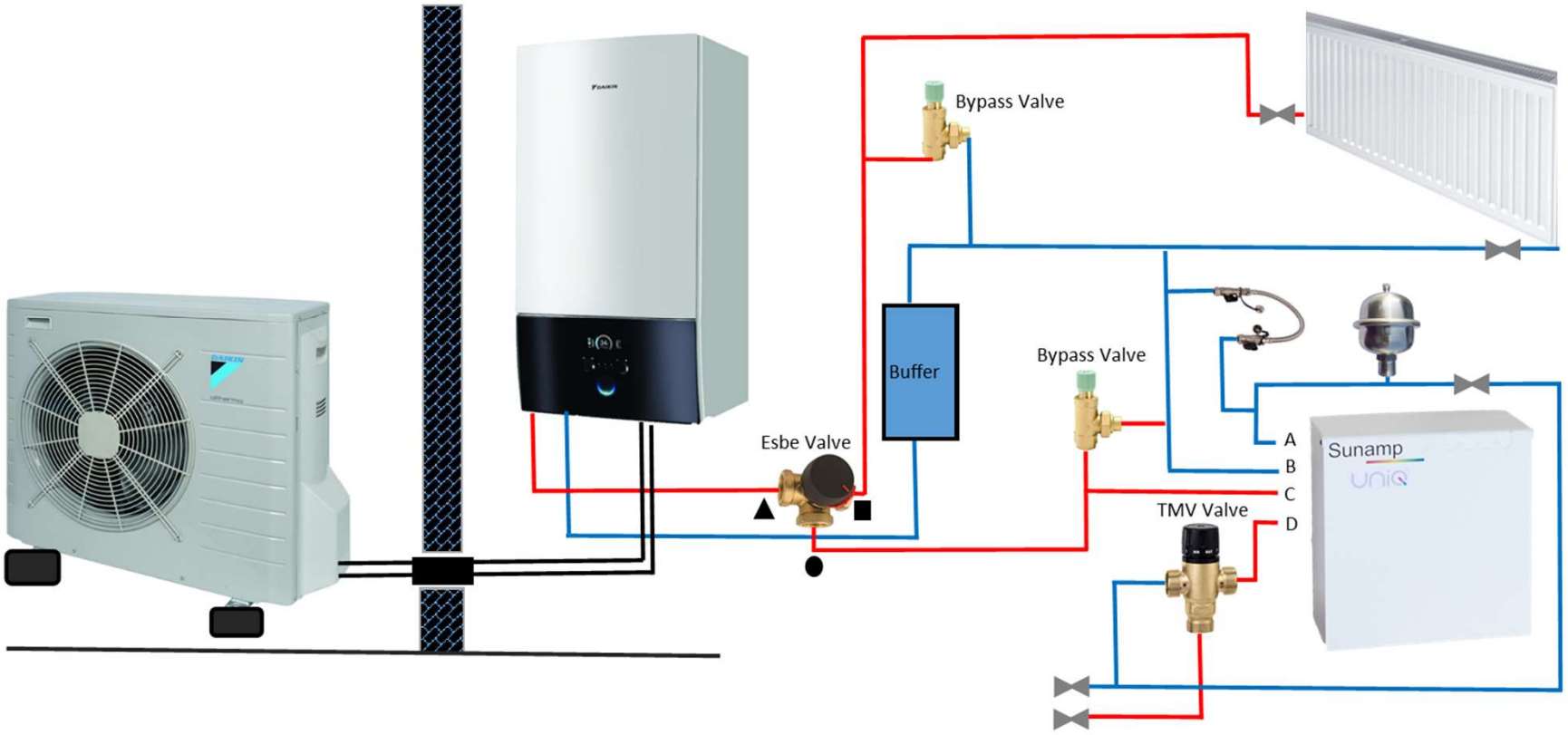
Figure 13.1: Example Wiring Option 2 Schematic (see Figure 3 for piping and electrical options available)

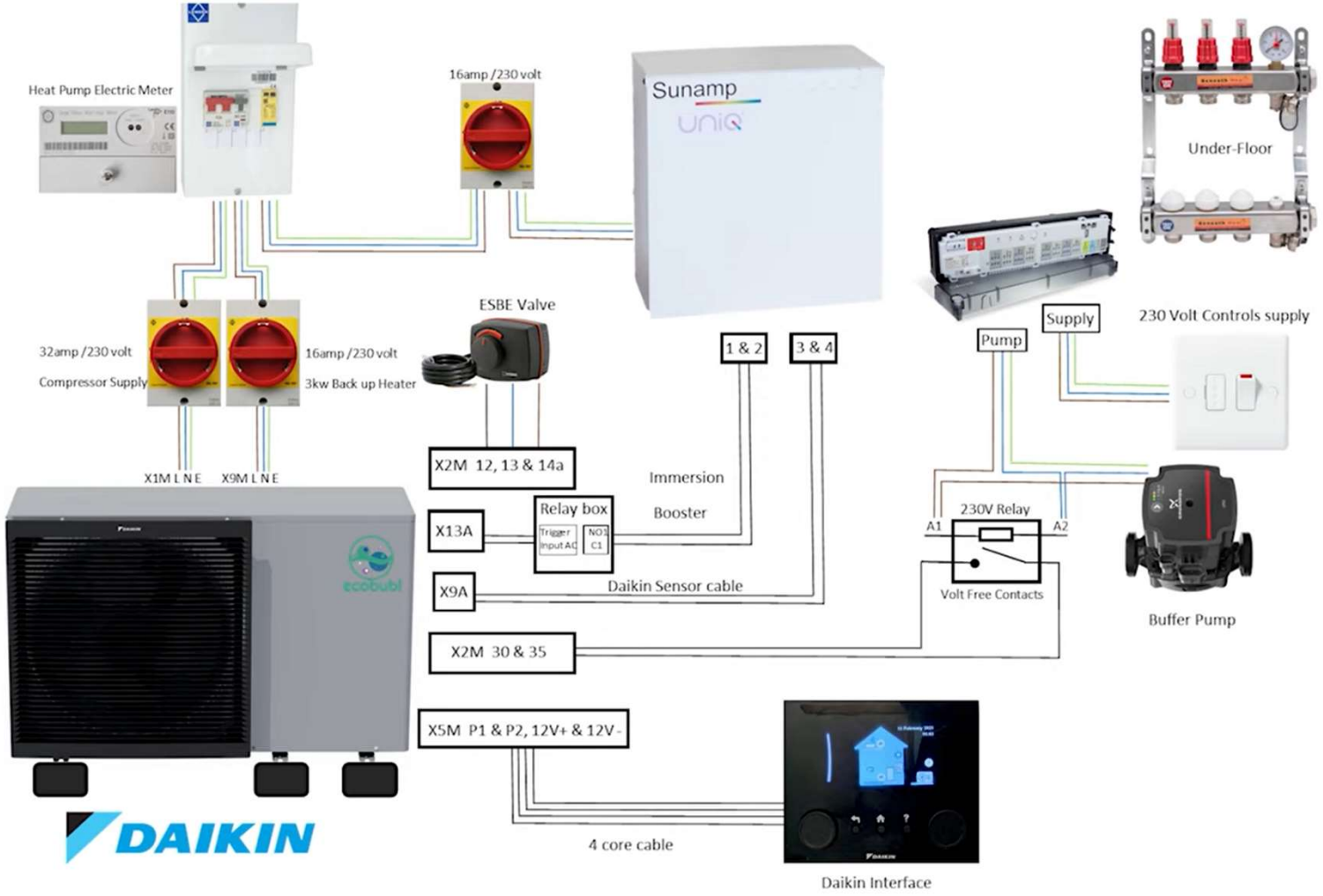
Item	Description				
1	Daikin Indoor Unit "*EHBH04/8D6V*" Heat Pump Controller	7	Central Heating Return	13	Hot Water Thermostatic Blending Valve
2	Circulation pump	8	Mains Cold Water Supply	14	Hot Water flow regulator
3	Motorised Three port Valve	9	Check Valve	15	230VAC 16 A power supply
4	Flow from Heat Pump	10	Hot water supply to dwelling	16	Local 2-pole isolator, 13A
5	Return to Heat Pump	11	Expansion Vessel	17	Cold Water Mains Pressure regulator
6	Central Heating Flow	12	Mains Water Expansion Relief Valve	18	Relay box

Table 16.3: Explanation of components

Refrigerant Split wall mounted unit.

Heats Ecobubl offices and Sunamp battery for WC hot water




Heat Pump Electric Meter
16amp /230 volt
Sunamp
uniQ
Under-Floor
32amp /230 volt
Compressor Supply
16amp /230 volt
3kw Back up Heater
ESBE Valve
1 & 2
3 & 4
Pump
Supply
230 Volt Controls supply
X1M L N E
X9M L N E
X2M 12, 13 & 14a
Immersion
Booster
Relay box
Trigger Input AC
NO1
C1
X13A
230V Relay
A1
A2
X9A
Daikin Sensor cable
Volt Free Contacts
Buffer Pump
X2M 30 & 35
X5M P1 & P2, 12V+ & 12V-
4 core cable
Daikin Interface
ecobuild
DAIKIN

Pressure Loss Characteristics

The primary circuit of the heat battery is connected to the heat pump flow and return as shown schematically in (Figure 6.3). The primary circuit design flow rate will depend upon the thermal rating of the heat pump and the design temperature difference. For a typical system, the primary flow rates are given in (Table 9), Primary flow rate in the heat battery charging circuit should be set to give around 7°C temperature difference to minimise flow rates.

Thermal output of the heat pump (kW)	**4.0**	**6.0**	**8.0**	**10.0**
Primary flow rate at 7.5°C design temperature difference (l/min)	7.6	11.6	15.2	19.2

Table 9: UniQ HW +iLTHP Heat Battery Primary circuit flow rate

The corresponding values for the pressure loss through the primary heat pump circuit can be read in (Figure 6.2).

The secondary circuit of the heat battery is connected to dwelling hot water circuit as shown schematically in (Figure 6.3). The pressure loss values can be read in (Figure 6.1).

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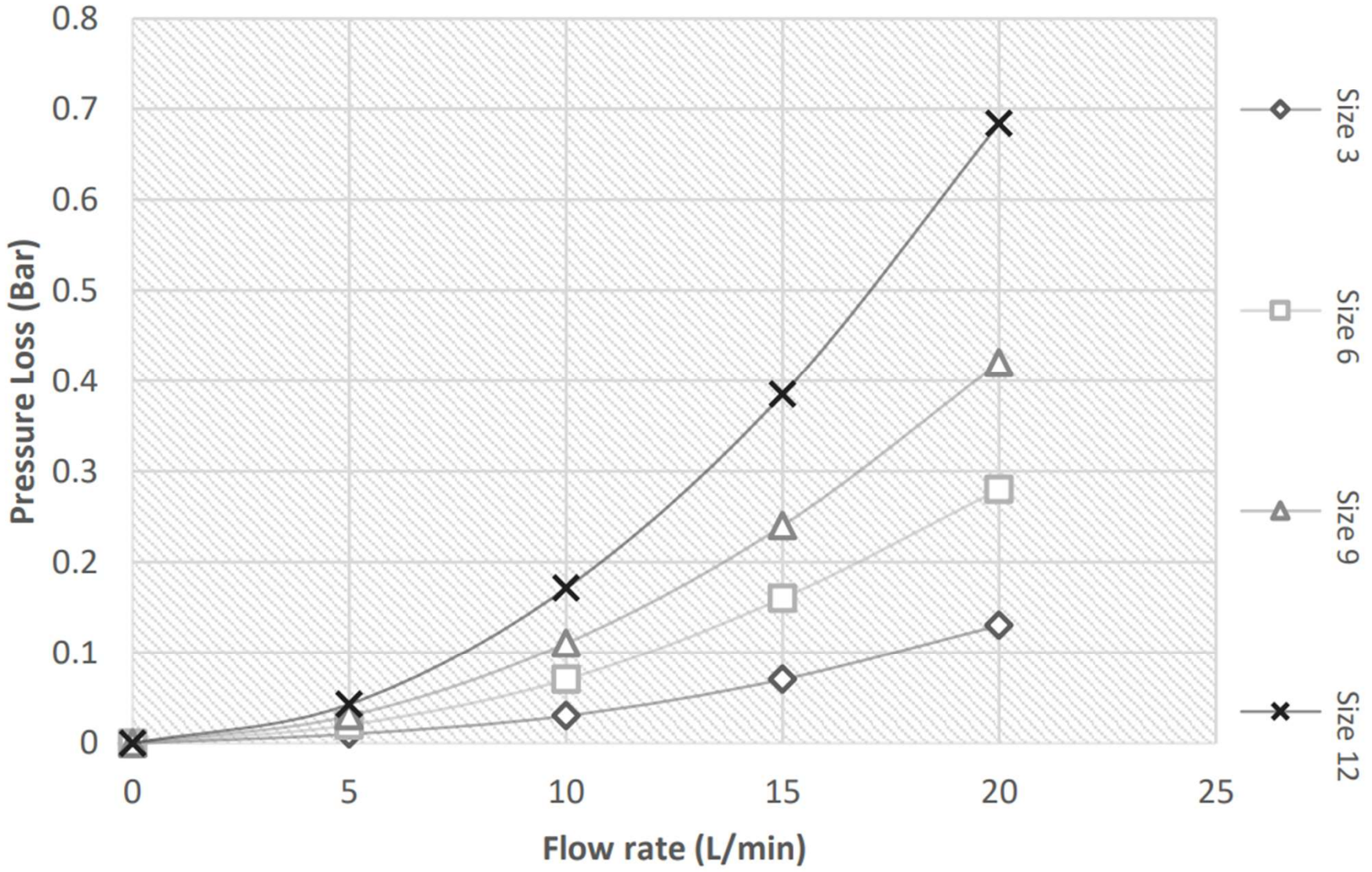
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Pressure Loss (Bar)
0
5
10
15
20
25
Flow rate (L/min)
Size 3
Size 6
Size 9
Size 12

+iLTHP Daikin electrical requirements

Sunamp

3.8 Wiring Option 2 – HW +iLTHP Daikin Low Temperature Heat Pump

Important: Please follow (Table 16.1) for information regarding the Links.

Link specification	Removed or Fixed
Link 1	Fixed (Factory setting)
Link 2	Fixed (Factory setting)

Table 16.1: Wiring option 2 – Link settings

Link 3 will be provided fixed within the product; this can be removed to meet the functionality required in (Table 16.2). Please isolate the electrical power to the unit if the Link requires removal.

Link specification	Removed or Fixed	Functionality
Link 3	Fixed (Factory setting)	Back-up timer function enabled (heat battery will charge electrically after a 45 minute delay timer has run out and heat demand is still present)
	Removed	Removes delay timer function, internal element operation is now only controlled by the heat pump controller

Table 16.2: Wiring Option 1 – Link 3 setting

- Link 1 & Link 2 are not to be removed, as this will lead to malfunction of the Heat Battery.
- Run and connect 3 Core mains power supply cable (16A, minimum 2.5mm^2 CSA) from the local 2-pole isolator 13A to the Heat Battery controller (Figures 13.1 and 13.2).
- Wire the cable via the appliance case cabling grommets and then into the control box housing through the hole available (Figures 8, 12.1 and 12.2).
- Prepare if necessary, the mains power cable and wire in the following terminals (Figure 10):
    - **Brown (Live):** Terminal L1 (Live)
    - **Blue/Grey (Neutral):** Terminal N1 (Neutral)
    - **Green/Yellow (Earth):** Terminal PE (Protective Earth)

3.8.1 Booster signal wiring

- Using the cable assembly provided (C2293), plug the connector end in the Daikin Indoor unit "*EHBH04/8D6V*" controller PCB plug terminal X13A (please refer to Heat pump manual). Then run the cable out of the Daikin indoor unit and into the relay box (C2291) provided into "TRIGGER INPUT AC" terminals (please refer to relay box instruction sheet). Then wire the 2 core PVC insulated cable provided (C2295) from the relay box terminals "NO1" & "C1" to the heat battery, into the control box housing through the hole available. Secure the cables in Terminal T1 & T2 independently (Figure 13.2). Please note that the polarity of the wires is not important in this wiring setup. Please ensure to use the provided relay backbox (C2292) & 2 x Cable grommets (C2296) when running the wires into the relay box.
- **Note:** Engaging this booster signal on the heat pump controller will put the Heat Battery into electric charging mode. This can lead to increased electricity consumption, resulting in higher energy costs. This should be explained to the end user.

3.8.2 Heat Pump sensor cable wiring

Using the cable assembly provided (C2294), place the connector end in the Daikin indoor unit controller "*EHBH04/8D6V*" PCB connector "X9A" (please refer to Heat Pump manual) , then run the wire into the appliance via the appliance case cabling grommets and then into the control box housing through the hole available. Secure the cables in Terminals T3 & T4 independently (Figure 13.2).

+iLTHP Daikin controller wiring

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3.6.2 Controller Wiring Diagram

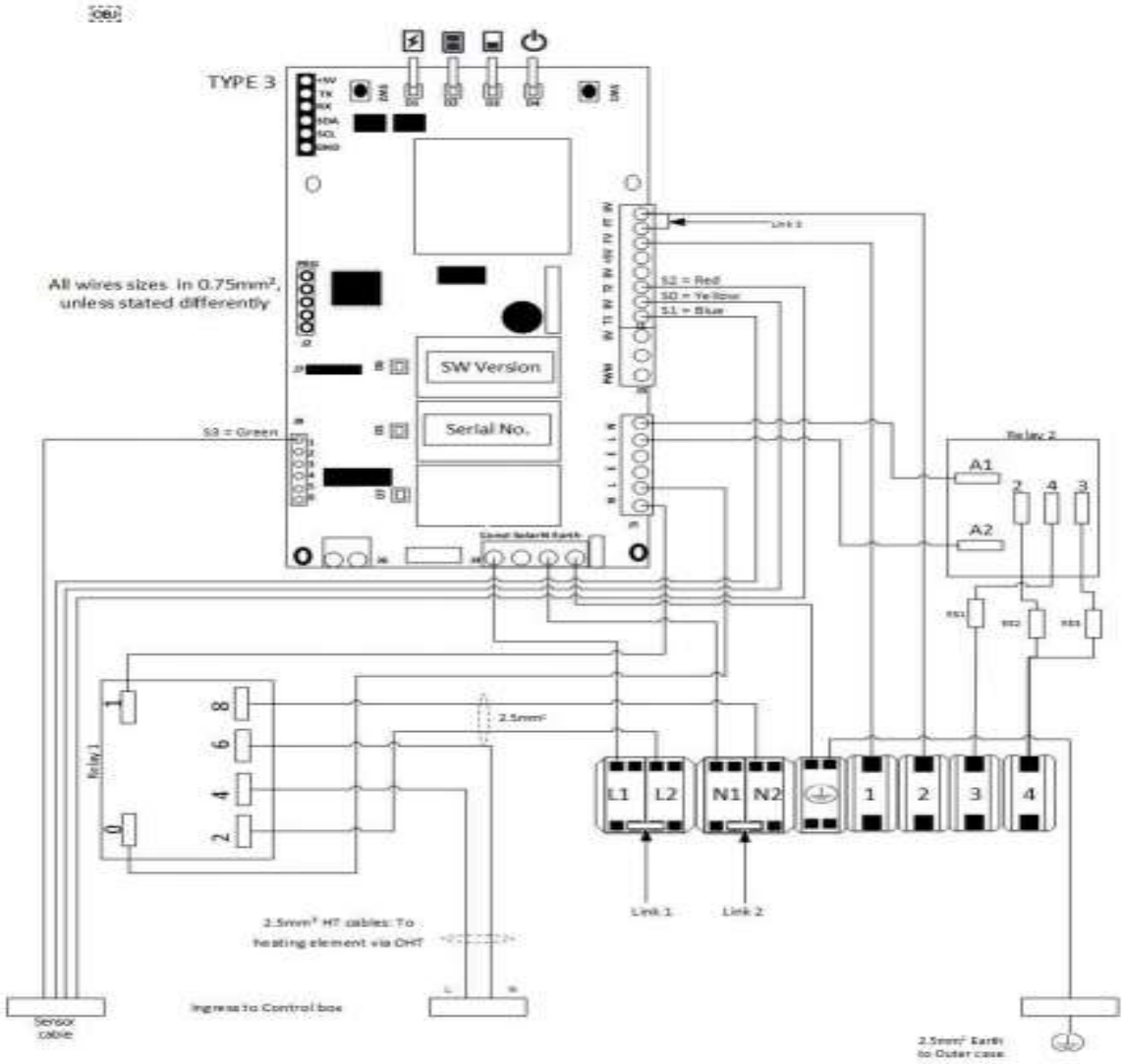

Figure 11: Internal controller wiring diagram (wire sizes=0.75mm², unless stated otherwise)

+iLTHP Daikin controller wiring

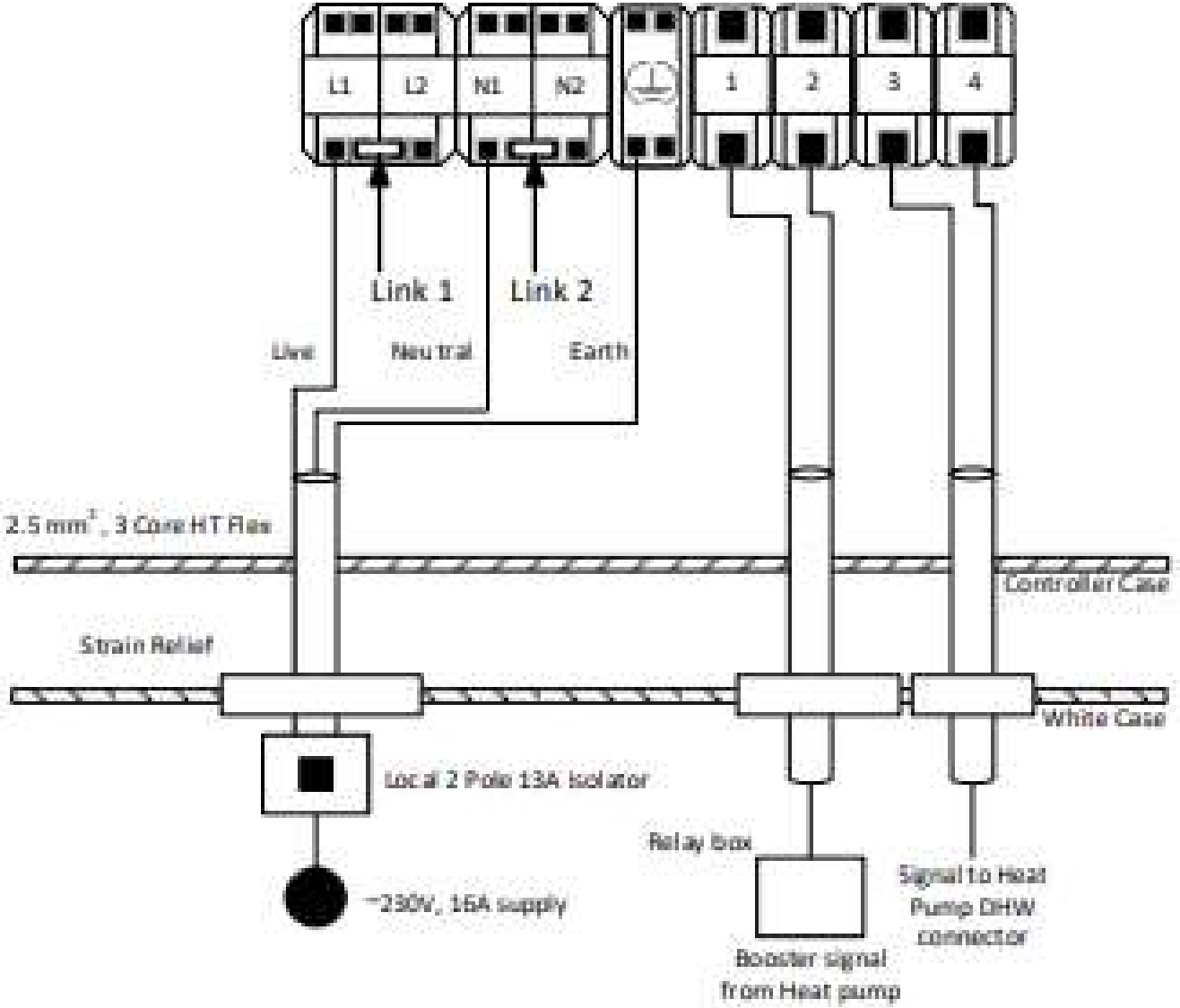

Figure 13.2: Wiring Option 2 – HW +iLTHP Daikin Low Temperature Heat Pump

4 Commissioning

⚠ Before commissioning works, 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.

4.1 Preparation

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

4.2 Process

1. Turn on the water supply and ensure that there are no leaks.
2. Fully open any hot water taps in the dwelling and allow to run for a **minimum time of 2 minutes**. This is for any air to leave the system. This may vary depending on Sunamp Ltd. Heat Battery model size.

   Note: For larger models such as the HW 9 +iLTHP , the **minimum time is increased to 4 minutes**.
3. Switch ON the power supply to the Heat Battery, via the 2-pole Isolator Switch.
4. Switch ON the power supply to the Heat Pump, via its dedicated isolator.
5. Ensure that the correct settings are made on the Samsung (Table 17; Section 4.3.1) or Daikin (Table 18; Section 4.3.2) Heat pump controller. (NOTE: At this stage the Heat Pump controller should show the tank temperature to be ~40°C, this will change to 70°C when the battery is fully charged. No intermediate temperatures are displayed.)
6. Test the booster function by manually overriding the booster section on the heat pump controller, after enabling this. Please reset the boost function to the relevant setting displayed in Section 4.3.
7. Continue to run the tap for a further **2 minutes**, then close.
8. Check the front of the Heat Battery to ensure that the "power" and "heater" LED's are lit (see Table 19).
9. Allow the Heat Battery to charge for approximately **30 minutes** with the hot water tap closed.
10. After 30 minutes open the hot water tap and check for hot water.
11. Adjust the Thermostatic Mixing Valve (TMV) so that the output temperature is **45°C to 55°C**.
12. Check hot water temperature at all hot water outlets in the dwelling with the customer and advise on temperature settings.
13. Ensure that the Heat Battery charges to half charge and that the power light is not rapidly flashing (which may otherwise indicate an error, see table 20, section 5).
14. Leave all product information and literature with the customer / end user.

15. Fill in and return the Sunamp Ltd. commissioning certificate, provided with the product. **These documents MUST be compiled and returned to Sunamp after installation.**

Heat pump settings

Sunamp

4.3 Heat pump settings

Please ensure that the heat pump's settings are set to the following for the Daikin and Samsung Low Temperature Heat Pumps. Please refer to the relevant heat pump manufacturer manual to apply the settings in the sections below (Table 17 & 18).

4.3.1 Samsung setup

To set up the Samsung please go to the Field Setting Values (FSV) page on the wired remote controller.

Setting	Set to	FSV #
DHW tank temp	65 °C	1051
Heat pump max temp	65°C	3021
Legionella cycling	0 (Off)	3041
dT(Flow/Return)	~7°C	

Table 17: Samsung Heat Pump settings

In the user-accessible menu, the DHW tank temperature set point should be set to 70°C.

4.3.2 Daikin Setup

Setting	Set to
Domestic Hot Water	EKHWS/E Tank with booster heater installed at the side of the tank.
Emergency	Automatic
Setpoint mode	2. Weather dependent
Control	1. External room thermostat (or as required)
Heat up mode	1. Schedule plus reheat (discuss with end user based on their preferences)
Comfort setpoint	70°C
Reheat setpoint	45°C
Legionella cycling	Disable
dT(Flow/Return)	~7°C

Table 18: Daikin Heat Pump settings

Heat pump settings

Option 1 Keep link in place

Option 2 Remove link
Remove link 3 and allow Heat Pump to control the Battery Immersion heater

Daikin Overview Settings for Booster heater

Breadcrumbs

4-03 allow the Booster Heater to operate (Installer settings of booster heater)

8-01 Maximum run time
8-03 Booster Heater Delay time Range: 20~95 minutes

EHW Model

Direct Electric Only

Typical eHW schematic

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3.7.1 Controller Wiring Schematic and Diagram

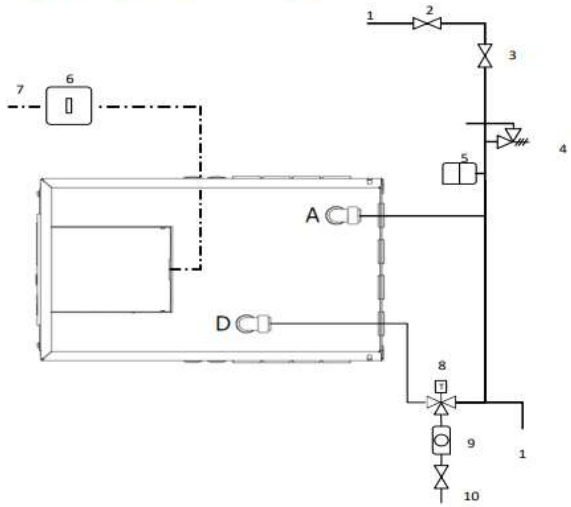

Figure 12.1: Example wiring option 1 schematic (see Figure 3 for piping and electrical options available)

Item	Description		
1	Mains cold water supply	6	Local 2-pole isolator, 13A
2	Check valve	7	230VAC, 16A power supply
3	Cold Water pressure regulator	8	Hot Water Thermostatic Blending Valve
4	Main Expansion Relief Valve	9	Hot Water flow regulator
5	Expansion Vessel	10	Hot water supply to dwelling

Table 14: Explanation of components

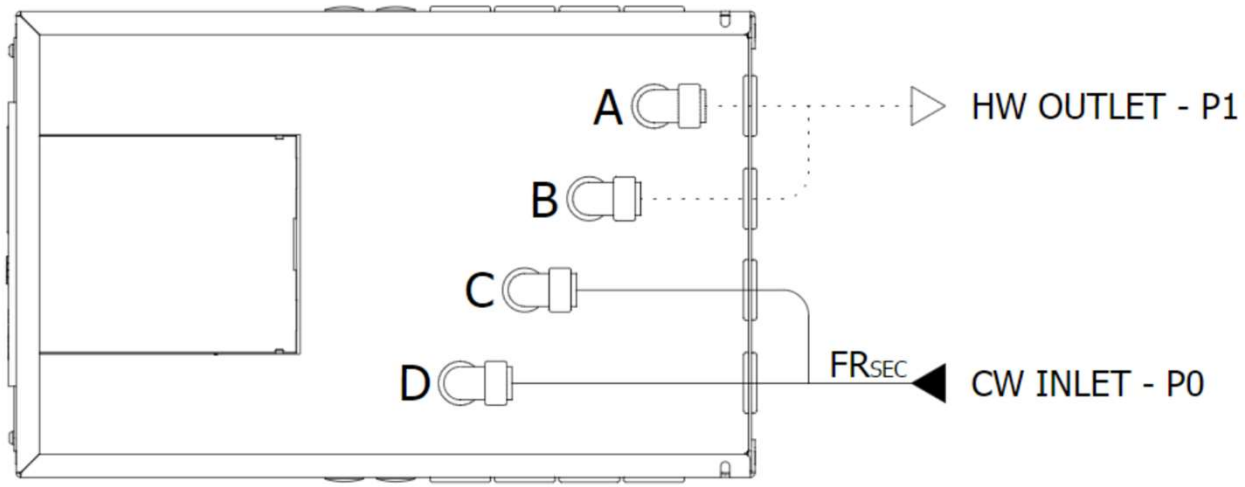

Figure 6.6: Pressure loss at inlet & outlet of the UniQ eHW 12 +iPV

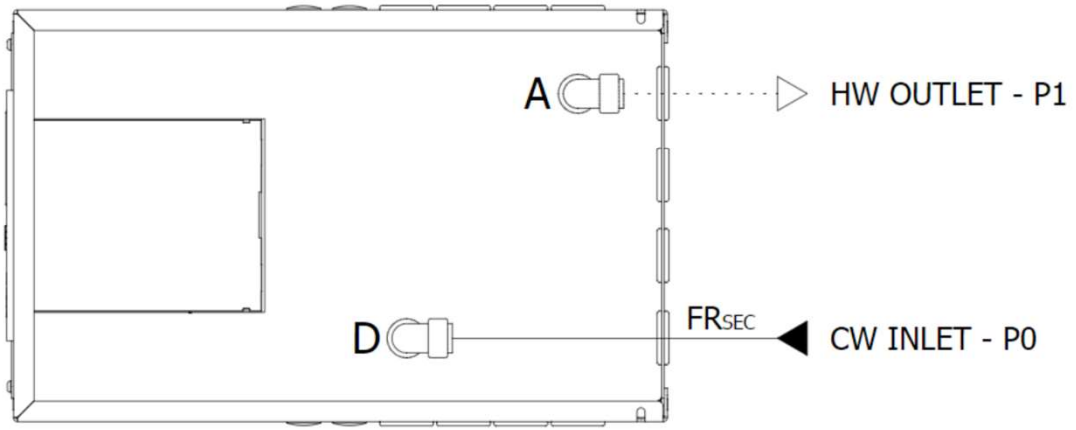

Figure 6.7: Pressure loss at inlet & outlet of the UniQ eHW +iPV, sizes 3,6 & 9

eHW electrical Requirements

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3.6 Electrical and Wiring Requirements

All range models within this manual are fitted with an internal controller situated at the top of the Heat Battery. Two wiring options are available:

1. **No time-switch:** 24-hour electricity grid supply only.
2. **Time-switch:** Standard electricity grid supply only. Zero Volt Time switch with options for tariffs such as E7 and E10.

Regardless of the option chosen, the Heat Battery is charged by the heating element from bottom to top and discharged during hot water draw-off from top to bottom.

Additionally, the Heat Battery does NOT require a separate control circuit electricity supply which is supplied internally by a main heating system power supply.

3.6.1 General

External wiring to the Heat Batteries must be in accordance with current IET (BS.7671) Wiring Regulations and any other applicable local regulations. **Local Means for disconnection must be incorporated in the fixed wiring in accordance with the wiring rules.**

Note: The lid cover of the controller can be removed by using a flat head screwdriver.

- The Heat Batteries must be earthed correctly.
- The point of connection to the mains should be readily accessible and adjacent to the Heat Battery installation; a fused spur is required.
- The product must have its own **dedicated 16A MCB protected** supply.
- Connection must allow isolation of the electrical supply, such as a double pole switch having a 3mm (1/8") contact separation in both poles. The means of isolation must be accessible to the end user after installation.
- All models are designed for heating by integrated electric heaters only. Wiring must be installed in accordance with the instructions provided (Sections 3.7 & 3.8).
- All models are fitted with only one 2.8kW heating element at ~230V AC and therefore recharging times increase with size of the Battery.

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3.6.2 Controller Wiring Diagram

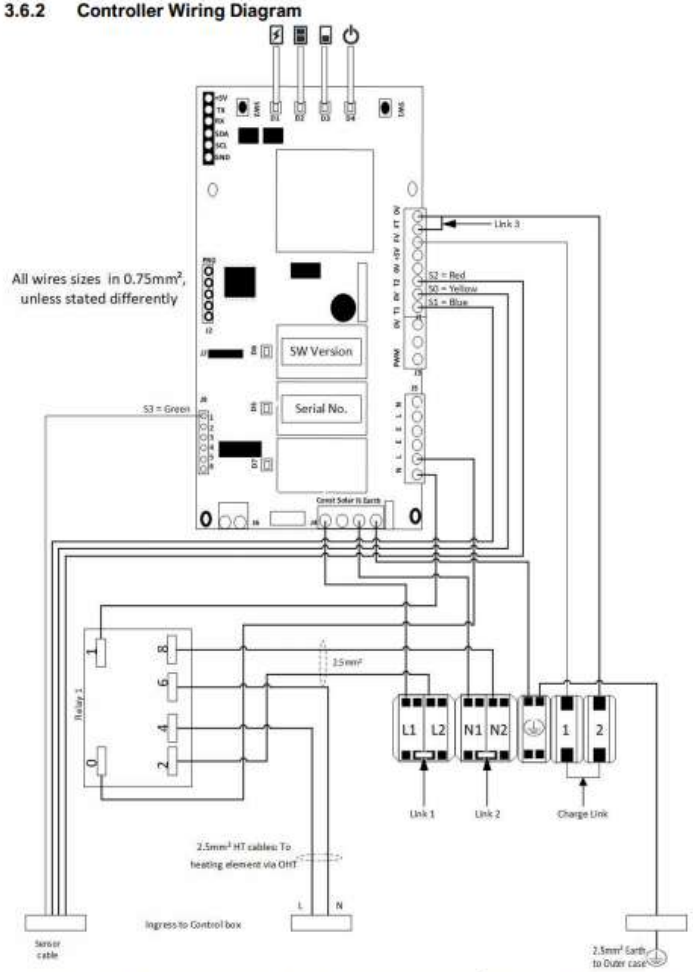

Figure 11: Internal controller wiring diagram (wire sizes=0.75mm², unless stated otherwise)

3.7 Wiring Option 1 – 24h Grid Supply Without Time-Switch

Important: Please follow (Table 13) for information regarding the Links.

Link specification	Removed or Fixed
Link 1	Fixed
Link 2	Fixed
Charge Link	Fixed

Table 13: Link settings wiring option 1 – 24h Grid supply without time-switch

- Run and connect 3 Core mains power supply cable (16A, minimum 2.5mm² CSA) from the local 2-pole isolator to the Heat Battery controller (Figures 12.1 and 12.2).
- Wire the cable via the appliance case grommets and into the control box housing (Figures 8, 12.1 and 12.2).
- Prepare, if necessary (Figure 10) and wire the mains power cable in the following terminals (Figure 12.1):
    - **Brown (Live):** Terminal L1 (Live)
    - **Blue (Neutral):** Terminal N1 (Neutral)
    - **Green/Yellow (Earth):** Terminal PE (Protective Earth)

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3.8 Wiring Option 2 – On-/Off-Peak Tariff with External Time-Switch

Important: Please follow (Table 15) for information regarding the Links.

Link specification	Removed or Fixed
Link 1	Fixed
Link 2	Fixed
Charge Link	Removed

Table 15: Link settings for wiring option 2 – on/off-peak tariff with external time-switch

- Run and connect 3 core mains power supply cable (16A, minimum 2.5mm² CSA) from the local 2-pole isolator 13A to the Heat Battery controller (Figures 13.1 and 13.2).
- Wire the cable via the appliance case grommets and into the control box housing (Figures 8, 13.1 and 13.2).
- Prepare, if necessary and wire the mains power cable in the following terminals (Figure 13.1):
  - **Brown (Live):** Terminal L1 (Live)
  - **Blue (Neutral):** Terminal N1 (Neutral)
  - **Green/Yellow (Earth):** Terminal E (Protective Earth)

3.8.1 Time-switch wiring to controller

- Wire a 2 core PVC insulated cable (3A, minimum 0.75mm² CSA, 24 x 0.2mm according to BS EN 50525) from a local 2-pole isolator 3A spurred fuse, into a Volt-free time-switch signal.
- Run the wire into the appliance via the appliance case cabling grommets and then into the control box housing through the hole available (Figure 8).
- Connect time-switch wiring supply cables, independently into terminals 1 and 2. Remove Charge Link, connecting terminals 1 and 2. The time-switch wiring will replace the Charge Link.

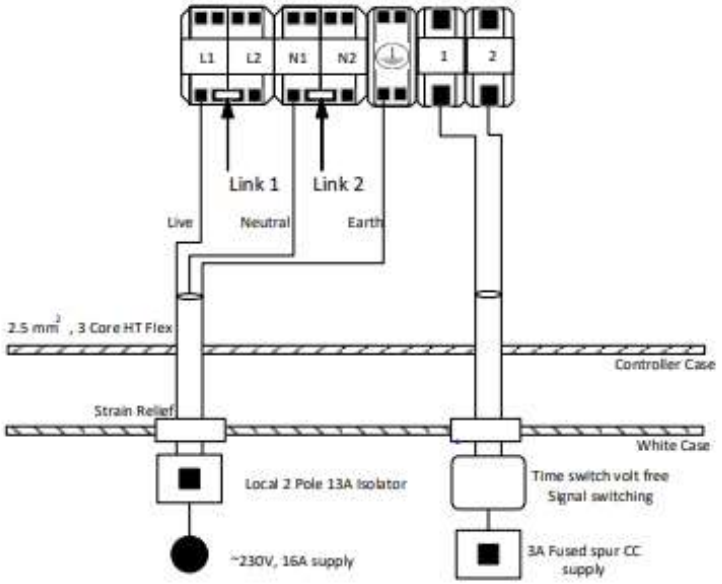


Figure 13.2: Wiring option 2 – on-/off-peak tariff with external time-switch

EHW + i PV Model

Direct Electric Solar PV

It‘s what‘s inside that counts

Sunamp

Charge with

Surplus PV electricity

Top-up / winter supply from boiler or high temperature heat pump*

Use for

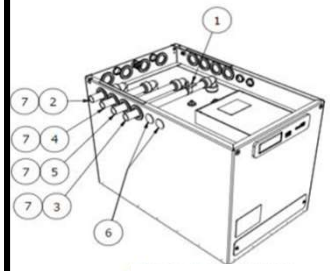
Hot Water

Energy Label

A+

UniQ HW +iPV

- Stand-alone or as a Myenergi EDDI Package*
- Optimised controls and plumbing for operation with PV Power Diverters
- Top-up / winter supply from an external heat source
- Equivalents of 70l, 140l, 210l or 280l indirect cylinders



Type	Order Code
UniQ HW 3 +iPV with EDDI	DGP-DBW-AWZ
UniQ HW 6 +iPV with EDDI	DKP-DBW-AWZ
UniQ HW 9 +iPV with EDDI	DNP-DBW-AWZ
UniQ HW 12 +iPV with EDDI	DRP-DBW-AWZ
UniQ HW 3 +iPV w/o EDDI	DGP-DBW-ATZ
UniQ HW 6 +iPV w/o EDDI	DKP-DBW-ATZ
UniQ HW 9 +iPV w/o EDDI	DNP-DBW-ATZ
UniQ HW 12 +iPV w/o EDDI	DRP-DBW-ATZ

* Note: Other PV Power Diverters can be used with the product. Please consult Sunamp for more information.

** Only HTHPs able to reach >65°C flow temp are suitable for this product.

Controller wiring eHW+iPV

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3.6.2 Controller Wiring Diagram eHW +iPV

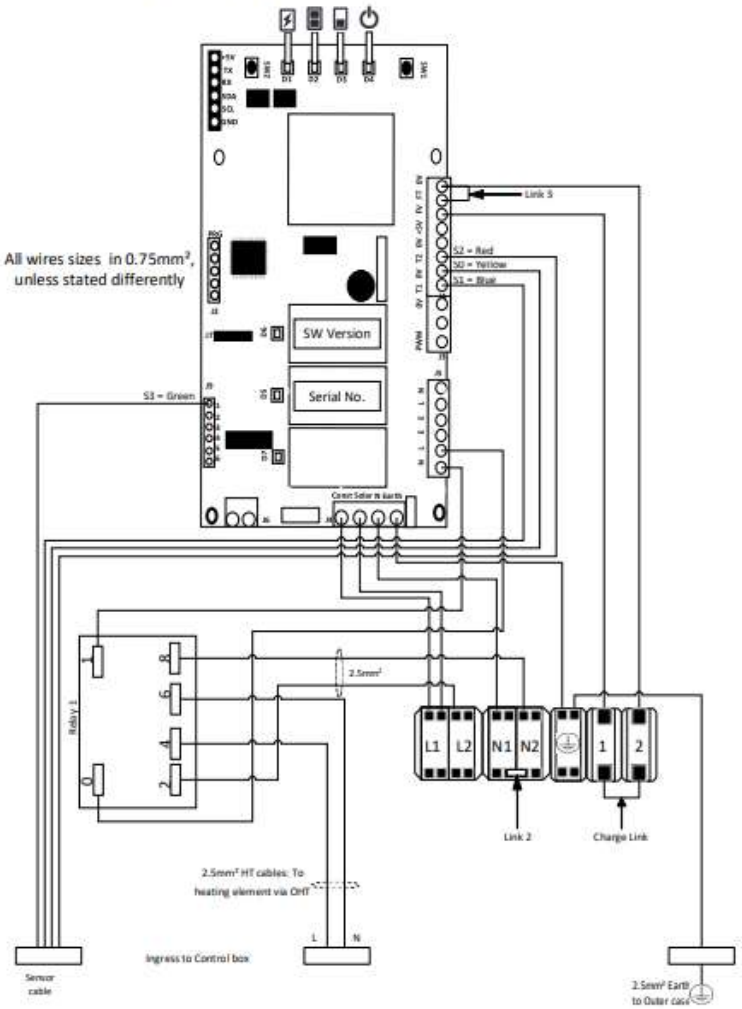

*Figure 11: **UniQ eHW +iPV** Internal controller wiring diagram (wire sizes=0.75mm², unless stated otherwise)*

Wiring – eHW +iPV

Important: Please follow (Table 13.1) for information regarding the Links.

Link specification	Removed or Fixed
Link 1	Removed
Link 2	Fixed
Charge Link	Fixed

Table 13.1: Wiring eHW +iPV – Link settings

- Run and connect 4 Core mains power supply cable (16A, minimum 2.5mm² CSA) from the Solar Power Diverter to the Heat Battery. (Figures 13.1, 13.2, 13.3 & Section 3.9).
- Wire the cable via the appliance case grommets and into the control box housing (Figures 8, 11 and 13.3).
- Prepare if necessary and wire the mains power cable in the following Heat Battery terminals (Figure 10 & 13.3):
    - **Brown (Live):** Terminal L1 (Permanent Live)
    - **Black (Live):** Terminal L2 (Modulating Live)
    - **Blue (Neutral):** Terminal N1 (Neutral)
    - **Green/Yellow (Earth):** Terminal PE (Protective Earth)

Power diversion controller

Sunamp

3.9 Wiring Setup of Solar Power Diversion Controller

Please refer to Solar Power Diverter Instruction Manual for further information.

- The mains power cable from the Sunamp Controller to the Solar Power Diverter should be a minimum of 2.5mm², 4 core HO5 VV-F sheathed cable, to BS 6500.
- Prepare if necessary and wire the mains power cable from the Sunamp Controller in the following terminals on the Solar Power Diverter (Figure 15):
  - **Brown (Live):** Terminal L "Supply" (Permanent Live)
  - **Black (Live):** Terminal L1 "Heaters" (Modulating Live)
  - **Blue (Neutral):** Terminal N "Heaters" (Neutral)
  - **Green/Yellow (Earth):** Terminal E "Heaters" (Protective Earth)
- The power main cable from the 2-pole local isolator, 16A to the Solar Power Diverter should be a minimum of 2.5mm², 4 core HO5 VV-F sheathed cable, to BS 6500.
- Prepare if necessary and wire the mains power cable Solar Power Diverter (Figure 15):
  - **Brown (Live):** Terminal L "Supply" (Live)
  - **Blue (Neutral):** Terminal N "Supply" (Neutral)
  - **Green/Yellow (Earth):** Terminal E "Supply" (Protective Earth)
- Please note that the Brown (Live) cable from the 2-pole local isolator and the Brown (Permanent Live) cable from the Sunamp Controller, will be wired into the same location on the Solar Power Diverter.

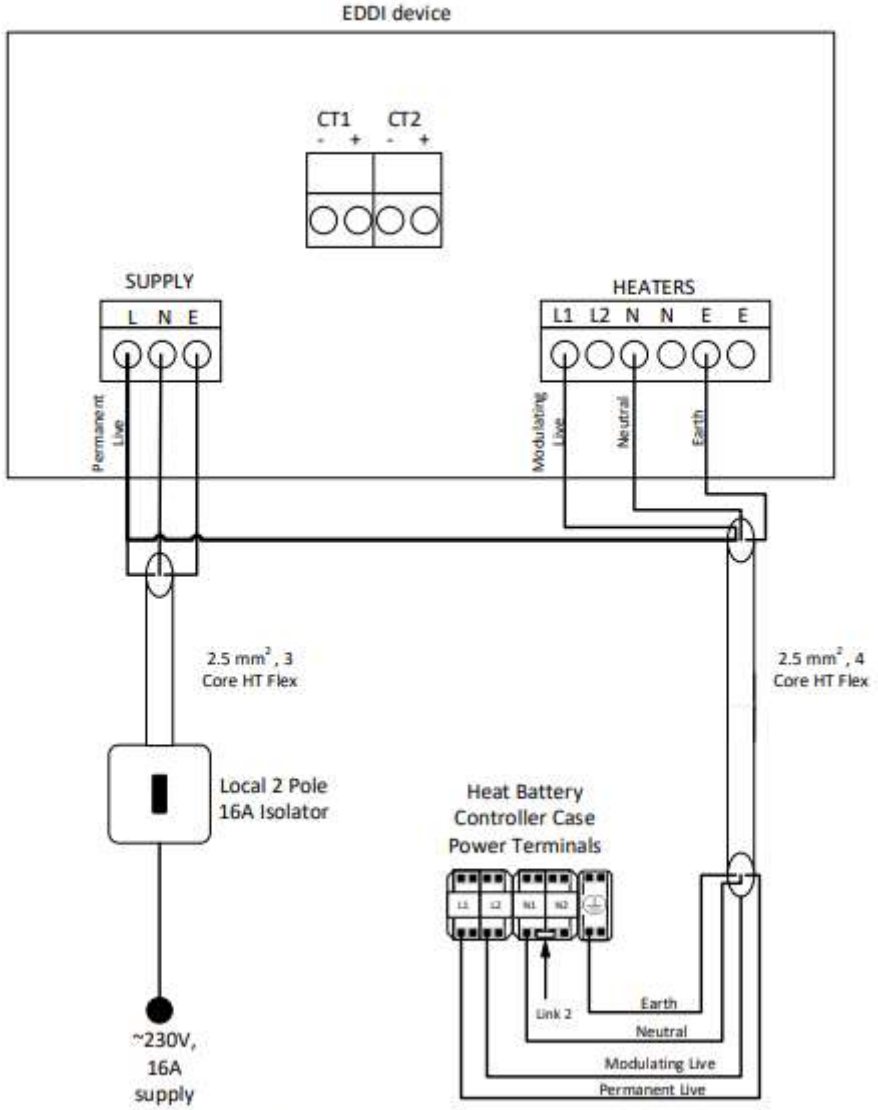

Figure 15: Solar Power Diverter wiring – "EDDI MYENERGI"

Controller wiring (e)HW+iPV

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4 Commissioning

⚠ Before commissioning works, first ensure that you have properly reviewed the previous sections, particularly in regard to Heat battery specifications as well as location, electrical supply and water supply requirements.

4.1 Preparation

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

4.2 Process

1. Turn on the water supply and ensure that there are no leaks.
2. Fully open any hot water taps in the dwelling and allow to run for a **minimum time of 2 minutes**. This is for any air to leave the system. This may vary depending on Sunamp Ltd. Heat Battery model size.

   Note: For larger models such as the (e)HW +iPV 9, the **minimum time is increased to 4 minutes**.
3. Switch ON the power supply to the Heat Battery and Solar diverter controller, via the 2-pole Isolator Switch.
4. Switch ON the power supply to the External Heat Source, via its dedicated isolator (if HW +iPV installed).
5. On the External Heat Source controller setting for hot water heating (if HW +iPV installed):
   a. Please set target hot water cylinder temperature: 65 – 70°C

6. The flow rate in the heat battery charging circuit should be adjusted so that the temperature difference between flow and return is between 5 – 7°C (if HW +iPV installed):.
7. If available press the BOOST button on the Solar Power Diverter.
8. Continue to run the tap for a further **2 minutes**, then close.
9. Check the front of the Heat Battery to ensure that the "power" and "heating element" LED's are lit (see Table 15).
10. Allow the Heat Battery to charge for approximately **30 minutes** with the hot water tap closed.
11. After 30 minutes open the hot water tap and check for hot water.
12. Adjust the Thermostatic Mixing Valve (TMV) so that the output temperature is **45°C to 55°C**, if applicable.
13. Check hot water temperature at all hot water outlets in the dwelling with the customer and advise on temperature settings.
14. Ensure that the Heat Battery charges to half charge and that there are no lights flashing (which may otherwise indicate an error, see Table 16, below).

15. Pre-planned Boost times should be set on the Solar Power Diverter, the information on this how these are set can be found in the "BOOST TIMER" section of the Solar Power Diverter manual. These depend on the end user usage type of the system.
16. Leave all product information and literature with the customer / end user.

17. Fill in and return the Sunamp Ltd. commissioning certificate, provided with the product. **These documents MUST be compiled and returned to Sunamp after installation.**
18. Fix any Energy labels to product main body.

Off Peak Electric

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Sunamp Heat Batteries can be charged using any energy source.

4 hours of 5p/kWh super off-peak electricity every night
from 12:30-04:30am.

Perfect for charging an electric vehicle or Sunamp Heat Battery

octopus energy

You can off-set peak energy costs by charging your Heat Battery with cheaper off-peak electricity

or divert energy from your solar PV, heat pumps or other renewable sources.

Once charged, the heat can be released instantly when needed,
delivering hot water and space heating during peak times.

Octopus Energy also pay an export tariff on your Solar PV Installation of 5.5p/kwhr

HW + i PV Model

HT Heat Pump/Boiler
Solar PV

Typical HW +iPV schematic

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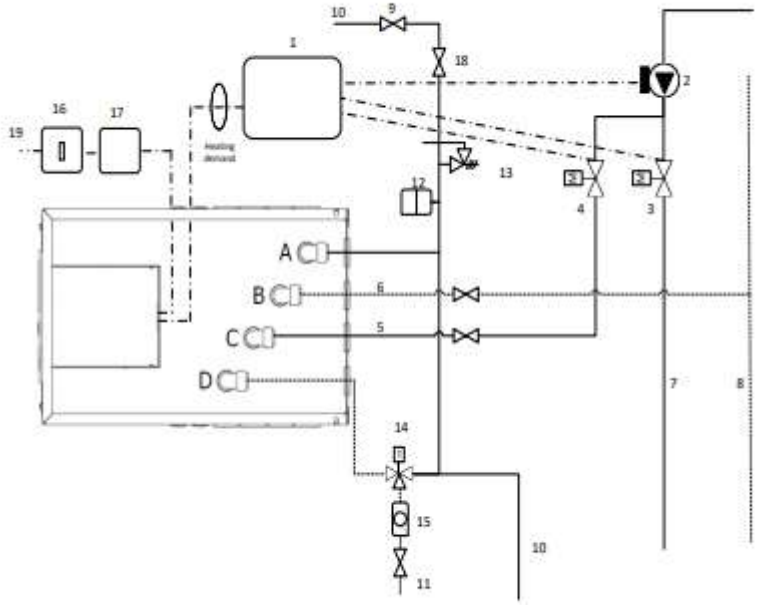

Figure 14.1: Example wiring option 1 schematic (see Figure 3a for piping and electrical options available)

Item	Description				
1	External Heat Source Controller	7	Central Heating Flow	13	Mains Water Expansion Relief Valve
2	Circulation pump	8	Central Heating Return	14	Hot Water Thermostatic Blending Valve
3	Central heating Zone Valve	9	Isolation Valve	15	Hot Water flow regulator
4	Heat Battery Hot Water Zone Valve	10	Cold water supply to dwelling	16	Local 2-pole Isolator, 16A
5	Flow from External Heat Source	11	Hot water supply to dwelling	17	Solar Power Diverter controller
6	Return to External Heat Source	12	Expansion Vessel	18	Cold Water Pressure regulator
19	Electrical supply from Dwelling consumer board ~230V AC, 16A				

Table 14.2: Explanation of components

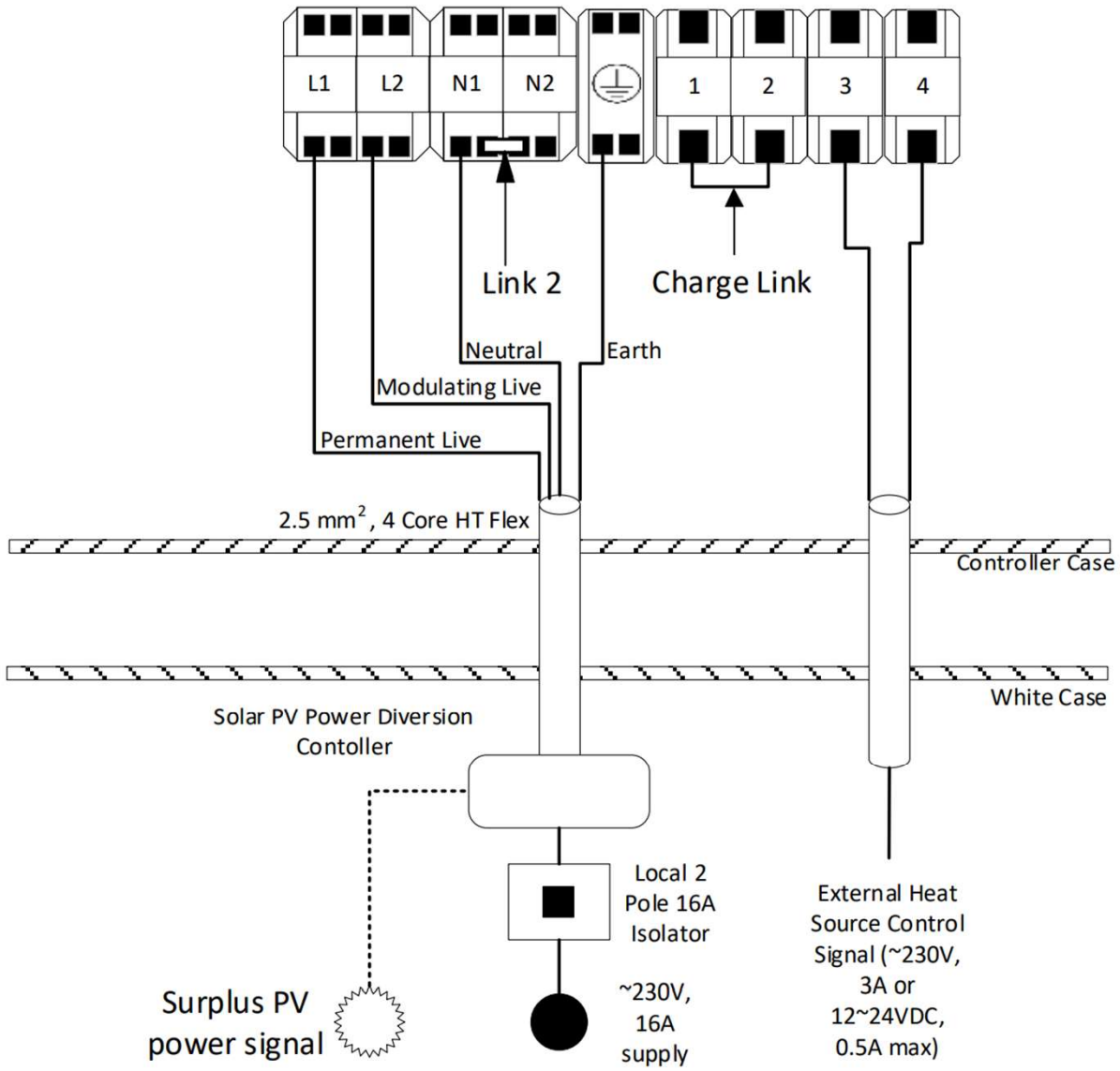

Figure 14.2: HW +iPV system wiring

Typical HW +iPV schematic

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Link specification	Removed or Fixed	
Link 3	Fixed (Factory setting)	If connected to a High temperature heat pump – The link ensures that the Heat Battery demand can be satisfied by the heat source delivering a flow temperature greater than 65°C.
	Removed	If connected to a Boiler – Removing the link ensures that the Heat Battery demand can be satisfied by the heat source delivering a flow temperature greater than 75°C.

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Thank you