



**Smart Hot Water
Controller Installation
Guide
Dual Element Version**

Smart Hot Water Controller – Retrofit Installation Guide -Dual Element Version

For technical help contact your distributor.

Distributor Details:

www.smarthotwater.co.nz

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INTRODUCTION AND SAFETY

Scope

Covers Smart Hot Water Controller Retrofit - Dual Element with Touch Display versions.

1. **Standard Dual Element**
2. **Night Rate Dual Element**

General Safety Precautions

Installation to be checked at least annually for damage or malfunction
All servicing must be carried out by an authorised service agent only.
All aspects of the installation must comply with local regulations

Hot Water Safety

All hot water installations must, at the outlet of all sanitary fixtures, used primarily for personal hygiene purposes, deliver hot water not exceeding 50°C as per AS/NZS3500. In some circumstances a lower temperature of 45°C must be delivered to be safe (Rest homes, children's facilities etc check requirements). This is achieved by installing a **thermostatic mixing valve**

BioSafe®

To protect against dangerous infections by waterborne bacteria, primarily Legionella the Smart-Hot Water Controller operates an automatic sterilisation regime according to AS 3498 (and AS/NZS 2712). It is important to always leave the controller on, even while away on holiday as the controller will manage this sterilisation. The controller can be put in holiday mode to greatly minimise energy use while you are away (see user manual)

Electrical Safety

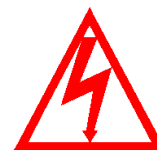
The Smart Hot Water Controller needs to be installed according to local electrical wiring regulations by qualified personal. It is also vital the cylinder thermostat and over temperature electrical cut-out is still functional. Although the Smart Hot Water controller takes over control of the cylinder heating the electromechanical thermostat and over temperature cut-out are there as vital safety features. **Do not disconnect, bypass or disable the cylinder thermostat or over temperature cut-out**



CAUTION:

Dangerous Voltages may be present. The Smart-Controller has no user serviceable parts.

Protective enclosure must only be opened by qualified personnel.
Remove ALL power sources before removing protective cover

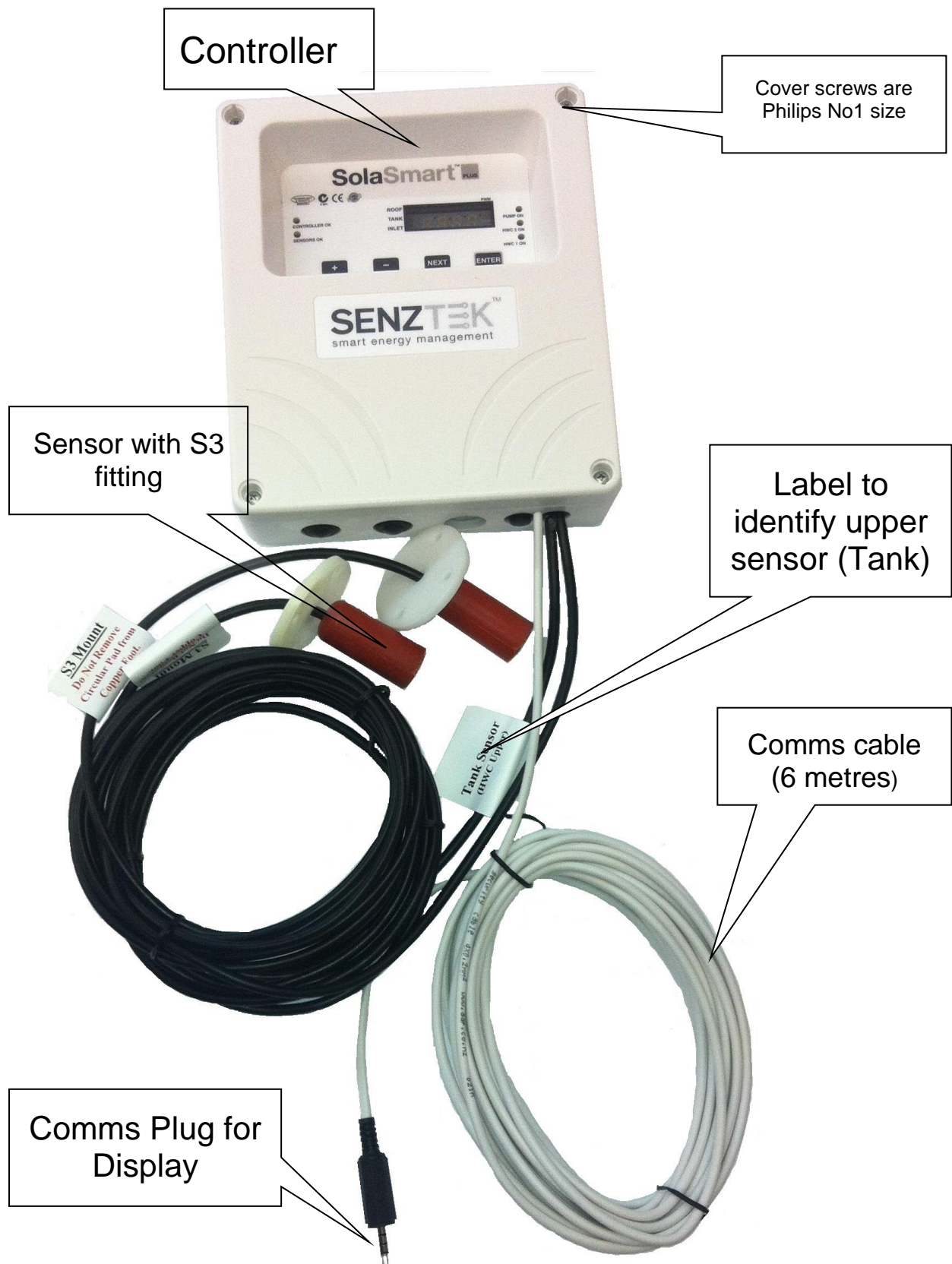


Warning

These products are not designed for use in, and should not be used for, applications which are in conjunction with items that are critical to any person's health (e.g. life support systems).

In any critical installation, an independent fail-safe back-up system must always be implemented.

SMART HOT WATER CONTROLLER – RETROFIT PACKAGE



INSTALLATION

Overview

The installation sequence will be;

1. Mount the controller
2. Electrically connect the controller to the cylinder and power source
3. Mount the S3™ sensors on the cylinder
4. Mount the Display
5. Power up and test
6. Set correct time + date and program (if necessary)

Controller Mounting

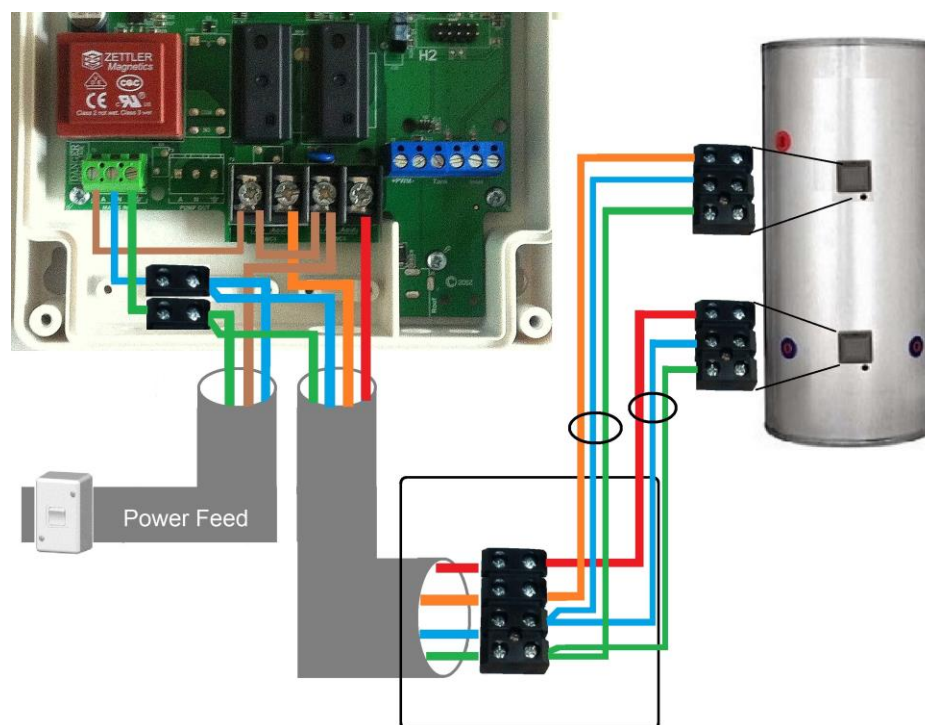
The controller comes with 4 mounting screws and a paper mounting template. Mount the controller vertically with the wires facing **down**. The controller enclosure and sensor entry points are water resistant to IP54 however if the glands and conduit used are not IP54 then the unit is no longer IP54. If the unit is mounted outdoors the power / conduit connections need to be IP54 and suitable for outdoor use.

Electrical Connections

This manual assumes and requires upper and lower elements and thermostats are completely separately wired and share no internal wiring within the cylinder and do not use cascading thermostat wiring between upper and lower elements (where when upper thermostat is a temperature power is routed to bottom thermostat). This is necessary to avoid commoning neutral wires on dual power source configurations etc.

Standard Option

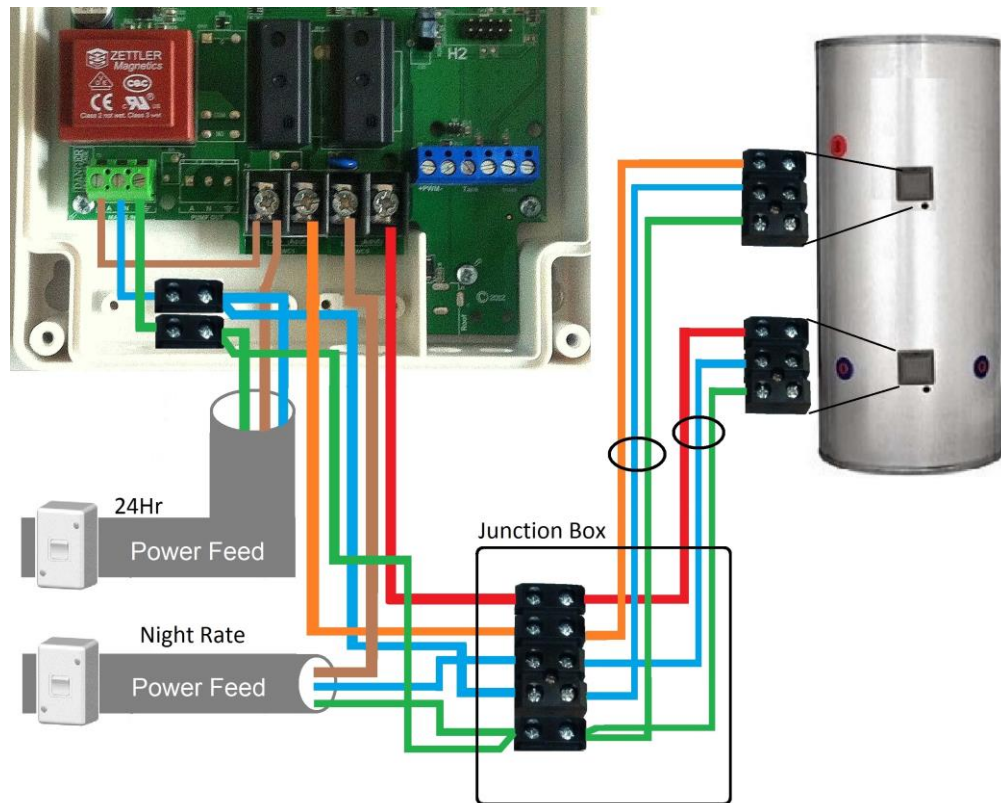
Use an external Junction Box for Upper / Lower wiring distribution



Night Rate

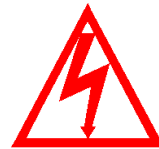
For separate power feeds run separate Neutral wires.

Program as a 'Dual Element Night Rate' configuration in the installer level settings. This must be done or the system will not function correctly



CAUTION:

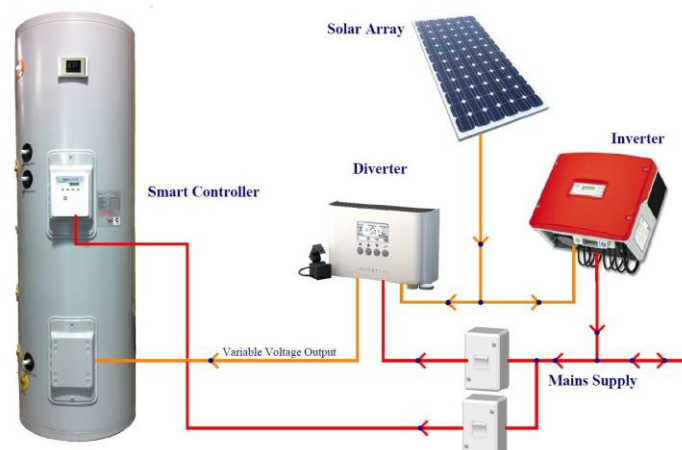
There must be a warning label on the cylinder and the controller that there are **2 Power Sources** which must both be isolated before safely carrying out any electrical work



PV with Diverter

A PV Diverter and Smart Hot Water Cylinder will work with a Dual Element Cylinder BUT using a **Single Element Controller**.

Wire as a single element and program as a **mid-element** cylinder configuration. This is a special installer setting.



S3™ Sensor mounting

1. Locate the best sensor position on the tank. We recommend the upper sensor is $\frac{1}{3}$ from the top and the lower sensor is just **above** the element and thermostat (approx $\frac{1}{3}$ from bottom)
2. Drill an 18mm hole* through the outer cladding being careful not to contact the inner tank wall. Place a thick piece of tape to on the hole saw to limit ingress past the outer cladding
3. Remove the insulation material within that hole manually.
4. **Ensure that no residual insulation material remains in front of the exposed inner tank wall (this is critical to the success of the installation)**
5. Place the sensor assembly in the hole. Add spacers until a millimetre or so of the last ring is protruding beyond the outer cladding. Spacers can be added by gently opening the split in the ring and pushing them over the sensor cable. **Note:** Tank sensor (labelled Tank) must always be above the Inlet sensor
6. Remove assembly and apply a liberal amount of heat transfer compound to the foot of the S3™ assembly.
7. Re-insert the sensor assembly
8. Fix in place by securing the flange to the outer cladding with the 4 screws provided.



***WARNING; Use only a hole saw with a short drill protruding from the saw. This will make it far less likely to damage the inner tank by coming in contact with the drill. Also place tape (or similar) on outer barrel of hole saw to limit ingress past the outer cladding**

Note: Ensure the attached thermal pad remains in place on the foot of the S3™ sensor. This is to electrically isolate the copper foot from dissimilar metals and avoid corrosion.

The S3™ sensor is patented by Senztek NZ Ltd.

Display mounting options;

DisplayTouch



1. Mount flush on Gib Board (dry wall)

- Use supplied Display paper template to cut out area needed to recess the circuitry
- Run comms cable so that it comes out behind this cavity
- Plug in Display to plug from controller.
- Screw Display onto wall
- Remove protective plastic cover for viewer clarity
- Replace white plastic cover

2. Use PDL® electrical surface mount block (PDL 89SP)

- Screw mounting block onto wall
- Run comms cable so that it comes out behind this block
- Plug in Display (as illustrated above)
- Screw Display onto block
- Remove protective plastic cover for viewer clarity
- Replace white plastic cover

Mount this way up



- Remove the protective screen cover after installation for clarity

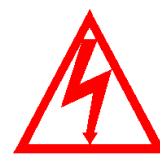
Note: Comms cable is standard at 6 metres but can be extended 20 metres

CAUTION:



The Display is not isolated and rated for voltages below 14 Volts DC and therefore must be installed well clear of mains wires and exposed mains terminals of any kind. Do not install in the same cavity or mounting box as light switches or power outlets.

***** Never insert or remove the Display interface board while the controller is on. It might destroy the controller. Ensure the controller is off whenever inserting or removing the controller interface board. This action is normally not required during a standard installation.



Power Up and Test

First display on power up

1. The Controller OK light should be illuminated on the controller
2. The Display should be displaying the home screen (as illustrated)



Initial BioSafe®

Note: On first power-up the controller does not know if the water is safe from Legionella so a BioSafe® heating cycle is initiated. Once heated to 60°C the cycle will reset in an hour and commence normal operation

3. Set the Time and Date



From the Home screen touch the Clock icon

- Set the Time and Date by touching the field that you want to update until it starts flashing and then using the Up/down arrow keys to adjust the value.
- Touch the Home icon when finished
- Your new Date and Time will be displayed on the home screen



Installers Screen- If you need to set observe system parameters then go into the setup screen



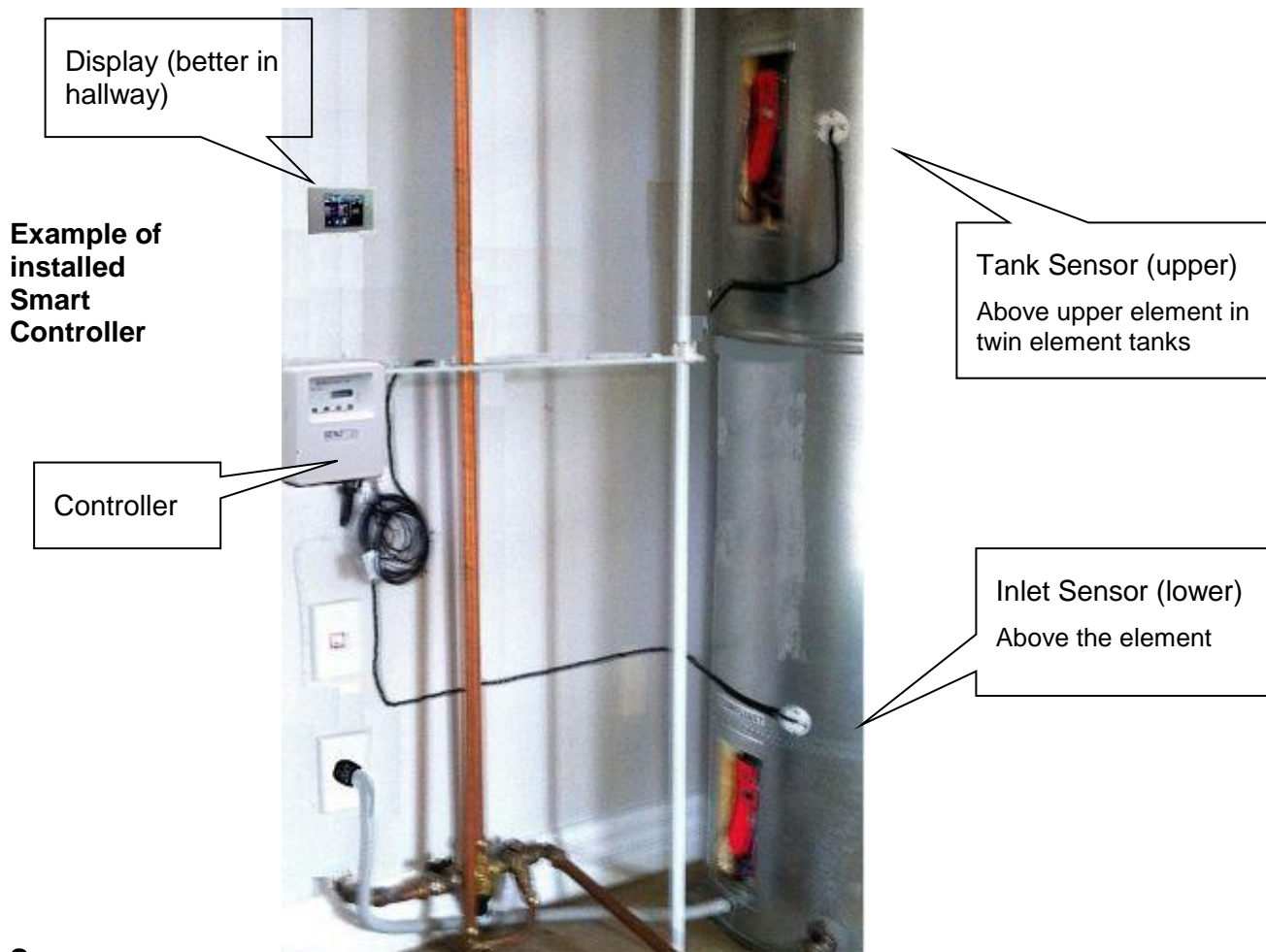
- From the Home screen touch the System icon



This screen is a more detailed diagnostic display.

The Smart Hot Water-Controller is now fully installed and should be working.

It is best to observe the cylinder heating and check all functions are working correctly before leaving the installation.



Sensor Resistances

The table below has the correct resistance values of the sensors at different temperatures. The sensor must be removed from the Smart-Controller to measure these values correctly.

This table is a reference for checking sensors

Sensor Resistances		
Temperature	Resistance in k Ω	
0°C	27.25	A 'short' circuit can be caused by the sensor wires being connected together. Check the wires are not partially cut and that moisture is not getting into the sensor causing corrosion.
25°C	10.00	
50°C	4.162	
75°C	1.925	An 'open' circuit can be caused by the sensor wires being broken. Check the wires are not cut and that moisture is not getting into the sensor causing corrosion.
100°C	0.973	
Above 300°C or 'shrt' on display Sensor light Off	<.050	
Below -40°C or 'oPn' on display Sensor light Flashing	>200	

TROUBLE SHOOTING GUIDE

SYMPTOM	POSSIBLE CAUSE	SOLUTION
No operation, no lights on controller (and blank Display). Power on in rest of house	⇒ Power is interrupted to controller	⇒ Check mains supply circuit breaker ⇒ Check if load control (ripple control) by power co has removed power. ⇒ If the controller going off with Ripple Control is undesirable then the controller will need a 24 hr power supply. See Appendix 1(Page 15)
Sensor O.K. light flashing (Sensor fault shows on Display Touch)	⇒ Inlet or Tank sensor not detected. Broken sensor wire	⇒ Replace sensor in either sensor port until Sensor O.K. light is ON (or reported fault is gone from Display)
HWC light stays on too long (more than 6 hours)	⇒ HWC power not getting to element ⇒ Element open circuit (blown) ⇒ Faulty thermostat / cutout ⇒ Excess water draw off or leak ⇒ BioSafe heating (Sterilising) cannot reach above 60°C on BOTH tank sensors for 32 minutes ⇒ NOTE: If tank is not very hot (or boiling) then power is not being consumed even though HWC light has been on for a long time	⇒ Check Display home screen or tech screen to determine why tank is heating ⇒ Is HWC circuit drawing expected current (typ 10 -16 Amps)? Qualified personnel only . If yes verify excess hot water is not being drawn off. ⇒ If NO then power is not able to heat the water to the target °C ⇒ Read temperature at controlling sensor. ⇒ If < 50°C issue will be interrupted power or a faulty element. Qualified personnel only ; Check for tariff / load control. Check power into the controller HWC contacts. Check power comes out of HWC contacts. Check wiring is correct. Check element is not blown. ⇒ If > 50°C but less than target (e.g. 60°C) issue will be tank thermostat accuracy. Ensure tank thermostat is turned up to max. If this doesn't work then thermostat is too inaccurate.
Running out of hot water HWC light on	⇒ Similar problem to above ⇒	⇒ See above solutions but also consider profile values and times. E.G. a high heating period might need to come on at an earlier time
Running out of hot water HWC light off	⇒ Profile and/or Comfort (Savings) control set too low ⇒	⇒ If a rare event then use one off Boost ⇒ If a regular event alter the comfort setting to a higher setting (decrease saving control) or adjust tariff / profile
Hot water stored drops significantly at night, yet little or no draw off by user	⇒ Water leak ⇒ Tank is losing heat	⇒ Check for water leak; see if hot water pipe is hot/warm 2 metres from tank. ⇒ Install better insulation on tank + fittings
Only heats using the upper element and (switched) night rate is not being used on the lower element to heat the tank	⇒ Incorrect configuration ⇒ Incorrect profile setting	⇒ Program configuration for "Dual Element Night Rate" ⇒ Check night rate hours are set to HIGH and savings setting not higher than 50%

Specifications

Power Supply:

Supply Voltage	240 Vac +/- 10% 50 to 60 Hz
Quiescent power usage	3VA typical

Relay Output: (element)

1x HWC: 16A max @ 240Vac (3.6kW max) Resistive
1.5 HP/1100W max (240Vac) Motor rating (0.4cos theta)
Minimum Load: 2watts @ 240Vac or 100mA below 60 Vdc
Zero Crossing contact closure

Sensors:

Sensors	-20 ~ +120°C tip 5.8mm diameter stainless steel -20 ~ +105°C cable, UV resistant
Accuracy	+/-1°C @ 25°C

Real Time Clock:

Backup interval (no power)	14 days min (After 4 hour full charge cycle)
Accuracy	Max 30 sec per month drift

EMC and Safety Compliances:

Emissions	EN 55022-A, RCM
Immunity	EN 50082-1
Safety Compliance	AS/NZ 60950.1:2003, RCM AS/NZ 3820:2009 AS/NZ 2712: 2007

General Specifications:

Control Range	-40 ~ +299°C
Operating Temperature	0~60°C
Operating Humidity	5 ~ 85% RH. Non-Condensing
Enclosure Construction	Polycarbonate - Impact Resistant UL94 V-2 Non Burning, UV A & B Stabilized Water resistant to IP54
Dimensions	L = 167mm
(excluding glands and cables)	W = 142mm H = 40mm
Weight	1200grams
(Standard model + cables + sensors + packaging)	

Note: Do not exceed these specification limits, result will be unit damage and void warrantee

Product Liability. This information does not constitute guaranteed properties and is not intended to affirm the suitability of a product for a particular application. Due to ongoing research and development, specifications and documentation are subject to change without notification. Regrettably, omissions and exceptions cannot be completely ruled out. No liability will be accepted for errors, omissions or amendments to this specification. Technical data is always specified by their average values and are based on Standard Calibration Units at 25°C, unless otherwise specified. Each product is subject to the 'Conditions of Sale'.

Appendix 1 – Dual supply variation

Single Phase only

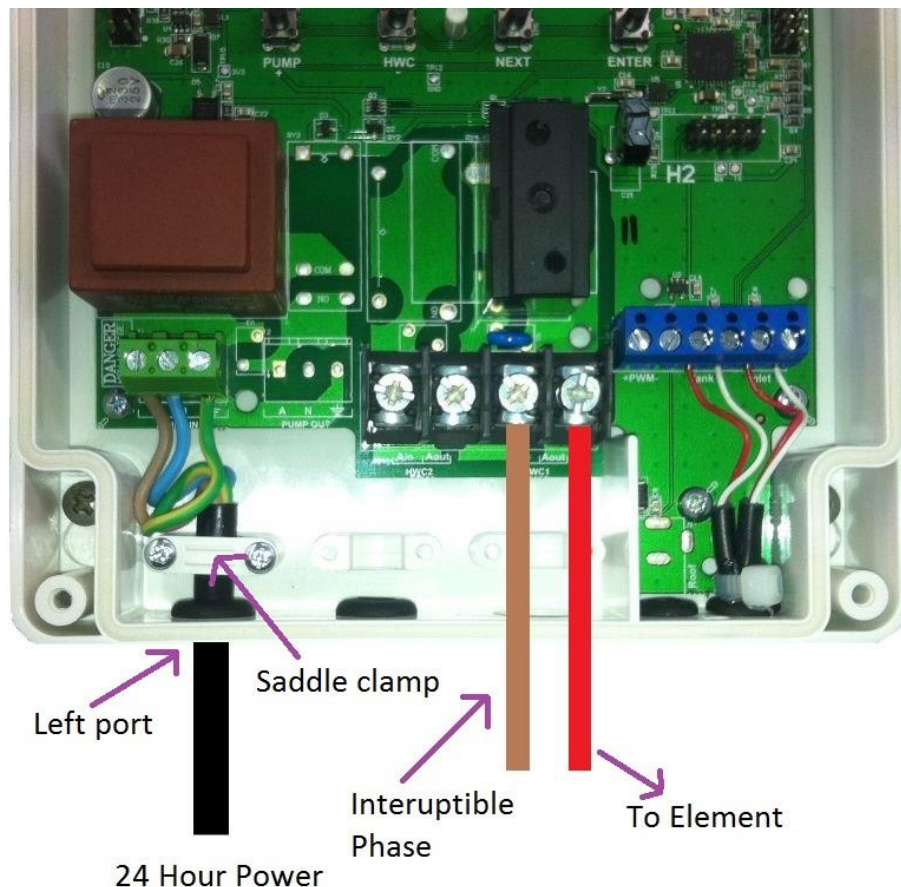


The Smart Hot Water Controller is configured for **ALL power sources to be on the same phase**. If 2 phases are to be used on the installation then contact Smart Hot Water for special wiring and installation instructions to meet the 400Vac isolation requirements



Note: If more than one power feed is used then a warning label must be affixed at the Cylinder and at the switch board stating that there are 2 circuits to isolate to make the Cylinder safe.

- Use in conjunction with wiring diagrams on pages 3 or 4
- 1. Remove the 3 Phase/Neutral/Earth jumper wires from the 'MAINS IN' terminal on the left hand side of the PCBA and the high current terminal block. Interruptible
- 2. Remove bung from left port.
- 3. Insert a round mains cable through the left port. Must be 6 - 7mm
- 4. Secure strain relief with 2 screws and saddle clamp. Do not over tighten
- 5. Screw in wires to 'MAINS IN' terminal
- 6. Wire in the cylinder high current wires to Ain and Aout (to element) in the HWC1 terminals as shown



Appendix 2 – Load Shedding (or Ripple Control) information

Ripple control is a form of load shedding used mainly in New Zealand and in a handful of other countries around the world, where power is removed periodically from the hot water cylinder electric circuit by the power utility to help reduce peak loading of the power grid.

This differs from Night Rate where power is always removed at exactly the same time every day, usually from 7:00 am to 11:00pm.

Ripple control in New Zealand is usually mainly used in winter and for only a few hours at a time at most. However in times of power shortage this might be longer and /or more frequent

If your ripple control has removed power for an extended time, especially for 12hours or even 24 hours then it is possible the ripple has failed to re-energize (a known issue). Contact your power provider to enquire if ripple control is still active.

Solutions: It is possible to have the Smart Hot Water Controller wired so the controller uses non-interruptible power while the hot water element uses ripple controlled power. See **Appendix 1** for wiring details

Another option is to have the ripple control removed; however this might increase your power costs. Your power utility will be able to help with information on this option.