THERMOSIPHON SERVICE MANUAL

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1. THE FEATURES OF ELECTRICAL TANK THERMOSIPHON

Safety: Each part of the thermosiphon is controlled very precisely in order to achieve operation continuity on perfect level. Electric circuit is completely isolated from the water circuit. All models are equipped with at least 3 safety mechanisms.
Ease of use: All models can be mounted on any desired location easily.
Low heat loss: It is preferred that the thermosiphons, which can be mounted anywhere, are located closely to the hot water point as much as possible, so that the heat loss in the plumbing is kept at minimum.
Low amount of hot water: In order to prevent unnecessary waste of energy, the models manufactured in different capacities are designed for locations like kitchen or service room that need little but constant hot water.

(1) Efficient insulation, low energy consumption.
High density, thick polyurethane foam layer provides perfect insulation for all electrical heaters and significantly decreases energy consumption.
(2) Long life boiler.
A special enamelling process is used to protect the tank against the corrosive effect of the water and water-soluble materials. The said protection ensures the boilers' long-life and reliability.
(3) Magnesium anode.
An electrochemical corrosion preventive system is used, which improves boiler life by using more magnesium anode in the products. Besides, the anode is placed into the boiler so that it can be accessed easily when needed for inspection and parts replacement.
(4) High quality heating elements.
Resistances are manufactured from first class materials to guarantee long life of use.
(5) Water temperature control.
Products have a temperature control knob that enables the temperature value to be kept between 35°C and 80°C. Thanks to this knob, each user can select the water temperature they require and thus save energy.
(6) Thermostat.
Thermosiphons are equipped with original thermostats that guarantee high performance and maximum safety. In electronic models, circuit board takes over for the thermostat.
(7) Limit thermostat.
Thermostats are equipped with “maximum temperature” thermostat. This safety mechanism disables the main thermostat and resistance in case of a malfunction.
(8) Pressure safety valve.
Thermosiphons are equipped with a safety valve that is approved by the standards regarding pressure value. A latch-type wall is used that allows unit draining without requiring to remove the discharge pipe.
(9) Freezing Safety.
When the temperature of the water inside your thermosiphon falls below 5°C, the heater resistance automatically activates and heats the water up to 16°C. All the while, the lamp that has Anti Ice and resistance symbols turn on and display the water temperature.
Your thermosiphon must be in stand-by mode for the freezing safety system to activate. Install your thermosiphon to a location without freezing risk.
“This safety system is present in only electronically controlled models.”

(10) Bacteria Prevention System.

Researches show that when water remains stagnant under **60^0 C** for a prolonged duration, the conditions become suitable for bacteria reproduction. To prevent this, your thermosiphon raises the water temperature to 65°C at least once a week while in stand-by mode and keeps the water at this temperature at this level for one hour.

"This safety system is present in only electronically controlled models."

(11) Anhydrous Operation Safety.

When your device is operated without water for any reason, system will be automatically activated and **E3** error code will be generated on display. In this case, ensure that your water heater is filled with water by cutting energy supply from V-automate. After ensuring that water is filled, if you re-provide energy supply, thermosiphon will continue normal operation.

"This safety system is present in only electronically controlled models"

(12) Low Voltage Protection.

If the supply voltage decreases down to a level that may damage device during mains fluctuations, low voltage protection system will activate and **E2** error will be generated on display. When the voltage goes back to the desired value, **E2** code will disappear and device will resume operation.

"This safety system is present in only electronically controlled models"

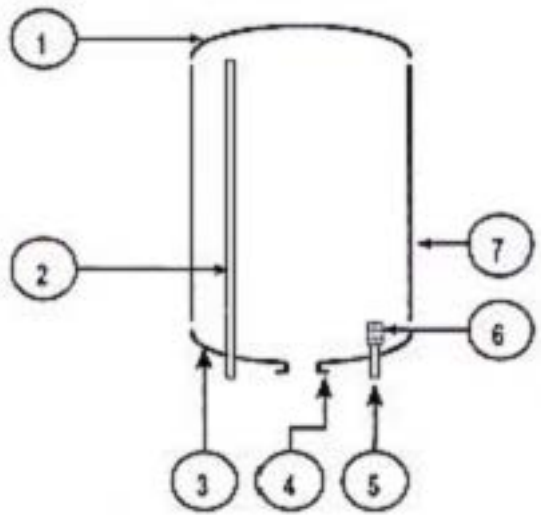
(13) Technical Specifications.

MODEL		STANDART			DIGITAL		
		TRV 50	TRV 65	TRV 80	TRV 50 E	TRV 65 E	TRV 80 E
Kapasite	Lt	50	65	80	50	65	80
Kontrol paneli	-	Thermostat-Led	Thermostat-Led	Thermostat-Led	Digital	Digital	Digital
Su Sıcaklık Ayar Aralığı	°C	35-85	35-85	35-85	35-85	35-85	35-85
Voltaj	V	230	230	230	230	230	230
Akım	A	9	9	9	9	9	9
Rezistans gücü	W	1980	1980	1980	1980	1980	1980
Çalışma Basıncı	Bar/MPa	9 / 0.9	9 / 0.9	9 / 0.9	9 / 0.9	9 / 0.9	9 / 0.9
Emniyet Ventili Max.	bar	10	10	10	10	10	10
Su Bağlantısı	inch	1/2	1/2	1/2	1/2	1/2	1/2
Anti bakteriyel Koruma	-	-	-	-	✔	✔	✔
Donma Kontrolü	-	-	-	-	✔	✔	✔
Susuz Çalışma Emniyeti	-	-	-	-	✔	✔	✔
Koruma Sınıfı	-	IPx4	IPx4	IPx4	IPx4	IPx4	IPx4
Korozyon Önleyici Sist.	Emaye Kaplı iç Kazan + Magnezyum anode						

2. COMPONENTS OF THE ELECTRICAL THERMOSIPHON

2.1 BOILER

Thermosiphon boiler is manufactured from steel sheets suitable for enamelling. Interior is coated with titanium-added enamel that withstands water at 850°C.

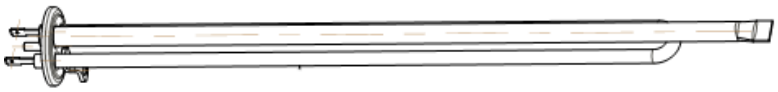


(1) Upper camber
(2) Hot water exit pipe. Hot water exit pipes of different dimensions can be used according to the model. Hot water is always extracted from the top portion of the tank.
(3) Lower camber
(4) Boiler flash
(5) Cold water Inlet pipe
(6) Entrance diffuser. Prevents turbulence and enables cold water entry from the lower part of the tank.
(7) Boiler

2.2 EXTERNAL BODY
Thermosiphon external body is manufactured from sheet with cataphoresis electrostatic paint.

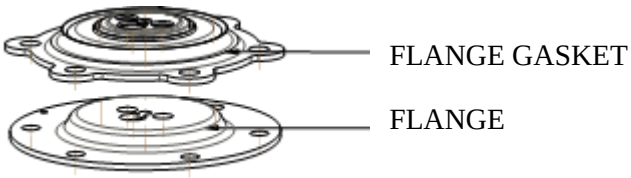
2.3 INSULATION
Pressurized polyurethane foam is filled between the boiler and the external body with the most suitable density for heat insulation.

2.4 RESISTANCE
The external part of the resistance is manufactured of stainless steel, and the inner part is made of resistance wire and magnesium oxide. Resistance flange contains the resistance, thermocouple pipe and anode rod mounting bracket. It can be in different shapes and strengths according to model. The mechanical thermostat, electronic thermostat and limit thermostat thermocouples attached into the thermocouple pipe must be fitted to the deepest part of the pipe and a rubber cap should be fitted to the end to prevent them from falling out.

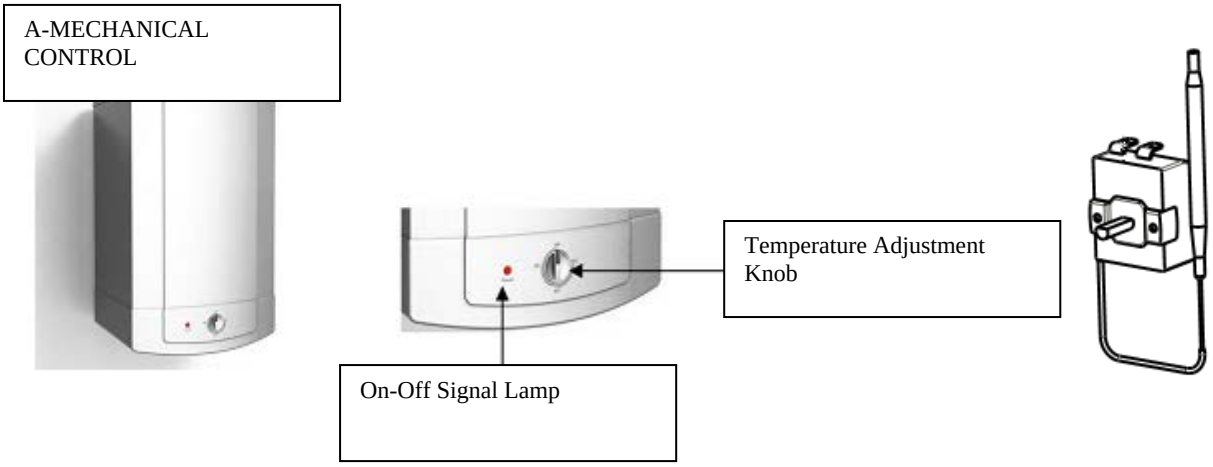


Resistance

2.5 FLANGE GASKET
The leak proofness and electrical insulation between tank flange and the heating element flange is achieved by a gasket. Gasket must be replaced in situations where the flange is removed, i.e. after cleaning the boiler scale of the thermostat.



2.6 THERMOSTAT
Mechanical thermostat is used to adjust the water temperature at the desired level. Thermostat is mounted on the front indicator panel. The capillary tube thermocouple is placed into the steel pipe on the resistance flange so that the thermostat can sense the water temperature. Thermocouple must be placed into the steel tube so that it will touch the deep end. The indicator lights red while the water is heated to the temperature that the thermostat is set. Indicator lights green when the water reaches the desired temperature.

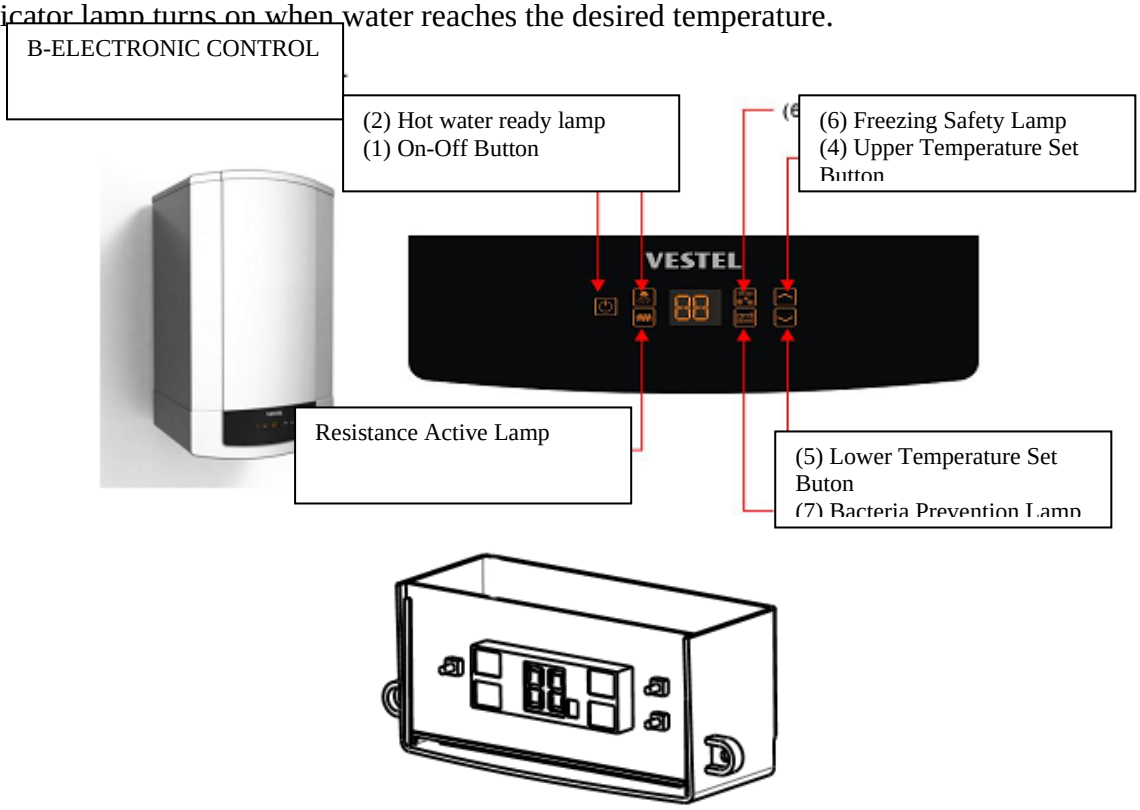


Thermostat.

2.7 ELECTRONIC THERMOSTAT

In electronically controlled thermostats, the temperature control and certain safety functions are conducted by circuit board. Circuit board is found on the front panel. It contains two touch-buttons to adjust temperature and one on-off touch button. Screen contains temperature value, resistance active, hot water ready, freezing prevention and bacteria prevention indicator LEDs. After removing the service cover, the electronic thermostat is removed by removing the crews on both sides inside the indicator panel. The protective lexan film on the front part of the indicator must be replaced when deformed.

The water temperature is set to the desired value by the circuit board. Setting is made only by using the up-down temperature buttons. At the end of the operation, current water temperature in the thermosiphon is displayed. And the resistance active lamp on the left side turns on. Hot water ready indicator lamp turns on when water reaches the desired temperature.



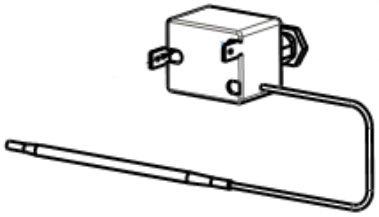
Electronic thermostat.

Electronic Thermostat Error Codes:
In some error cases, the following codes are displayed on the circuit board indicator.

E1	Thermistor error	Check the thermistor socket. Replace the thermistor with a new one.
E2	Low voltage warning	When voltage returns to normal, this error will automatically be removed.
E3	Waterless operation	Error shall be removed when the boiler is filled with water and power is cut off and then turned on again.

2.8 LIMIT THERMOSTAT

In case water temperature in boiler over-increases or temperature setting thermostat fails, limit thermostat maintains safety by deactivating resistance. When the limit thermostat is blown, first the thermostat is checked for integrity. After the problem is removed, the limit thermostat is activated again by pressing the reset button on it.



Limit thermostat.

2.9 SAFETY VALVE

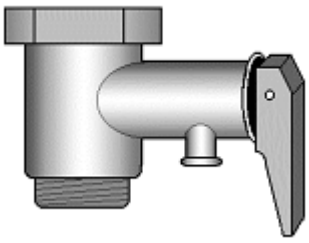
Safety valve checks the water pressure in the tank. It provides protection against high pressure and activates when the internal pressure exceeds 9 bars. Valve is closed in order to prevent the thermostat from emptying when the water feed is cut off. The minimum pressure for the valve to open and allow water in is 0.2 bars, which corresponds to 2 meters of water height. Safety valve has a latch that opens the valve. This latch can be used to discharge the water tank.

Safety valve is inserted to cold water inlet of the thermosiphon. When mounting and using safety valve, the following conditions should be followed.

1-As water may spill from discharging end, this pipe is required to be opened to atmosphere. To avoid dripping water from damaging the surroundings, you can connect a drain hose to waste water drain.

2- To avoid lime accumulation and verify that it is not blocked, it should be operated by pressing the latch in intervals.

3- When connecting safety valve to device, notice that discharging end is downwards.



Safety valve with drainage latch.

2.10 ANODE ROD

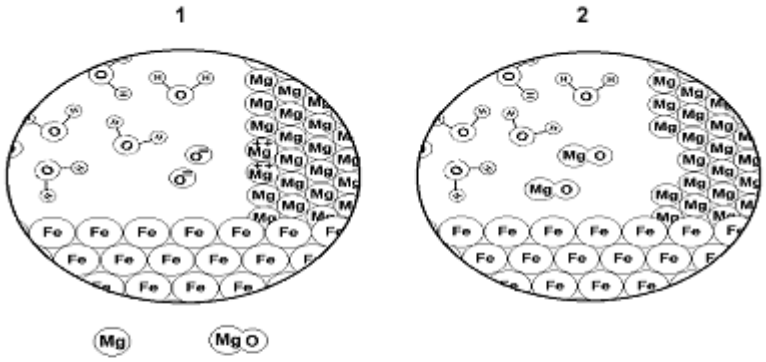
Corrosion is a chemical process that occurs between the metal of the thermosiphon (tank, pipes, resistances) and the water around them. Corrosion causes opening of holes in the tank, decreases the

mechanical strength of the components and causes the heating component to be damaged. The reasons for corrosion are as below:
1. Melt oxygen (example: From 5 mg/l in high temperature to 12 mg/l in low temperature)
2. Salts that harden the water.

Magnesium anode is used to prevent the tank from being perforated.

Corrosion develops in three stages:
1. Oxygen that melts in water contacts the interior surface of the tank.
2. The iron of the tank starts to dissolve (atom loses two electrons and becomes Fe++ ion).
3. Iron ion is separated from the tank surface and bonds with oxygen to form (FeO). In this case, a hole starts to form on the tank.

Both iron and magnesium are soluble in water; magnesium becomes the solution because it is more electropositive (turns into Mg++ easier) compared to iron.
At this point, magnesium leaves the anode and bonds with oxygen atoms. Corrosion ends, in other words magnesium rod corrodes as the thermostat remains the same.

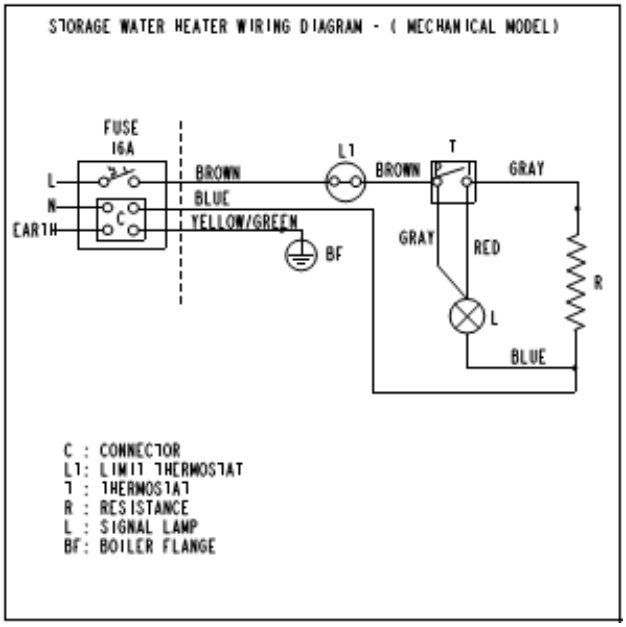


Magnesium atom (element that forms the anode)	Magnesium oxide MgO

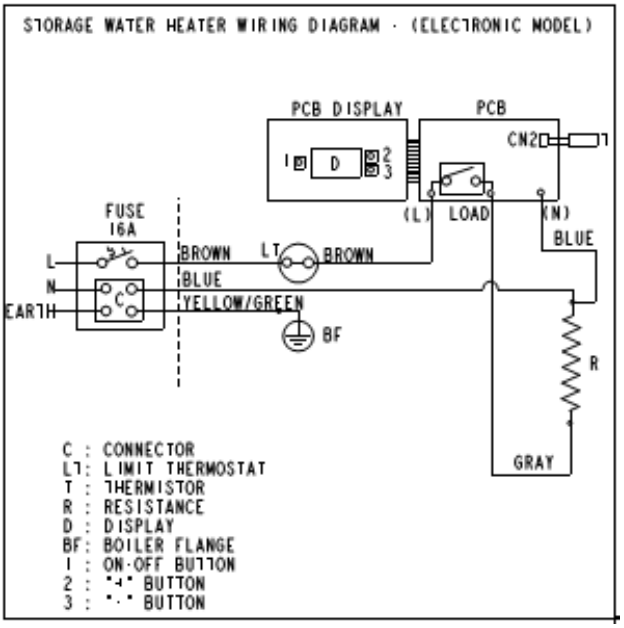
The life of anode depends on the water temperature, its amount and quality. Anode must be checked and replaced before it is completely out of use. Recommended duration is checking once every two years.

Anode rod

2.11 CONNECTION SCHEMATICS



Mechanically controlled model



Electronically controlled model

3. OPERATION PRINCIPLE

3.1 OPERATION

Tank is always filled with pressurized water. When the desired temperature is reached, control thermostat shuts down the electric resistance. When hot water starts to be used, cold water starts to enter the tank through the cold water Inlet pipe. Thermostat cools and reactivates the resistance. Cold water is heated until it reaches the temperature value set in the thermostat. The water in the tank is kept hot and ready for use until more water is drawn.

3.2 STRATIFICATION OF THE HOT AND COLD WATER LAYERS

The operating principle of a thermosiphon is the water forming layers with different temperatures that don't mix.

It is easy to explain this principle simply: when water heats, it expands and its density decreases compared with cold water. In this case, the density decreases as water heats and it accumulates on the top part of the tank. Water with lower temperature forms a layer closer to the lower part.

When hot water is drawn from the upper part of the tank, cold water enters the tank from below. Thus, the density balance is achieved.

4. ELECTRICAL THERMOSIPHON PLUMBING

The usage life of a thermosiphon is largely dependent on its plumbing being done right. We recommend that plumbing is conducted by a Professional. The plumber first has to check the water source, power source and the waste water connections for conformity with manufacturer recommendations.

The plumbing and commissioning of the thermosiphon should be conducted in accordance with the instructions in the manual supplied with the device.

4.1 MOUNTING AND PLUMBING OF THE UNIT

The following should be considered when mounting the thermosiphon to the wall.

- Thermosiphon must be in a location to meet the water connection point on the wall.
- The inserts and hanging screws attached to the wall must be strong enough. An 80-liter thermosiphon can exceed 100kgs with its own weight. As this weight shall entirely rest on the hanger screws, the screws must be screwed strong enough not to come off the wall.
- After hanging, the thermosiphon is adjusted to be parallel to the wall by the adjustment plastic on the lower side.
- The device must not have any damage that will adversely affect electrical insulation.
- The power feed cable of device must be connected to the circuit breaker provided with the device.
- Safety valve must definitely be mounted on the cold water inlet pipe with the blue ring.
- There are flexible gaskets on the fittings of the water connection hoses. Water tightness is achieved without tightening the fittings too much. Fittings and gaskets might be damaged in case to too much tightening. In case the hose lengths are not enough, only hoses of different length recommended by Vestel Service Centre must be used.
- Thermosiphon must be mounted on a location where the water inside won't freeze.

5. MAINTENANCE

5.1. RESISTANCE CORROSION BY THE TANK

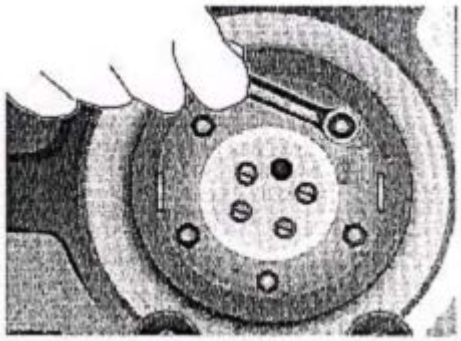
Boiler scale (calcification) can cause the following operation problems:

- Decrease in usable hot water volume
- Increase in resistance malfunction risk
- Thermosiphon making noise during heating
- Thermostat activating and deactivating frequently

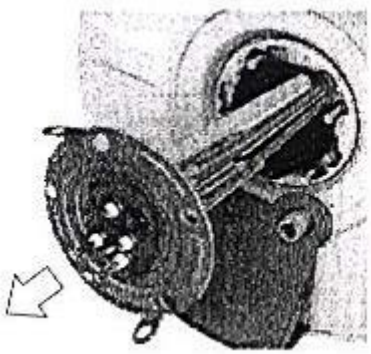
Thus, thermosiphon must be cleaned in a frequency depending on the water quality and product use. The recommended cleaning period is at least once every two years.

The operation:

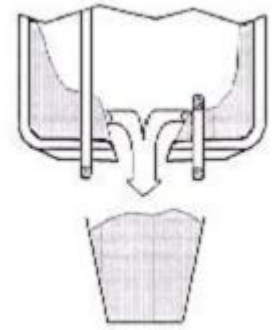
1. Cut the power off before cleaning the thermosiphon.
2. Shut the valve to cut off the water into the device.
3. Open the hot water faucet to remove the pressure in the tank and then close it.
4. Cut off the water main connections of the inlet pipe.
5. Remove the safety valve and attach a rubber hose of appropriate length for discharge instead.
6. Open the hot water faucet to drain the remaining water inside the thermosiphon.
7. Remove the screws that fix the flange (that the resistance is connected to).



8. Remove the flange.



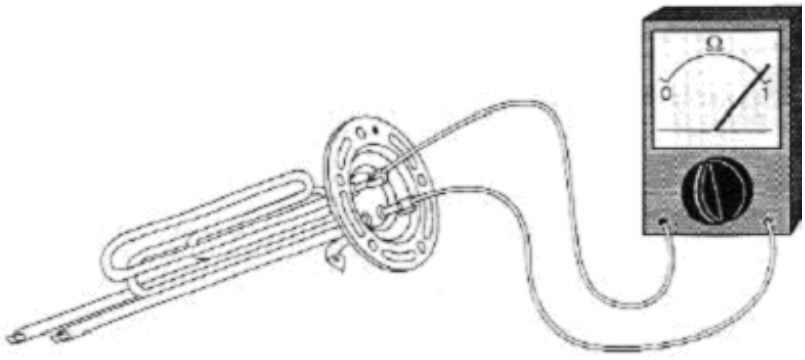
9. Clean the boiler scale carefully with hand or with a tool (depending on the device type).



5.2 Resistance Check

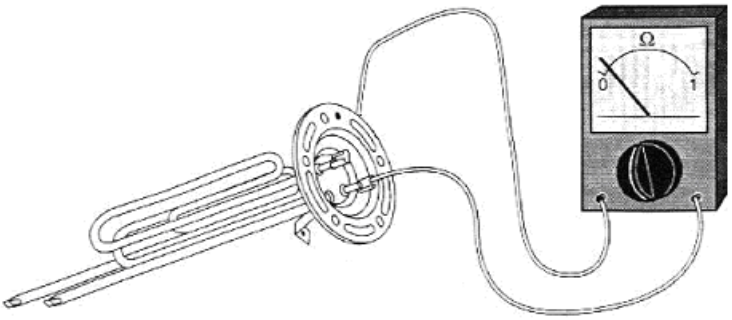
Wire Integrity Test

- Set the test device to OHM reading.
- Connect the two cables of the test device to the two terminals of the resistance.
- Test device should read the resistance (ohm) value of the resistance; if it does not give any reading, resistance is disabled.



Short Circuit Test

- Connect one cable of the test device to the resistance terminal. The other cable must be in contact with the tooth part of the heating component.
- No resistance value must be read on the test device. Otherwise, the resistance must be replaced.



5.2 Malfunction chart

MALFUNCTION	REASON OF MALFUNCTION	REMOVAL OF MALFUNCTION
No hot water can be drawn. (Only cold water)	* Power feed might be cut off. *Thermostat might not be running. * Thermostat sensor might not be placed correctly on the heating component. * Limit thermostat might be cutting off the circuit. * The V-automate at the feed input might not be open. * Resistance might not be active or there might be a short circuit. * There might be an open circuit in resistance feed cables.	*Ensure power to the thermosiphon. * Set the thermostat temperature adjustments correctly. * Remove and reattach the thermostat sensor. * Press the limit thermostat reset button and bring it to active position. * Bring the V-automate at the feed input to turned on position. * Replace the resistance and gaskets. * Check the current consistency in power feed cables, sockets and connection terminals.
Insufficient hot water production.	* Hot/cold water pipe connection might be clogged. * Connections might be wrong.	* Connect the pipes correctly. * Ensure the plumbing is in accordance with the schematics.
Excessive hot water or steam generation.	* Thermostat setting might be incorrect or might be stuck. * There might be calcification or mud forming in the tank.	* Set the thermostat correctly or replace the thermostat. * Clean the scale or mud.
It takes too long for the thermostat to reactivate.	* The tank connection of the thermostat might not be correct. * Thermostat might have lost its accuracy.	* Place the thermostat sensor correctly. * Replace the thermostat with a new one.
Heating time is long, energy consumption is too much and thermosiphon cannot reach maximum	* Hot water system might be leaking. * Resistance might be damaged.	* Locate and mend the leak. * Replace the resistance.

temperature.		

MALFUNCTION	**REASON OF MALFUNCTION**	**REMOVAL OF MALFUNCTION**
The water coming from the thermosiphon has a stench.	* Bacteria might have formed in the thermosiphon due ton on-continuous operation.	* Completely drain the water in the thermosiphon and clean.
Thermosiphon activates and deactivates frequently.	*Thermostat might be malfunctioning. * Resistance might be covered with scale. * There might be incorrect power input.	* Replace the thermostat. * Clean the resistance. * Check the main voltage.
Thermosiphon makes noise during heating.	* There might be calcification on the resistance. * It might be the sound of the water boiling during the resistance heating.	* Clean the resistance. * It is a normal process. No action is required.
Thermosiphon frequently leaks water from the safety valve during heating.	The water volume increases due top heating and valve activates when the pressure in the tank exceeds 9 bars as a result.	Make the drainage connection of the safety valve. If that is not possible, recommend placing an expansion tank (with 5 litres capacity) to the system. Take care not to locate pressure reducers or check valves close to the thermosiphon. Cut off about 5 cm portion of the hot water pipe.
There is leakage in the resistance and flange unit.	* Flange or resistance gaskets might be damaged. * Flange might be punctured due to corrosion.	* Replace the gaskets. * Replace the flange and the gaskets (in both cases, mount the flange carefully).

NOTE: In some models of the thermosiphons, heat control is performed electronically. Thus, the thermostat used in temperature control is digital. It senses heat through a sensor.