



Service Manual Vitreous Enamel Electric Water Heater



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INTRODUCTION

- The information provided in these instructions is based on the water heater being installed in accordance with the Installation Instructions provided with each water heater. In particular, please pay special attention to the Safety Instruction and Warnings. These instructions must be read in conjunction with other instructions affixed to the appliance.
- This appliance must only to be installed by persons authorised for the installation of electric water heaters in accordance with all Local and Government Regulations.
- For Safe Performance, this Storage Water Heater is supplied with a Thermostat, Thermal Energy Cut Out, and Temperature & Pressure Relief Valve. These devices must be installed and not tampered with or removed. The water heater must not be operated unless each of these devices is fitted and is in working order.
- Should you require further technical advice on a Rheem, Vulcan, Everhot, Solahart or Aquamax Electric Water Heater, contact Rheem Technical Support.

SAFETY MARKINGS IN THIS MANUAL

The purpose of this Service Manual is to provide sufficient information to allow a person with the skills as required by the controlling Regulatory Authorities to carry out effective repairs to a Rheem, Vulcan, Everhot or Aquamax Electric Water Heater in the minimum of time.

Safety precautions or areas where extra care should be observed when conducting tests outlined in this service manual are indicated by print in ***bold italics*** and/or a warning symbol. Take care to observe the recommended procedure.

	<i>“Live” testing to be conducted. Personal Protective Equipment (PPE) shall be worn. If the water heater is fitted with a power lead and plug, an RCD shall be installed between the power point and the power lead to reduce the risk of electric shock.</i>
	<i>Isolate power before conducting the indicated test</i>
	<i>Hot surface or liquid. Personal Protective Equipment (PPE) shall be worn to reduce the risk of scalding.</i>
	<i>General warning symbol. Observe the instructions accompanying the symbol.</i>

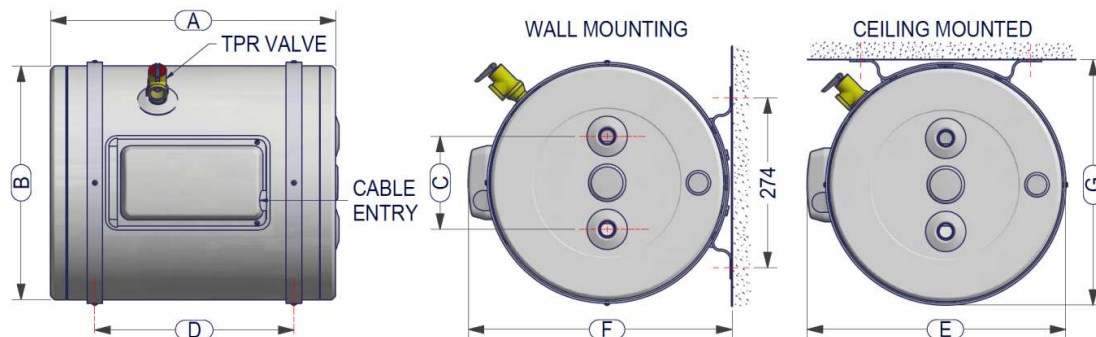
HEATER MODEL IDENTIFICATION

All identification numbers are designed to convey detailed information about the water heater to which it is attached. Model number, serial number and date of manufacture should be quoted in all correspondence.

	EV	1	0	050	L	300		O	MG	JG
EV - (Vitreous) Electric Vertical	PRODUCT CATEGORY	1	0	050	L	300		O	MG	JG
EH - (Vitreous) Electrical Horizontal										
HP - Heat Pump										
G - Gas										
S - Solar										
T - Storage Tank										
SH - Stainless Electric Horizontal										
SV - Stainless Electric Vertical										
0 - Solahart Model	BRAND	1	0	050	L	300		O	MG	JG
1 - Rheem Standard										
2 - Everhot Model										
6 - Vulcan Model										
9 - Aquamax Model										
0 - Default Floor Mounted (EV), Ceiling Mounted (EH)		1	0	050	L	300		O	MG	JG
1 - Wall Mounted twin bracket (EV & EH)										
2 - 2 Piece Cylinder Construction										
Rated Capacity or Delivery in Litres	LEFT or RIGHT SERIES	1	0	050	L	300		O	MG	JG
L - Left Hand										
R - Right										
D - Dual										
035 - 350W										
050 - 500W	HEATING ELEMENT RATINGS	1	0	050	L	300		O	MG	JG
120 - 1200W										
150 - 1500W										
180 - 1800W										
200 - 2000W										
240 - 2400W										
250 - 2500W										
300 - 3000W										
360 - 3600W										
480 - 4800W										
Blank - Single Element	NUMBER of HEATING ELEMENTS	1	0	050	L	300		O	MG	JG
D - Double Element										
X - Special										
O - Without Power Lead	POWER LEAD	1	0	050	L	300		O	MG	JG
P - With Power Lead										
MG - Std Magnesium Anode	ANODE	1	0	050	L	300		O	MG	JG
HW - Hard Water Anode										
BL - Blue Anode										
AL - Aluminium Anode										
OW - Std (Off White)	PAINT COLOUR	1	0	050	L	300		O	MG	JG
MG - Mist Green										
JG - Joey Grey										
SB - Saltbush										

SPECIFICATIONS

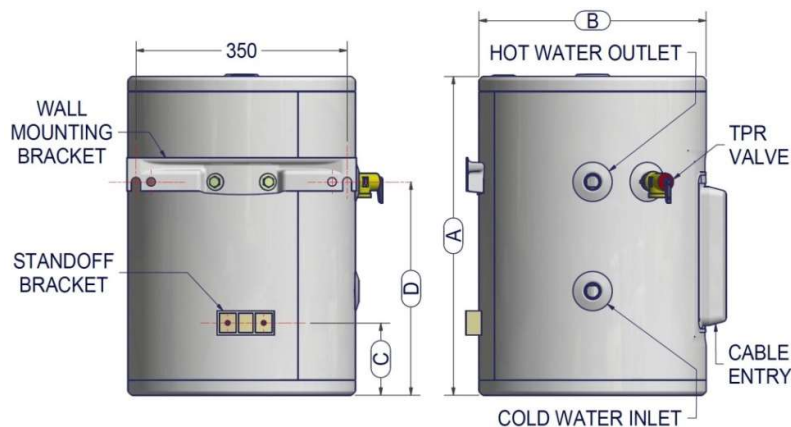
HORIZONTAL MODEL



Model Capacity (EH-Series)	Litres	25	40	55	75	100
Rated Power (Options)	kW	0.35, 0.50, 1.0, 1.2, 1.8, 2.0, 2.4, 2.5, or 3.0kW				
Approx. ☉ Heat Up Time to 60°C	min.	20	33	45	61	81
Length A	mm	460	664	868	1140	973
Diameter B	mm	377				
Inlet & Outlet Spacing C	mm	150				
Mount Hole Spacing D	mm	320	340	478	812	632
Overall Width Heater Unit E	mm	418				
Total Distance from Wall F	mm	426				
Total Height from Ceiling G	mm	396				
Voltage Input	V	220 – 240 Va.c. / 50 Hz				
Temperature Setting	°C	Robert Shaw Model ST1201133, Factory Set 60 (Max 70)				
Rated Pressure	kPa	1,000				
T&P Relief Valve Pressure	kPa	1,000				
Thread Sizes for Water Inlet & Outlet		Rp 20 (3/4" x 14)				
Thread Size for Safety Valve		Rp 20 (3/4" x 14)				
Shipping Weight	kg	16	23	28	34	38

☉ Heat up time is calculated based on incoming temperature of 25°C @ 3.0kW.
Available in Left Hand and Right (Shown) Connection

VERTICAL MODEL



Model Capacity (EV-Series)	Litres	25	42	50	75	100
Rated Power (Options)	kW	0.35, 0.50, 1.0, 1.2, 1.8, 2.0, 2.4, 2.5, or 3.0kW				
Approx. ☉ Heat Up Time to 60°C	min.	20	34	41	61	81
Height A	mm	460	487	554	764	973
Diameter B	mm	377	461			
Spacer Bracket C	mm	100				
Wall Mounting Bracket D	mm	286	292	359	568	777
Voltage Input	V	220 - 240V ~ / 50 Hz				
Temperature Setting	°C	Robert Shaw Model ST1201133, Factory Set 65 (Max 70)				
Rated Pressure	kPa	1000				
T&P Relief Valve Pressure	kPa	1000				
Thread Sizes for Water Inlet & Outlet		Rp 20 (3/4" x 14)				
Thread Size for Safety Valve		Rp 20 (3/4" x 14)				
Shipping Weight	kg	16	21	23	29	36

☉ Heat up time is calculated based on incoming temperature of 25°C @ 3.0kW.
Available in Left Hand Connection

SERVICE SAFETY PROCEDURE – WORKING WITH ELECTRICITY

The installation and servicing of Rheem, Vulcan, Everhot, Solahart or Aquamax Electric Water Heaters involves working with electric circuits. Predominantly the water heaters are “hard wired” to single phase circuits. Also some water heaters and ancillary equipment are connected via a 10-amp lead and GPO.

To ensure the safety of all technicians and supervisors when working on water heaters with an electrical mains supply connection the following requirements must be followed:

All technicians must work within the confines of their electrical licence:

- a) Service staff (unlicensed) may only work on equipment that can be disconnected from the electrical supply via a removable plug and GPO. (Regulations require that all technicians be licensed, either as electricians or plumbers with restricted licences to work on these appliances). They must also have a documented record of safety training for working on this equipment.
- b) Electricians/Plumbers can carry out after sales service for warranty and non-warranty claims. It is the electrician/plumber's responsibility to be aware and only carry out work as stated by their license.
- Close observance of the instructions contained in this service manual will minimise the opportunity for electricity related injuries. The service manual highlights when safety precautions are required and when Personal Protective Equipment (PPE) is to be used.
- Equipment should be isolated before removing safety covers exposing live components. Exceptions to this requirement are stated in the service manual. Isolation must include either disconnecting the load wire from the fuse/circuit breaker base, or the use of a lock out device to prevent the circuit being made active. Lock out devices are fitted to circuit breakers, fuse bases, isolation switches or 3 pin plugs to isolate the circuit/appliance. In either case a suitable warning notice to AS 1319, as well as in accordance with all local authority and law requirements, must be attached to the point of isolation.
- Prior to working on an isolated appliance, a voltmeter test must prove conclusively that the appliance is isolated. If you leave the appliance, always retest to ensure it has not been reconnected in your absence. Remember – test before touching.
- Element changes or leaking water heaters can expose electrical components to water. Whenever an element change is being done, remove all electrical components from the danger of becoming wet. If water has contacted any component, that component must be thoroughly dried and an insulation check must be conducted before reconnecting it to the supply. Regard all liquids as conductive unless proven otherwise.
- Never leave an appliance without ensuring all covers have been refitted. If a cover is missing, then the appropriate electrical circuit must be isolated and locked off.
- Whenever live testing is required to be done (refer to service manuals), the following precautions must be included:
 - a) Exposed parts are to be treated as “live” until they are isolated and proved conclusively not to be energised.
 - b) PPE must be worn including long sleeves, long pants, safety glasses, OO gloves and rubber soled shoes.
 - c) Ensure that the person in control of the equipment has been consulted.
 - d) Ensure sufficient lighting so that the correct contact points can easily be seen.
 - e) Any ladders or steps being used must be non-conductive.
 - f) Do not probe connections haphazardly. Ensure that the service manual has been read and thoroughly understood. Identify each contact point prior to commencing the testing.
- g) Review and recognise all live components that may be inadvertently touched.
- h) Work from a safe position which would require a deliberate movement to contact directly energised conductors or parts.
- i) Remove any neck chains, bracelets, earrings, watches and rings that could contact directly energised conductors or parts.
- j) Whenever testing is to be done on appliances connected electrically by a plug and lead, always insert a portable RCD between the GPO and the appliance to provide additional safety.
- k) If an RCD cannot simply be inserted into the supply prior to live testing being required, then insulated working gloves, Class “OO” must be worn on each hand.
- Using a “tong tester” – ammeter is considered to be live testing and extreme care needs to be taken to ensure there is no inadvertent contact with live conductors or parts.
- When disconnecting/reconnecting a hard wired appliance, always disconnect the earth last and reconnect the earth first.
- Whenever there is a requirement to leave a site having disconnected (either permanent or temporarily) the water heater, the circuit must be isolated and suitably terminated so that future energising of the circuit will not cause a safety risk.
- Always check that terminations are tight to ensure no high resistance joints.
- Equipment such as meggers and multimeters must be calibrated within the period(s) as per local Electrical Safety Regulations.
- All electrical leads, power tools, extensions lamps and RCD's must be visually checked for defects and insulation tested annually, as well as in accordance with all local authority and law requirements, with a permanent tag attached indicating date of test. A record of maintenance is to be retained by each contractor for each electrical lead, power tool, RCD or extension lamp, indicating the date of test, condition and the readings obtained. Consult local regulations for all other electric test requirements.
- Use insulated tools whenever possible and ensure all equipment is checked at least annually during vehicle safety checks.
- Safety glasses, safety helmets and safety footwear shall be in accordance with all local authority and law requirements and shall be worn in any work area as designated by Workplace Health and Safety requirements.
- All electrical hand tools, lights and extension leads must be used in conjunction with Residual Current Device (RCD).
- If more than one technician including apprentices are working on one site, they must discuss and decide who is responsible for each task at the beginning of the job. Many electric shocks are caused by poor communication between workers. Never ASSUME that another person has taken all safety precautions.
- Appropriate clothing code must apply which may include flame retardant material.
- Do not allow poor lighting to be the cause of safety problems. Use a good torch (with charged batteries) or a lead lamp fitted with an RCD).
- When drilling holes always check that the bit will not contact wiring which is behind or under the drilling surface.
- It is the responsibility of the technician on site to ensure that nothing is done or left undone that will jeopardise the safety

of the residents, staff and general public who may be on that site.

- Remember electricity will be conducted by most liquids, wet or damp timber, concrete, gases, flames (LPG and oxyacetylene), uninsulated tools, metal rulers and tape measures, and fire extinguishers that contain conductive liquids.
- Working on water pipes. (Excerpt from AS 3500.1 Clause 5.2)

If work is to be done on water pipes, the following procedure must be adopted:

- a) Locate the main switch/switches for the premises, turn off and tag.
 - b) Use a bridging contactor with suitable clamps to bond across the section of pipe to be cut and keep in place until the work is completed. It is highly recommended that a braided copper lead, which will carry 70 amps or more be used.
 - c) Where the clamps are to be connected, the pipe shall be cleaned to bare metal.
 - d) The electrical bridge shall not be broken or removed until all work on the water service is completed and continuity of the metallic service pipe is restored.
 - e) Where any metallic fittings or couplings exist, the earthing requirements should be checked by an electrical contractor to ensure the main earthing system remains effective.
- Any electrical shock must be reported immediately to the Service Manager. Other accidents involving injury or damage, or/and dangerous conditions at the work site, must also be reported to the Service Manager
 - Any equipment associated with an accident must not be interfered with until the accident has been investigated.
 - If a technician observes someone being subject to an electric shock, it is most important that in rescuing the person, the technician does not become subject to the risk of electric shock.

If the supply cannot be switched off immediately, try to remove the victim from electric contact as quickly as possible by using a dry, non-conducting material, e.g. dry clothing, or a dry wooden stick. Avoid direct contact with the skin of the victim or any conducting materials, which may be touching the victim. Once the victim has been removed from electrical contact, contact Emergency Services.

- Observe and eliminate all hazards prior to commencement of work, which includes live work and/or live testing.

SAFETY DURING OPERATION, MAINTENANCE AND SERVICING

- This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning the safe use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.
- CAUTION: In order to avoid a hazard due to inadvertent resetting of the thermal cutout, this appliance must not be supplied through an external switching device, such as a timer, or connected to a circuit that is regularly switched on and off by an appliance or utility.
- The water heater must have provision for drainage in the event that the water heater leaks or connection pipes break.
- The water heater is rated 220-240V/50Hz AC, single phase.
- The installation of the Electrical power supply cable must be correctly sized to safely carry the maximum current draw of

the appliance. Ensure all earth wires and connections are separated from the neutral circuit.

- Ensure that the electrical connections are undertaken by a qualified electrician complying with Local Code of Practice.
- Power must not be turned on until the water heater is filled with water. Open all hot water taps/faucets to release trapped air until only water is discharged.
- Temperature over 50°C may cause scalding. Please mix cold water with hot water to obtain the right bathing temperature.
- Please operate the Temperature and Pressure Relief Valve (TPR) manually at least once every 6 months to remove lime deposits and verify that the drain pipe from the valve is not blocked.
- Power must be turned off before any service and maintenance work can commence. All work must be performed by a qualified technician.
- For replacement of parts, please use original parts from manufacturer. Use of non-approved parts will result in a void the manufacturer's warranty.
- Water may drip from the discharge pipe of the TPR valve during normal expansion. The discharge pipe should be left open to the atmosphere preferably 150 mm above the nearest floor trap. On no accounts must the drain pipe be plugged. Blockage of the TPR discharge pipe may cause serious damage and will void the manufacturer's warranty.
- Warning – Scalds Minimisation. To minimise scalding, especially for those people in high risk categories ie. Young children, people with incapacitating medical conditions, elderly people, etc, this unit must be installed in accordance with all local and government regulations, and the use of secondary devices such as a suitable tempering valve or anti-scald water shut-off valve. (If a tempering valve is used, refer to its servicing instructions for periodic maintenance.)
- Hot water must be stored at a minimum of 60°C to inhibit the growth of Legionella bacteria.

ELECTRICAL SAFETY

Warning! DO NOT turn on the electrical power supply to the water heater until the water heater is completely filled with water. There will be NO WARRANTY for dry firing of the appliance.

- All electrical work and permanent wiring must be carried out by a qualified person and in accordance with the wiring rules, all local codes and regulatory authority requirements.
- The water heater shall be connected to single phase AC supply and its rated voltage is 220-240V 50Hz. Refer to rating label for input in wattage.
- Do not install this appliance near any possible contact with water.
- DO NOT CONNECT THE WATER HEATER WITH A NON MANUFACTURER AUTHORISED PLUG AND SOCKET.
- Where Power leads are supplied, please ensure the appliance is correctly connected to a Residual Current Circuit Breaker, and the correct wires size is installed as per the appliance Power Rating.
- The appliance must be earthed.
- All wiring must conform to local requirements. Ensure the household connecting wire rating is capable of withstanding the appliance load. If in doubt, please consult a qualified electrician.
- For entry to the element cover remove two fixing screws. Connect all ACTIVE and NEUTRAL wires as per the wiring

diagram provided on the inside of the element access cover. Ensure the incoming EARTH wire is securely fixed to the earth post provided in the heater case. Inspect and ensure that all wiring links are secure prior to fixing the access cover and turning the POWER on.

- The water heater must be completely filled with water prior to connection with power.
- To ensure the Over-temperature and Energy Cut-out is set, press the Reset Button on the thermostat.

PREVENTATIVE MAINTENANCE

Annual Service

It is suggested for peak performance that the water heater be serviced annually.

- Check for discharge from the T&PR valve. When the element is operating a small discharge of water may be evident. Operate the valve-easing lever to ensure the valve opens and resets properly. Always open and close the valve gently.
- Check for discharge from the ECV if fitted. When the element is operating a small discharge of water may be evident. Operate the valve-easing lever to ensure the valve opens and resets properly. Always open and close the valve gently.
- Check for leaks at all tank fittings.
- Check for signs of excessive corrosion on the water heater jacket.
- If an overflow tray is installed, check to ensure the overflow tray drain pipe is not blocked.
- **Isolate power** to the water heater and check all electrical connections for signs of overheating due to poor connection.
- Conduct an electrical insulation test on the water heater (refer to section "Electrical Insulation Testing")

Major Five Year Service

It is recommended that a major five year service be conducted on the water heater.

Note: The five (5) year service and routine replacement of any components, such as the anode and relief valve(s), are not included in the Rheem warranty. A charge is to be made for this work. Only genuine replacement parts should be used on the water heater.

The major service includes the following actions:

- Replace the temperature pressure relief valve.
- Inspect and flush the expansion control valve (if fitted). If required, replace the valve.
- In areas with water supplies that are either softened or desalinated, or where the water supply may alternate or is variable: inspect and (if there is any sign of depletion) replace the anode.
- Check the electric heating unit for excessive calcium build up or corrosion and replace if necessary.
- Visually check the unit for any potential problems.
- Inspect all connections.
- Check the drain line from the safe tray (if one is installed) is not blocked.
- Conduct an electrical insulation test on the water heater (refer to section "Electrical Insulation Testing").

INSTRUCTIONS FOR MAINTENANCE OF THE "ELCB" SAFETY DEVICE

- Only use the Manufacturer's supplied Power Lead. Depending on the model of your water heater, this appliance may be supplied with an integrated ELCB.
- Only connect to a ground earthed wall socket. Connection must only be made to the appliance by a Certified Electrician.

Periodic inspection of the ELCB should be conducted. To inspect the operation of the ELCB safety device, follow the following steps:

- Plug into power supply. Light (B) will be on as normal situation.
- For testing, push the Test button (A). Power will cut off, light (B) will be off and the Reset button (C) will pop up.
- To reset: push Reset button (C). Power will be on and light (B) will be on.

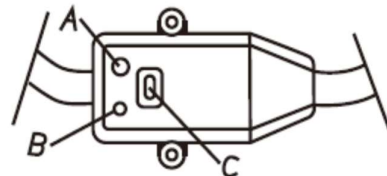


Diagram of ELCB (if supplied with the appliance)

- If after pushing test button (A) the power does not cut off and/or the light (B) is still on, it means the "ELCB" safety device is not working properly.
- If after pushing reset button (C) the power is still cut off and/or the light (B) is still off, it means the water heater is not working properly.
- In the above cases, stop using the water heater and call technical assistance.
- To reduce the risk of electric shock, do not remove, modify, or immerse this ELCB.

OPERATION

Single Element Models

Water temperature is maintained via a thermostat switching the active conductor to an electric immersion element positioned towards the bottom of the cylinder.

When the water temperature within the cylinder falls sufficiently, the thermostat contacts close supplying power to the element.

Once the water temperature reaches the set point of the thermostat, the contacts open cutting power to the element.

A double pole 'manual reset' over temperature cut out is incorporated into the thermostat to provide additional protection in the event the controlling thermostat contacts fail. The ECO contacts open between 80°C and 88°C.

Twin Element Non-Simultaneous Models

Water temperature is maintained via two electric immersion elements, one is positioned near the top of the cylinder and the other towards the bottom. Only one element is operational at any time (known as non simultaneous operation).

A thermostat, positioned adjacent to each element is utilised to maintain water temperature.

The top thermostat switches the neutral from the top element to the bottom element, this ensures only one element can be energised at a time. The top thermostat is factory set at 60°C. The bottom thermostat switches the active to the bottom element only.

Both thermostats incorporate a double pole 'manual reset' ECO to provide additional protection in the event the controlling thermostat contacts fail.

Once the top thermostat senses a temperature of approximately 60°C the thermostat contacts open the neutral circuit to the top element (between terminals 1 and 2 for ST thermostats), causing the top element to be de-energised, and close the neutral circuit to the bottom element (between terminals 1 and 5 for ST thermostats).

When the water temperature at the bottom of the tank reaches the set point of the bottom thermostat, the thermostat contacts open cutting the active circuit to the bottom element.

Under normal usage the top element is unlikely to operate, the water temperature being maintained by the bottom element. During periods of heavy use when the complete supply of hot water is depleted, the top element will operate to maintain the water temperature at the top of the tank (above the top element).

When the bottom element is connected to an off peak tariff full recovery of the tank will occur whenever power from the off peak tariff is available, usually overnight.

COMPONENTS AND THEIR FUNCTION

Temperature and Pressure Relief Valve

A valve designed to provide automatic relief by discharging water in case of excessive temperature, pressure or both.



Never fit a T&PR Valve with a pressure rating greater than that indicated on the product-rating label.

Pressure Limiting Valve (P.L.V.)

A valve that controls its outlet pressure to a predetermined limit.

Outlet Delivery Tube (Dip Tube)

A plastic tube installed in the hot water outlet of the water heater cylinder to conduct water from the highest point to the outlet connection. It also acts as a fitting liner.

Inlet Delivery Tube (Dip Tube)

A plastic tube installed in the cold water inlet of the water heater cylinder to assist with stratification. It also acts as a fitting liner.

Diffuser

A plastic device installed in the cold water inlet of the water heater cylinder to assist with stratification. It also acts as a fitting liner.

Fitting Liner

A plastic tube installed in the cold-water inlet of the water heater to provide protection against corrosion throughout the life of the water heater.

Anode (Sacrificial)

A metal alloy electrode installed in the water heater cylinder that by galvanic action protects the cylinder from corrosion.

Thermostat

A device, which is responsive to temperature, controls the supply of electrical energy to the element to maintain the stored water at the required temperature.

Non-simultaneous (Top) Thermostat – Twin Element Models

A device, which is responsive to temperature, controls the supply of electrical energy to the top element to maintain the stored water at the required temperature.

Over Temperature Energy Cut Out (E.C.O.)

A temperature-sensing device in combination with the thermostat that automatically cuts off the supply of electrical energy to prevent excessive water temperature occurring. This device will not reset automatically but may be manually reset once temperatures have fallen to a safe level.

DETERMINE CAUSE OF OPERATION.

Heating Unit (Element)

A tubular device containing an electric resistance element that converts electrical energy to heat.

Standard ratings are 0.35, 0.50, 1.0, 1.2, 1.8, 2.0, 2.4, 2.5, 3.0, 3.6 and 4.8kW.

FAULT FINDING

Common Faults

When a complaint is lodged about the performance of a hot water system there are a number of causes that should be checked and eliminated. In an attempt to pinpoint the most likely cause it is important to discuss with the customer their reasons for the complaint, the duration of the problem, any change in circumstances or usage and recent weather conditions. This information in conjunction with the following listed common complaints will assist you in locating the most likely cause. All procedures assume there is water flowing through the water heater.

Excessive hot water usage

The complaints of insufficient hot water and no hot water can on many occasions be attributed to hot water usage exceeding the capacity of the water heater to provide hot water.

When first attending a call of this nature it is essential to establish the probable hot water usage by querying the usage habits of the household and compare this with the potential delivery of the model water heater installed. It can then be established if the usage is within or outside the capacity of the model. The areas to look at for excessive usage are:

1. Automatic washing machines.
2. Showers exceeding 12 litres/minute for mixed water and 5 minutes in duration.
3. Two or more showers operating at the same time.
4. Change of occupancy or number of persons increased.
5. High water pressure area (Excessive pressure relief valve discharge).
6. Plumbing leaks.
7. Thermostat temperature setting.
8. Crossed connection.

Discoloured water

This may be the result of discoloured water entering from the cold water mains. Check if the cold water is also discoloured.

Water hammer

A water heater will not cause water hammer, however valves associated with the water heater may be the source of the problem i.e. cold-water stopcock, non-return valve or relief valve.

Most water hammer problems are associated with plumbing, hot and cold or appliances i.e. solenoid valves, ballcocks, loose pipes, sharp angles in pipe work, faulty or worn valve parts, loose tap washers or neighbouring equipment.

High water pressure areas will have more complaints of this nature and the use of a pressure-limiting valve (PLV) to reduce the household cold-water pressure will usually solve most problems.

Hot water plumbing leaks

If hot water has not been used for a period of time, feeling the temperature of the hot water line may give an indication of water flow if the pipe is warm. The method of checking for plumbing leaks is:

1. Turn off the stopcock on the cold water supply to the water heater.
2. Open a hot tap to ensure the flow of water stops. This will confirm the stopcock is operating correctly.
3. Turn off the hot tap.
4. Turn on the stopcock to make up the water pressure in the cylinder and then turn the stopcock off again.

5. Wait approximately 5 minutes then do either of the following:
 - a. With your ear close to the stopcock turn it on slightly and listen for any water passing. If there are no leaks, water should not pass.
 - b. Open a hot tap while listening for any pressure release. If there is a pressure release there will be no leaks in the plumbing system.

Mixing or crossed connections

If an automatic dishwasher, washing machine, flick mixer tap, tempering valve or thermostatic mixing valve is installed there is always the possibility that the cold water could mix with the hot water through a faulty or incorrectly installed valve. This is referred to as a cross connection. The complaints of insufficient hot water, water too cold or excessive discharge from the pressure relief valve may be attributed to a cross connection. The method of checking for a cross connection is:

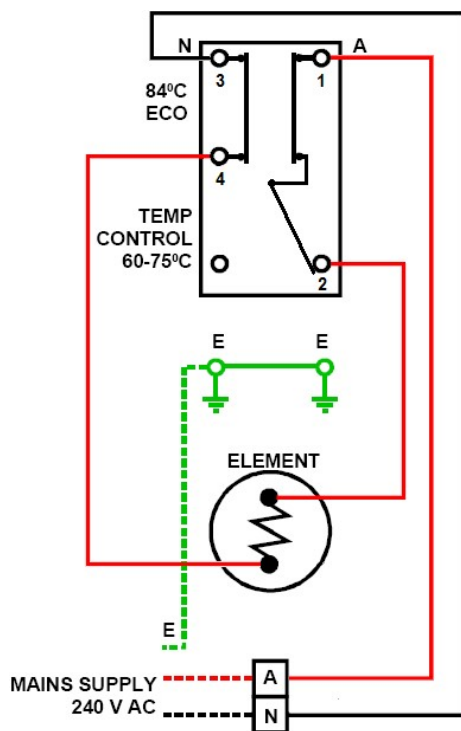
1. Turn off the stopcock on the cold water supply to the water heater.
2. Open a hot tap. If water flow is persistent and cold then a cross connection exists.

Robertshaw ST Thermostats

Single Element Models
ST Thermostat



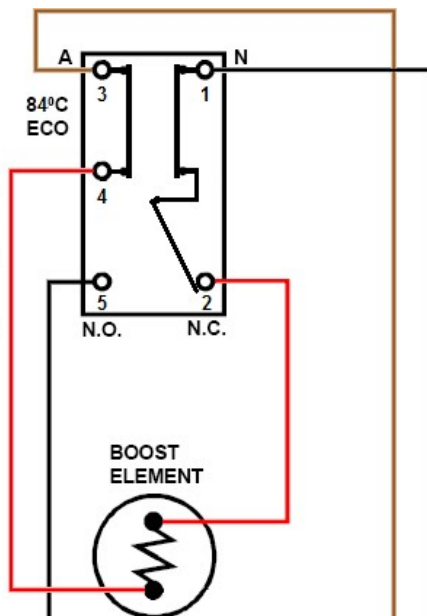
Single Element Installation



Twin Element Models
ST Thermostat

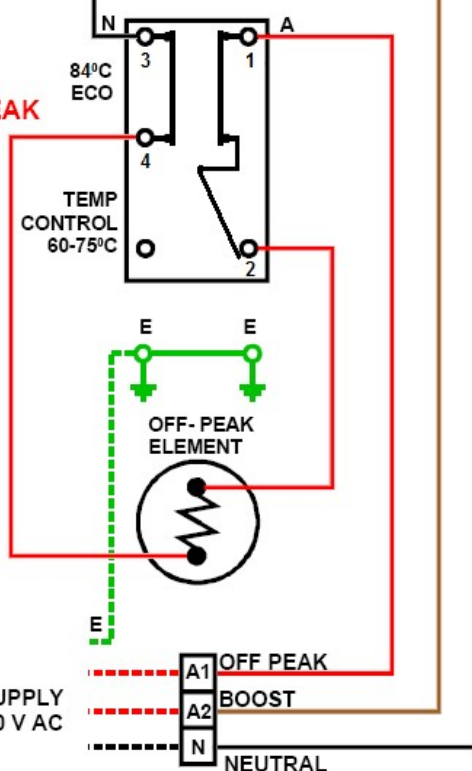
BOOST

BOOST thermostat neutral to 1 when calling for heat; switches to 5 when reaches 60°C and completes neutral circuit to off-peak thermostat below.



OFF-PEAK

MAINS SUPPLY
240 V AC



General Fault Finding Chart

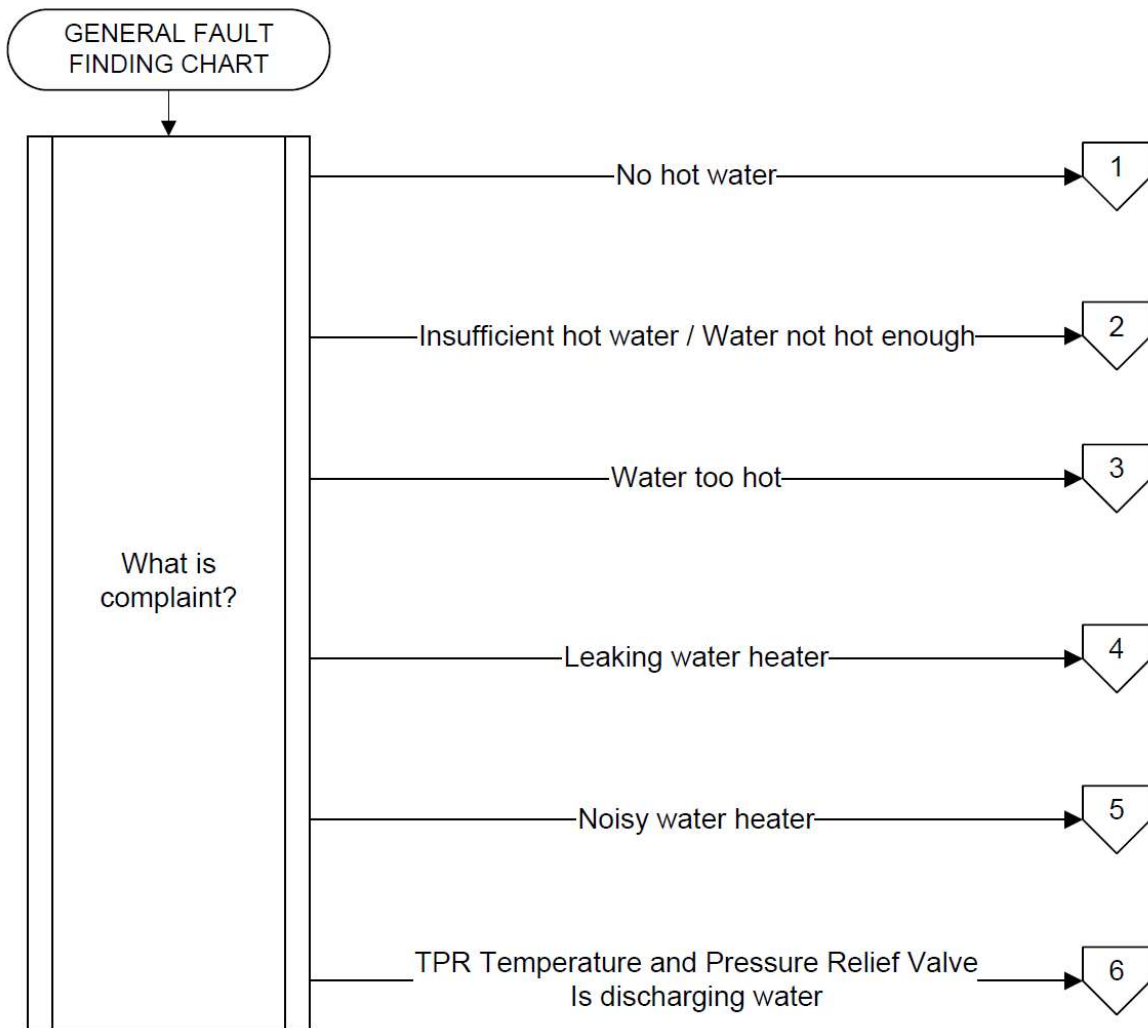
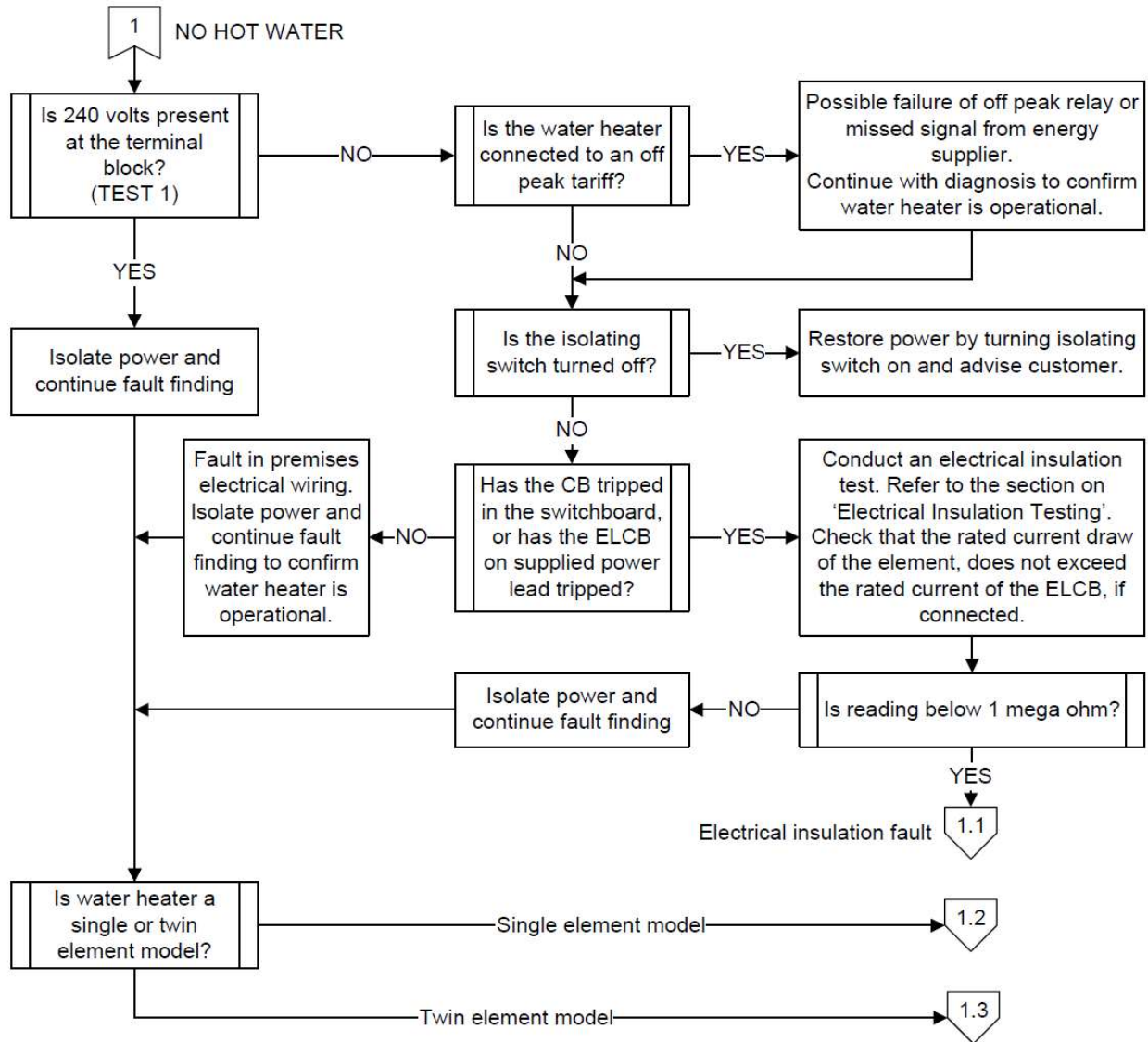
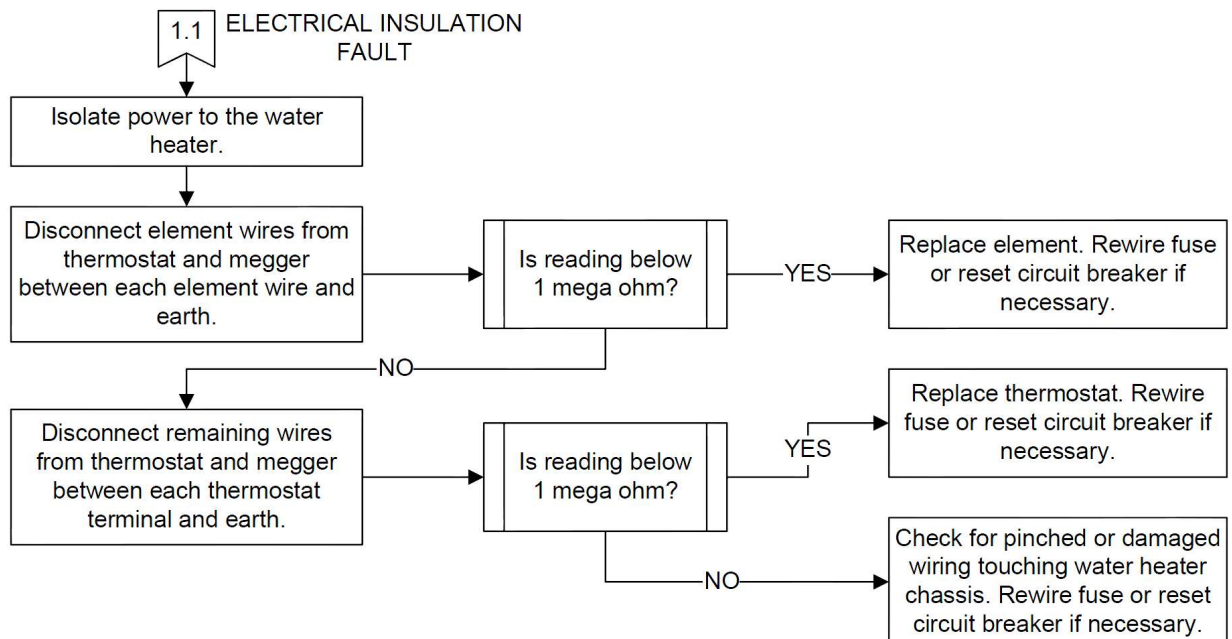


Chart	Complaint
1	No hot water – Power supply fault finding
1.1	Electrical Insulation Fault
1.2	No hot water – Single element fault finding
1.3	No hot water – Twin element fault finding
1.4	No hot water – Twin element fault finding (continued)
2	Insufficient hot water / Water not hot enough
3	Water too hot
4	Leaking water heater
5	Noisy water heater
6	TPR Temperature and Pressure Relief valve is discharging water

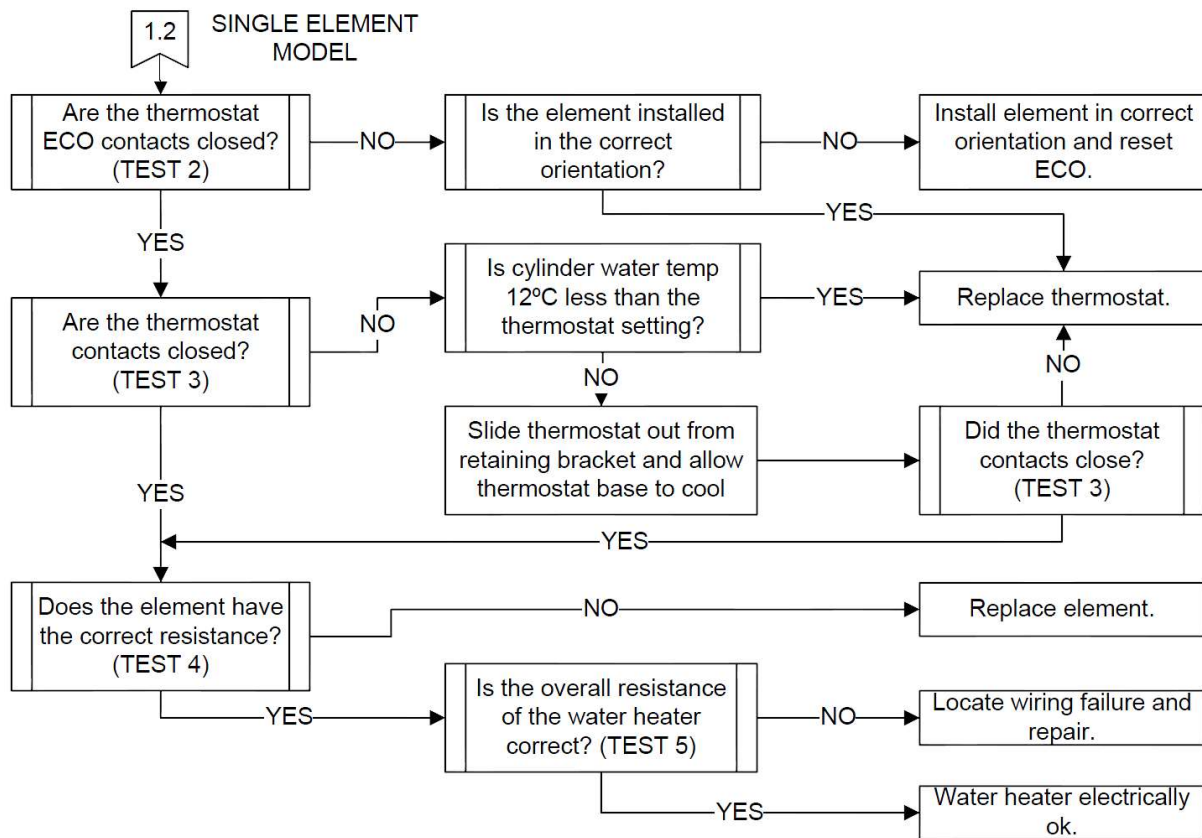
Fault Finding Chart 1 – No Hot Water



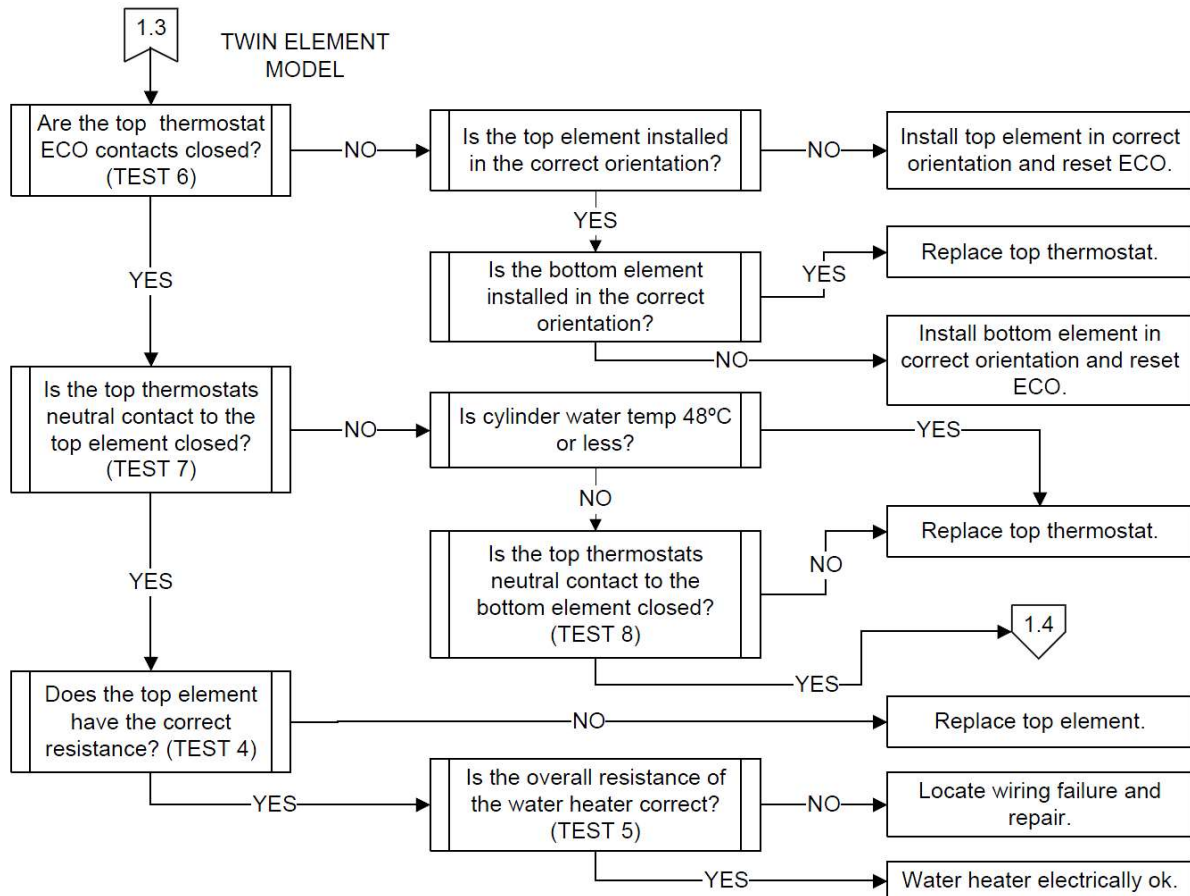
Fault Finding Chart 1.1



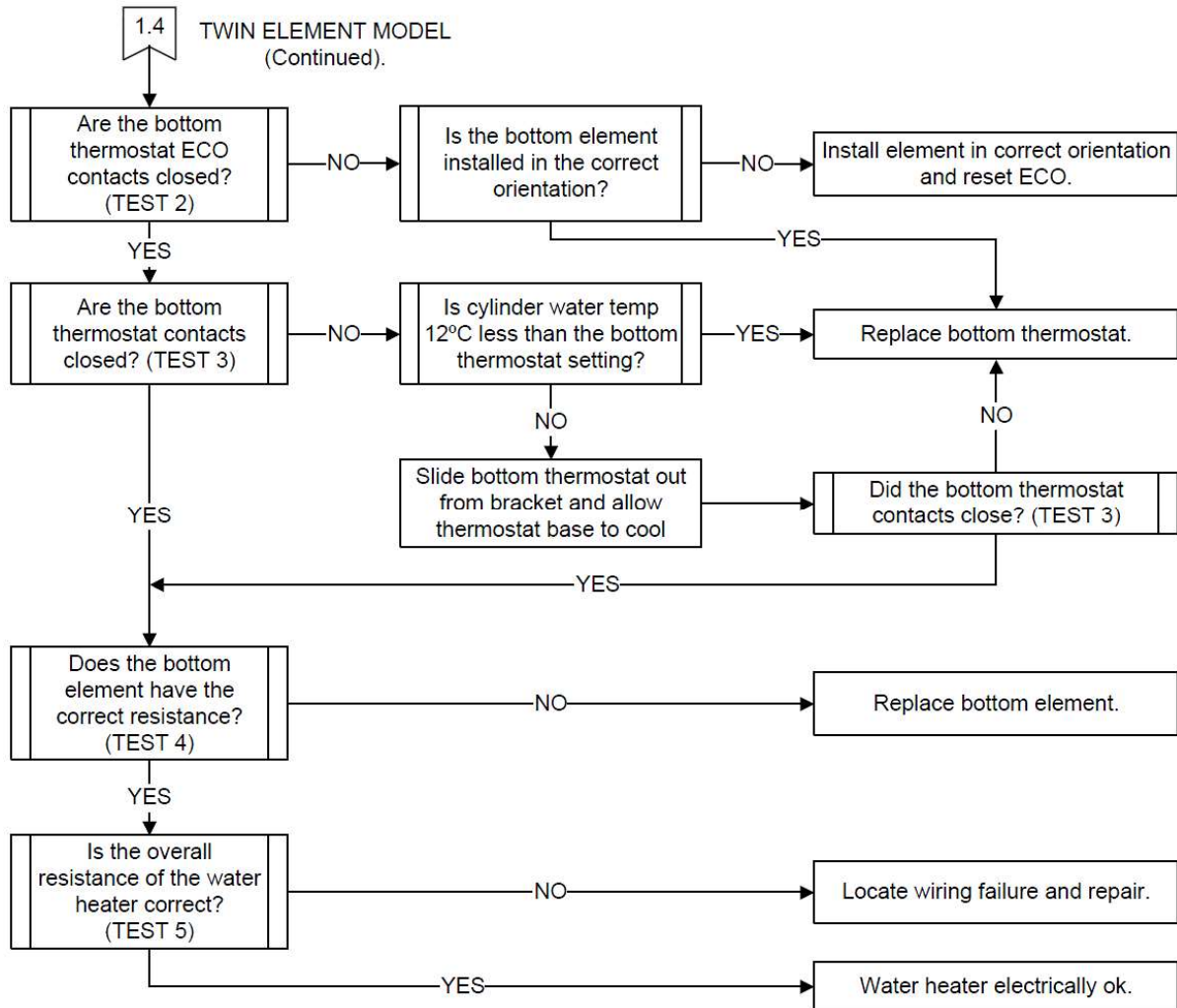
Fault Finding Chart 1.2



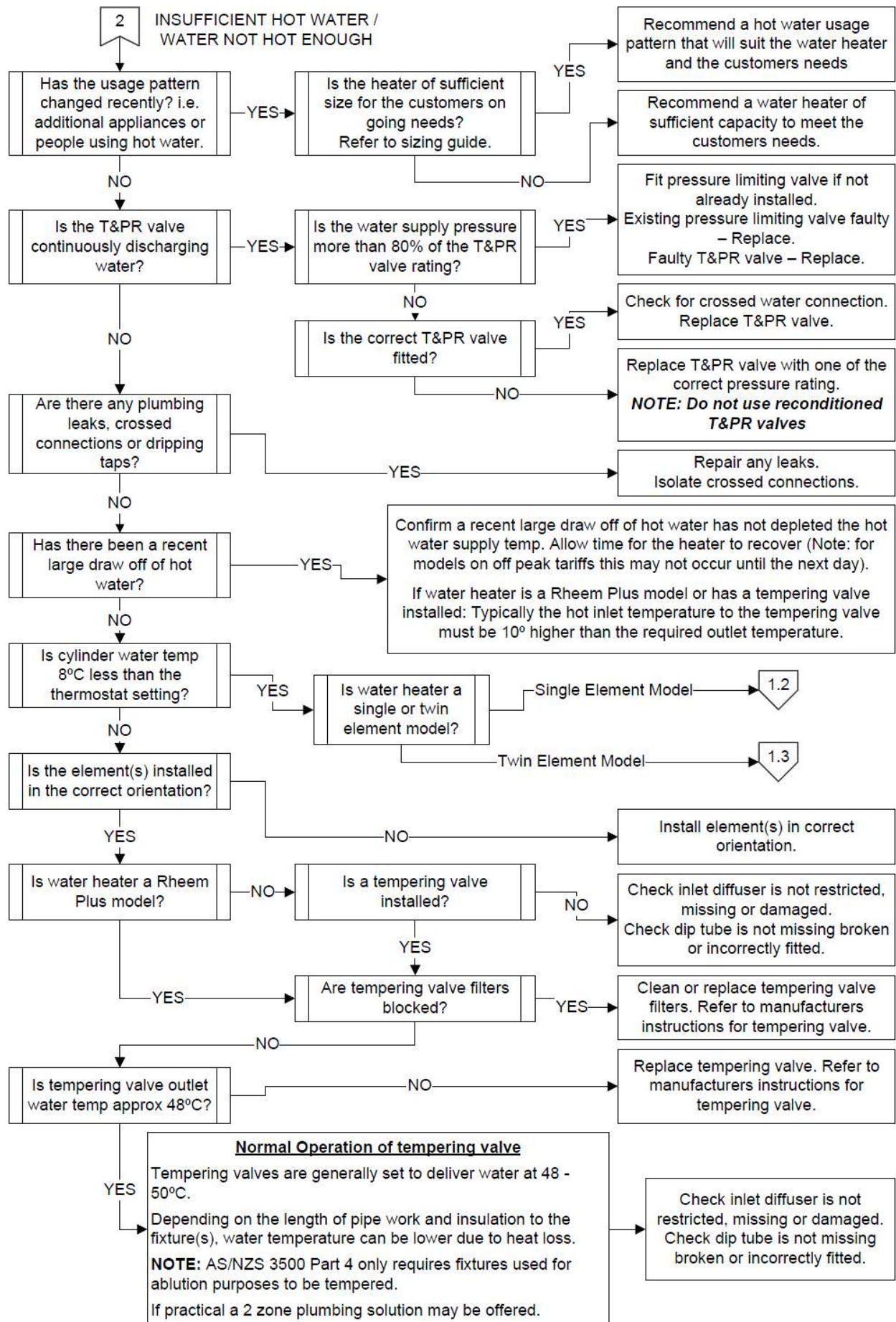
Fault Finding Chart 1.3



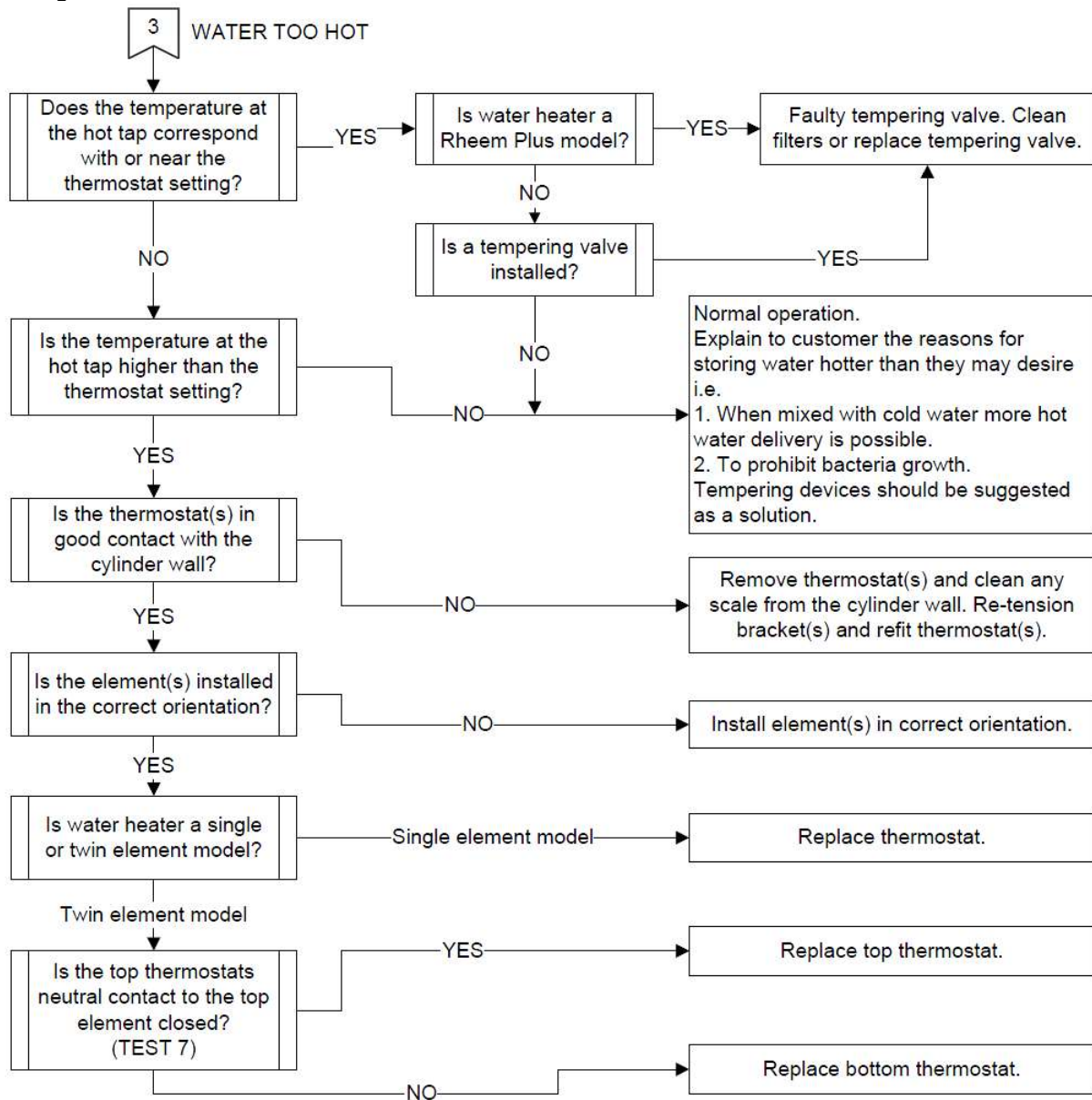
Fault Finding Chart 1.4



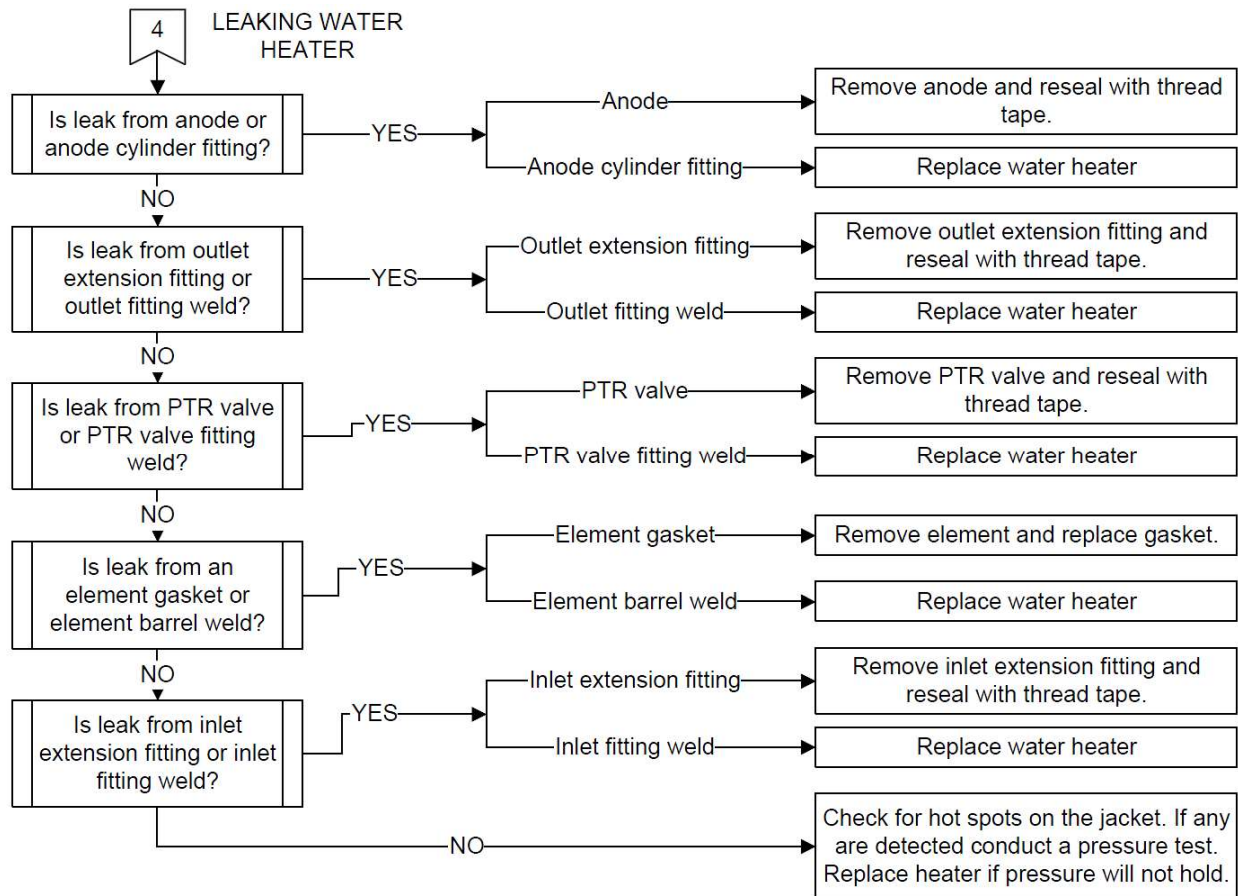
Fault Finding Chart 2 – Insufficient Hot Water / Water Not Hot Enough



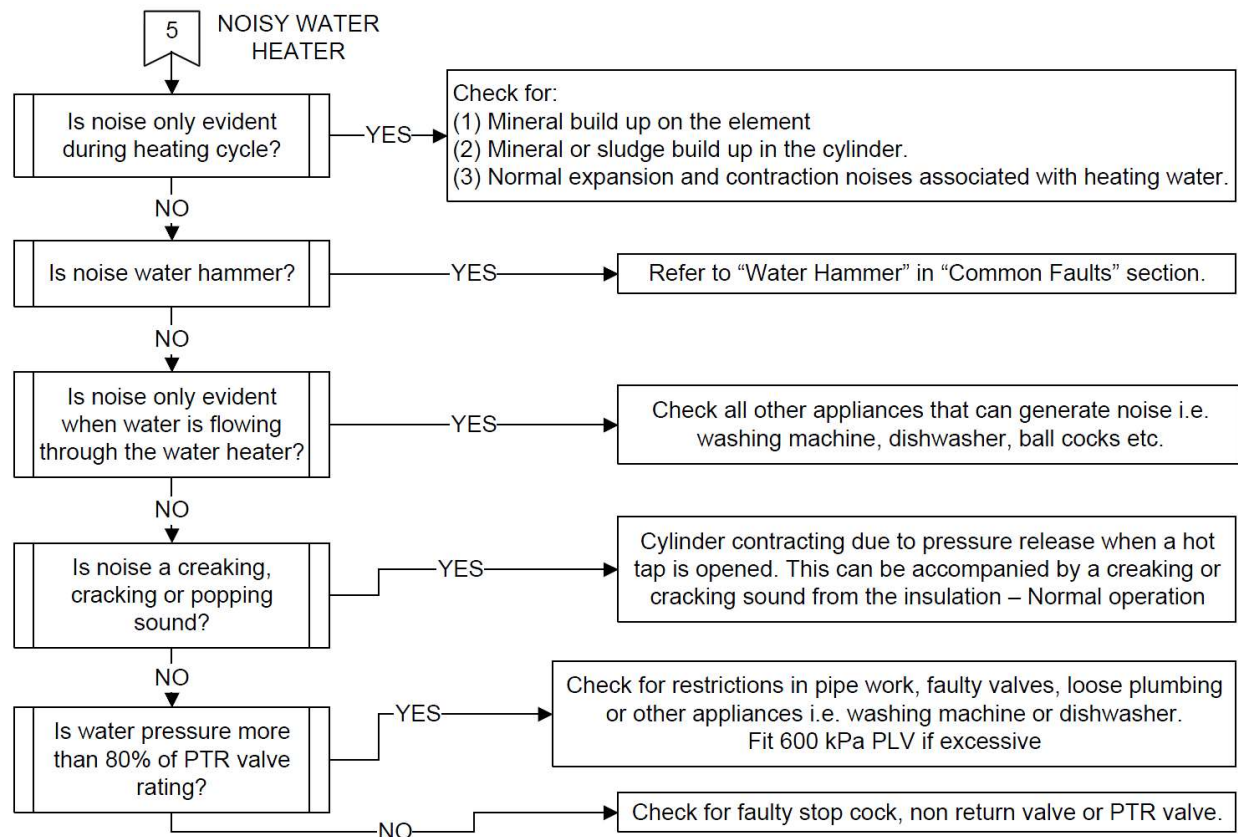
Fault Finding Chart 3 – Water Too Hot



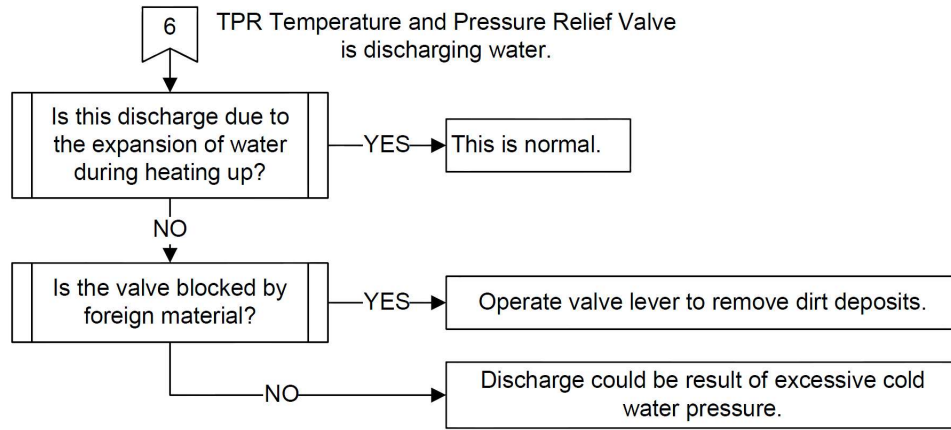
Fault Finding Chart 4 – Leaking Water Heater



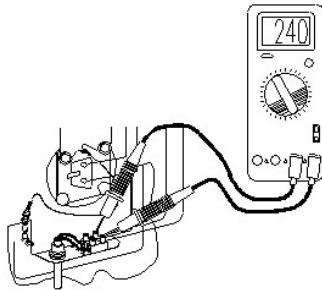
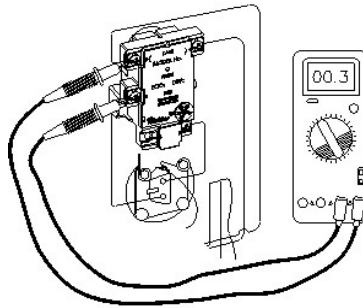
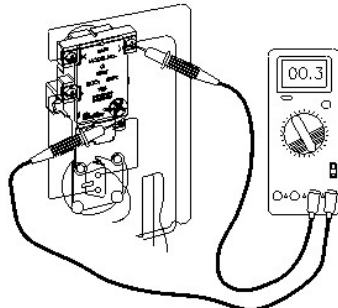
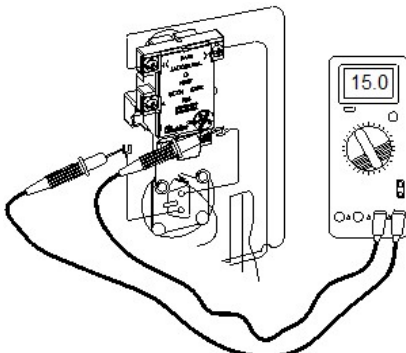
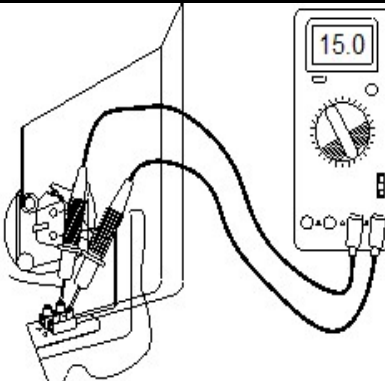
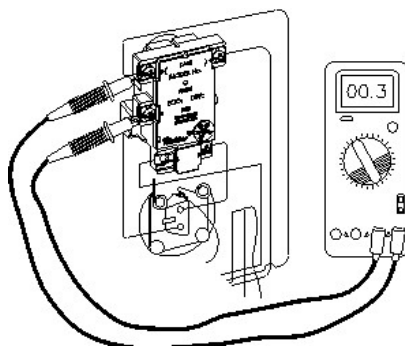
Fault Finding Chart 5 – Noisy Water Heater

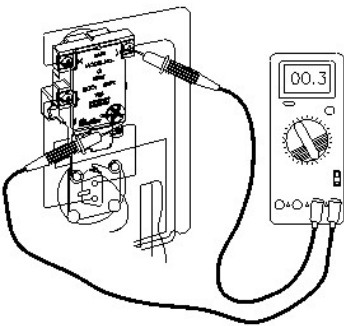
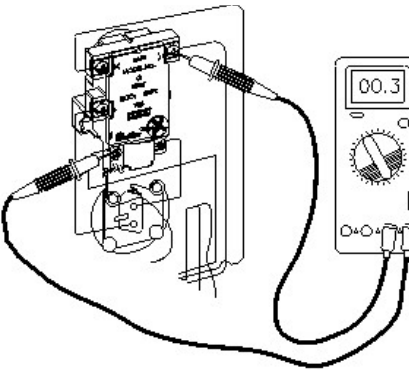


Fault Finding Chart 6 – TPR Temperature and Pressure Relief Valve is discharging water.



Fault Finding Tests

Test 1 – Single Element Models	Test 2 – ST Thermostat	Test 3 – ST Thermostat																				
																						
 Using a multimeter set on the AC voltage scale, measure between the Active terminal 'A' and the Neutral terminal 'N' on the terminal block. Normal voltage is 220-240 Volts AC.	 Using a multimeter set on the resistance scale, measure between the thermostat terminals marked '3' and '4' (bottom thermostat on twin element models). Normal resistance is less than 1 ohm when the ECO contacts are closed.	 Using a multimeter set on the resistance scale, measure between the thermostat terminals marked '1' and '2' (bottom thermostat on twin element models). Normal resistance is less than 1 ohm when the thermostat contacts are closed.																				
Test 4 – ST Thermostat	Test 5 – ST Thermostat	Test 6 – ST Thermostat																				
 ST thermostat shown	 Single element model shown																					
 Disconnect both element wires from the thermostat and using a multimeter set on the resistance scale, measure between the two disconnected element wires. Normal (cold) resistance is as follows: <table><tr><td>350W element:</td><td>131 ~ 154Ω.</td></tr><tr><td>500W element:</td><td>92 ~ 108Ω.</td></tr><tr><td>1.0kW element:</td><td>46 ~ 54Ω.</td></tr><tr><td>1.8kW element:</td><td>29 ~ 35Ω.</td></tr><tr><td>2.0kW element:</td><td>23 ~ 27Ω.</td></tr><tr><td>2.4kW element:</td><td>22 ~ 26Ω.</td></tr><tr><td>2.5kW element:</td><td>18 ~ 22Ω.</td></tr><tr><td>3.0kW element:</td><td>16 ~ 20Ω.</td></tr><tr><td>3.6kW element:</td><td>14 ~ 17Ω.</td></tr><tr><td>4.8kW element:</td><td>11 ~ 13Ω.</td></tr></table>	350W element:	131 ~ 154Ω.	500W element:	92 ~ 108Ω.	1.0kW element:	46 ~ 54Ω.	1.8kW element:	29 ~ 35Ω.	2.0kW element:	23 ~ 27Ω.	2.4kW element:	22 ~ 26Ω.	2.5kW element:	18 ~ 22Ω.	3.0kW element:	16 ~ 20Ω.	3.6kW element:	14 ~ 17Ω.	4.8kW element:	11 ~ 13Ω.	 Using a multimeter on the resistance scale, measure between the Active wire 'A' and the Neutral wire 'N' on the terminal block. Note: If model is a twin element model, mark, disconnect and twist 'A1' and 'A2' actives together to form one active connection for testing purposes. Normal overall resistance when thermostat is closed will depend on element size. Refer to test results for test 4.	 Using a multimeter set on the resistance scale, measure between the top thermostat terminals marked '3' and '4'. Normal resistance is less than 1 ohm when the ECO contacts are closed.
350W element:	131 ~ 154Ω.																					
500W element:	92 ~ 108Ω.																					
1.0kW element:	46 ~ 54Ω.																					
1.8kW element:	29 ~ 35Ω.																					
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3.6kW element:	14 ~ 17Ω.																					
4.8kW element:	11 ~ 13Ω.																					

Test 7 – ST Thermostat	Test 8 – ST Thermostat
	
 Using a multimeter set on the resistance scale, measure between the top thermostat terminals marked '1' and '2'. Normal resistance is less than 1 ohm when the neutral contact to the top element is closed.	 Using a multimeter set on the resistance scale, measure between the top thermostat terminals marked '1' and '5'. Normal resistance is less than 1 ohm when the neutral contact to the bottom element is closed.

ELECTRICAL INSULATION TESTING

There are three basic test procedures that should be carried out when the operation and function of a water heater's electrical system is in doubt.



Personal Protective Equipment should be worn when conducting this procedure to reduce the risk of electric shock.

To check insulation resistance of the water heater Neutral Circuit (reading not to be below 1 mega-ohm).

1. **Isolate the power supply to the water heater by removing fuse or switching off circuit breaker. Confirm with a multi-meter across the Active(s) and Neutral wires at the terminal block that voltage is not present (refer to "Test 1").**
2. Once satisfied, disconnect the power supply active and neutral wires from the terminal block. Note: If model is a twin element model, mark and disconnect both active wires (marked 'A1' and 'A2').
3. Connect megger leads to the neutral of the water heater wiring and earth.
4. Operate megger on 500 VDC setting. A reading above 1 mega-ohm should be obtained.
5. If a reading below 1 mega-ohm is obtained, all component parts will need to be individually tested to locate the fault (refer to "fault finding chart 1.1").

To check insulation resistance of the water heater Active Circuit (reading not to be below 1 mega-ohm).

6. Connect megger leads to the active of the water heater wiring and earth. Note: If model is a twin element model, mark, disconnect and twist 'A1' and 'A2' actives together to form one active connection for testing purposes.

7. Operate megger on 500 VDC setting. A reading above 1 mega-ohm should be obtained.
8. If a reading below 1 mega-ohm is obtained, all component parts will need to be individually tested to locate the fault (refer to "fault finding chart 1.1").

To check "Continuity" of the water heater electrical circuit.

9. Set megger to resistance scale or multimeter to x1 resistance scale and measure between the active and neutral wires on the water heater. Note: If model is a twin element model, keep 'A1' and 'A2' actives twisted together to form one active connection for testing purposes (previously performed in step 6).
10. If a reading of less than 10 ohms or greater than 154 ohms is obtained, all electrical component parts will need to be individually tested to locate the fault (refer to "Test 5").
11. Reconnect power supply active cable to 'A' terminal and neutral cable to 'N' terminal at heater terminal block. Note: If model is a twin element model, untwist water heater 'A1' and 'A2' active wires and reconnect to terminal block as per markings.
12. Replace fuse or reset circuit breaker. **Note: If continuing with diagnosis procedures do not replace fuse or reset circuit breaker.**

COMPONENT ADJUSTMENT PROCEDURES

Thermostat Adjustment – Trade Adjustable

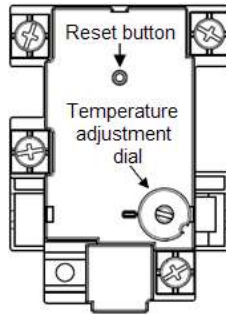
The main (bottom) thermostat is trade adjustable. For twin element models; the boost (top) thermostat is set to 60°C and is non adjustable.

To adjust the main thermostat:



Personal Protective Equipment should be worn when conducting step 3 of this procedure to reduce the risk of electric shock.

1. **Isolate the power supply to the water heater by removing fuse or switching off circuit breaker.**
2. Remove lower access cover.
3. **Confirm with a multi-meter between each Active and Neutral at the terminal block that voltage is not present.**
4. Turn thermostat temperature adjustment dial clockwise to increase temperature setting or anticlockwise to decrease temperature setting.
5. Replace lower access cover.
6. Restore the power supply to the water heater.



Draining the Water Heater



Elevated temperatures may be present during the draining process. Personal Protective Equipment should be worn to prevent the risk of scalding.



Personal Protective Equipment should be worn when conducting step 2 of this procedure to reduce the risk of electric shock.

1. **Isolate the power and water supplies to the water heater and remove lower access cover.**
2. **Relieve pressure from the water heater through T&PR valve or a hot tap.**
3. **Confirm with a multi-meter between each Active and Neutral at the terminal block that voltage is not present.**
4. Disconnect the cold water supply pipe.
5. Fit a drain hose to the cold water connection and run the other end to a drain or safe location.

Filling the Water Heater (by authorised person only)

1. Open all hot water taps in the house, including the shower to release air in the pipelines.
2. Open the cold water inlet to the water heater.
3. When water flows from each hot water tap without any presence of air, it means that the heater is completely filled with water. Close all hot water taps.
4. Check all plumbing connections for leaks.

Maintaining the Temperature & Pressure Relief Valve

1. It is recommended that routine preventative maintenance is carried out at least once every 6 months to remove lime deposits and verify that the valve is operating correctly and

the discharge line is not blocked. Failure of routine inspection may result in the water heater exploding.

2. Continuous leakage of water from the valve may indicate a problem with the water heater.
3. To manually operate, carefully lift and release the lever handle on the TPR valve to ensure the valve operates freely and allow several litres of water to flush through the discharge line. Ensure the discharge water is directed to the floor drain. Avoid any contact with the discharge water to avoid scalding.
4. If there is no water flowing out, please contact a serviceman.
5. Damage to the water heater due to blockage/restriction at the overflow outlet will void the manufacturer's warranty.

Replacing the Temperature & Pressure Relief Valve



Never fit a T&PR valve with a rating higher than that indicated on the water heater rating plate. Do not use reconditioned T&PR valves.



Warning! Beware of high temperature water..

1. Partially drain the water heater (refer to "Draining the Water Heater").
2. Remove the drain line from the T&PR valve.
3. Unscrew the T&PR valve and remove.
4. Confirm the replacement T&PR valve is the correct rating and refit using thread tape.
5. Refit the drain line.
6. To fill heater refer to instruction "Filling the Water Heater"
7. Close the hot tap and restore water supply.
8. Check T&PR valve thread for leaks.
9. Operate the T&PR valve lever to reset relief drain.
10. Purge air from the system through hot taps.
11. Restore the power supply to the water heater.

Dip Tube



Elevated temperatures may be present during the draining process. Personal Protective Equipment should be worn to prevent the risk of scalding.

1. Partially drain the water heater (refer to "Draining the Water Heater").
2. Disconnect the hot water line from the outlet of the water heater.
3. Remove the extension fitting.
4. Using a flat blade screwdriver gently split the outer rim at the top and bottom of the dip tube face and prise the dip tube out of the cylinder fitting.
5. Fit the replacement dip tube into the cylinder fitting ensuring the flat lines up with the fitting (dip tube facing up) and gently drive the dip tube into the fitting a short distance.
6. Apply thread tape to the extension fitting and refit; this will push the dip tube into the correct location.
7. Reconnect the plumbing and restore the water supply.
8. Purge air from the system through hot taps.
9. Restore the power supply to the water heater.

Anode



Elevated temperatures may be present during the draining process. Personal Protective Equipment should be worn to prevent the risk of scalding.

1. **Drain the water heater (refer to “Draining the Water Heater”).**
2. Remove the anode cap.
3. Using a 27mm tube or socket spanner remove the anode.
4. Apply thread seal tape to replacement anode, refit and tighten. **Note:** It may be necessary to cut the anode to length prior to fitting (refer to the chart below for the correct anode length and spare part number).
5. Restore water supply and check for leaks.
6. Refit the anode cap.
7. Purge air from the system through hot taps and restore the power supply to the water heater.

Capacity	Anode P/No.	Anode Length
----------	-------------	--------------

Horizontal Series

25 Litre	SP 020 35 01	297 mm
40 Litre	SP 020 35 07	501 mm
55 Litre	SP 020 35 10	705 mm
75 Litre	SP 020 35 12	977 mm
100 Litre	SP 020 35 11	808 mm

Vertical Series

25 Litre	SP 020 35 01	297 mm
42 Litre	SP 020 35 02	322 mm
50 Litre	SP 020 35 04	389 mm
75 Litre	SP 020 35 08	598 mm
100 Litre	SP 020 35 11	808 mm

Top Thermostat - Non-Simultaneous



Personal Protective Equipment should be worn when conducting step 2 of this procedure to reduce the risk of electric shock.

1. **Isolate the power supply to the water heater** and remove upper and lower front covers.
2. **Confirm with multi-meter between each Active and Neutral at the terminal block that voltage is not present.**
3. Remove the protective cover and disconnect wiring from the thermostat (Note wiring positions).
4. Slide thermostat vertically out of clamp.
5. Remove any scale or corrosion from cylinder surface.
6. Slide replacement thermostat into place behind clamp and connect wiring to appropriate points (refer to section “Wiring Diagrams”). Note: Ensure thermostat face is in good contact with cylinder surface.
7. Check water heater internal wiring insulation for cracking.
8. Refit the thermostat protective cover and upper access cover securely.
9. Conduct an electrical insulation test on the water heater (refer to “Electrical Insulation Testing”).
10. Replace lower access cover and restore the power supply to the water heater.

Bottom Thermostat – Trade Adjustable



Personal Protective Equipment should be worn when conducting step 2 of this procedure to reduce the risk of electric shock.

1. **Isolate the power supply to the water heater** and remove access cover.
2. **Confirm with multi-meter between each Active and Neutral at the terminal block that voltage is not present.**
3. Remove the thermostat protective cover and disconnect the wiring from the thermostat (Note wiring positions).
4. Slide thermostat vertically out of clamp. Note the current temperature selected.
5. Remove any scale or corrosion from cylinder surface.
6. Slide replacement thermostat into place behind clamp, set temperature to that noted in step 4 and connect wiring to appropriate points (refer to “Wiring Diagrams”). Note: Ensure thermostat face is in good contact with cylinder surface.
7. Check water heater internal wiring insulation for cracking.
8. Conduct an electrical insulation test (refer to “Electrical Insulation Testing”).
9. Refit the thermostat protective cover and the lower access cover.
10. Restore the power supply to the water heater.

Bottom Thermostat – Consumer Adjustable



Personal Protective Equipment should be worn when conducting step 2 of this procedure to reduce the risk of electric shock.

1. **Isolate the power supply to the water heater** and remove access cover.
2. **Confirm with multi-meter between each Active and Neutral at the terminal block that voltage is not present.**
3. Remove the thermostat protective cover and disconnect the wiring from the thermostat (Note wiring positions).
4. Slide thermostat vertically out of clamp. Note the current temperature selected.
5. Remove any scale or corrosion from cylinder surface.
6. Slide replacement thermostat into place behind clamp and connect wiring to appropriate points (refer to “Wiring Diagrams”). Note: Ensure thermostat face is in good contact with cylinder surface.
7. Conduct an electrical insulation test (refer to “Electrical Insulation Testing”).
8. Refit the thermostat protective cover, rotate the thermostat pointer to the middle position and fit the tee connector to the thermostat.
9. Gently disengage the knob from the access cover by compressing the 4 retaining fingers.
10. Replace lower access cover.
11. With the pointer of the knob indicating the middle temperature setting, gently refit the knob into the access cover ensuring the connector shaft engages into the knob and press until the 4 retaining fingers engage the access cover.
12. Select the temperature as noted in step 4 and restore the power supply to the water heater.

Tempering Valve – Rheem Premium Export Models



A quantity of hot water will discharge from the tank during this process. Personal Protective Equipment should be worn to prevent the risk of scalding.

1. **Isolate the power and water supplies to the water heater.**
2. **Relieve pressure from the water heater through the T&PR valve or a hot tap.**

3. Drain the water heater (refer to "Draining the Water Heater").
4. Remove the tempering valve and cold pipe access covers.
5. Disconnect cold and warm water pipes from tempering valve and unscrew tempering valve from heater.
Note: Removal of the cold pipe requires the use of a special tool, part number 890330. To remove the cold pipe from the tempering valve slide the tool over the pipe and push up against the quick connect fitting whilst pulling down on the cold pipe.
6. Screw new tempering valve into heater using thread tape on threaded section.
7. Insert cold pipe into tempering valve quick connect fitting and push up to click pipe into place (no tool required).
8. Reconnect warm water pipe using thread tape on threaded section.
9. Close hot tap or T&PR valve and restore water supply.
10. Check for leaks.
11. Purge air from the system through hot taps.
12. When tank is full restore the power supply to the water heater.

After replacing the tempering valve the warm water temperature will need to be checked to ensure correct operation. A reading of 48°C +/- 1.5°C should be obtained at the NEAREST warm water tap.

NOTE: The reading obtained must be less than 50°C.

Element – Top and Bottom



Elevated temperatures may be present during element removal process. Personal Protective Equipment should be worn to prevent the risk of scalding.



When replacing an element on a heater with a cylinder barrel that does not have an earth tab, ensure the metal surround of the element flange is in direct contact with the cylinder barrel flange to ensure a good earth contact is made. Conduct an earth continuity test (reference AS/NZS 3000 6.3.3.2).

When a fault or leak is traced to the element, the water heater should be drained to prevent damage to flooring or floor coverings by accidental flooding.

If an element requires replacement, do not install an Element with a current rating:

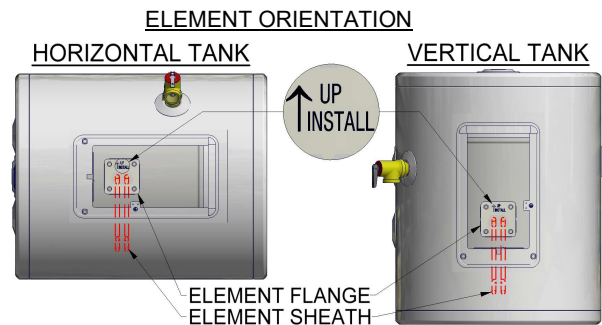
- exceeding the Rated Current as stated on the ELCB (if supplied with your appliance),
- exceeding the CB (circuit breaker) at the electrical distribution board, or
- exceeding the rated current capacity of the electrical supply cable back to the distribution board.

When replacing the Element, follow the steps:

1. **Drain the water heater (refer to "Draining the Water Heater").**
2. When the water heater is drained, undo the four element screws, removing thermostat clamp first.
3. Withdraw the element. Care must be taken to ensure the loop of the element does not catch in the cylinder opening and open out inside the cylinder.

NOTE: Do not cut off the element and leave a portion inside the cylinder

4. Clean around cylinder fitting. Fit a new gasket to the new element and slide the element into the cylinder (reverse of step 3) taking care that it is in the correct orientation as shown on the element flange – refer diagram below.



5. Replace screws and thermostat clamp and tighten.
The earthing of the internal storage cylinder relies on a good electrical contact between the metal surround of the element flange and the cylinder barrel flange.
An earth continuity test should be performed whenever an element or element gasket is replaced, adjusted or serviced in any way. This continuity test is performed between the heaters internal storage cylinder and the main earth terminal of the water heater with a resulting reading of not more than 0.5 ohms (reference AS/NZS 3000 6.3.3.2).
6. Restore cold water supply and fill the storage tank. Release air by gently lifting the easing lever on the T&PR valve until water runs from the drain or opening hot taps.
7. Check for water leaks around the element flange.
8. Conduct an electrical insulation test (refer to "Electrical Insulation Testing").
9. Replace access cover and restore the power supply to the water heater.

DISCLAIMER

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- Product designs, functions and specifications are constantly changing and this information may be out of date, inaccurate or incomplete at time of printing.
- This is not necessarily a concise Manual and it cannot cover every conceivable situation that might arise.
- No matter how much one can learn from reading the information in this Manual, there is no substitute for the training and experience of a qualified plumber or relevant tradesperson or hydraulic designer, and we recommend that you seek the advice of such a professional before conducting Installation, Operation, Maintenance and Service activities.
- The use of this Manual and the information contained within it is at your own risk.
- To the maximum extent permitted by law, Rheem excludes all liability for loss or damage of any kind relating to this Manual.
- No liability can be accepted for any consequences, which may arise as a result of the application of this Manual.
- Every care has been taken to ensure accuracy in preparation of this publication.

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1	Service Instructions issued Vitreous Enamel EH & EV Series Models	14/11/2016

Authorised Dealer