

Instruction manual for the safe and correct installation
and maintenance of the complete
No Pressure Solar Hot Water System

For use by qualified personnel

Applicable to the following models:
100ℓ / 150ℓ No Pressure Evacuated Tube System

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1 Introduction

Thank you for obtaining an Extreme Heat Solar (EHS) Solar water heater.

WARNING: Please read the complete manual before attempting to install the Solar water heater. Failure to do so can cause serious injury and/or damage.

All EHS solar water heaters are very efficient thermal solar systems using advanced materials to convert sun energy into heat energy.

This manual describes the safe and correct installation procedure for EHS solar water heaters. It assumes the general knowledge of a registered installer and provides guidance in terms of the installation of the solar thermal components. Systems must be installed by qualified plumbers and electricians, in accordance with relevant South Africa norms and standards, National Building regulations, Law and Regulations, Local by-Laws, including the following:

- SANS 198 - Functional control valves and safety valves for domestic hot and cold water supply.
- SANS 10106 - The installation, maintenance, repair and replacement of domestic solar water heating systems, edition three.
- SANS10252 - Water supply and drainage for Buildings. Part 1 – Water supply installations for buildings.
- SANS 10254 - The installation, maintenance, replacement and repair of fixed electric storage water heating systems.
- SANS 10142 - The wiring of premises. Part 1 - Low-voltage installations.
- SANS 10400 - Parts A, B, L, XA.
- Occupational Health and Safety Act (Act 85 of 1993).
- National Buildings Regulations Act 103 of 1977.
- Water Services Act (Act NO 108 of 1977).

It is the responsibility of the installer to ensure that they and their staff are familiar with and competent in respect of the above. Responsibility for the safe and proper installation of a system rests with the installer.

The solar hot water systems referred to herein must be installed in accordance with these instructions, local and national plumbing regulations, municipal building codes and any other relevant statutory regulations.

Observation of these instructions is most important and failure to do so could void the warranty. The connection, attachment, integration or general association of other equipment or parts which either directly or indirectly affect the operation or performance of the solar system could void the warranty. Other such equipment or parts not supplied by EHS, which may affect its operation/performance, must first be authorised by EHS in writing to validate the full benefits of the warranty.

EHS does not accept liability or responsibility for the final fitness of water for consumption from this water heater, as the water quality is not affected by the system and is a function of the water supply. This manual has been written with the intention of ensuring that the system is correctly installed and that the owner/user is fully informed.

2 System description

2.1 Basic operation

EHS Solar water heaters utilize state of the art materials to ensure high efficient heat transfer from the sun to the water in a wide variety of weather conditions. Heat generated by the collector is directly related to the amount of sun energy onto the vacuum tubes.

EHS No Pressure solar water heaters are complete on the roof systems whereby the water storage tank and solar collector are mounted on the roof as a complete system.

2.1.1 Collector

The solar collector consists of various evacuated tubes or vacuum tubes. These glass tubes are constructed by creating 1 glass tube inside a second glass tube. The area between the 2 glass tubes is a vacuum, forming a theoretical perfect temperature isolator. The inner glass tube is coated with a highly absorbent material collecting the sun's energy and transferring it to the water inside the inner glass tube. The UV energy from the sun passes through both glass tubes heating the water in the inner tube. Since the vacuum between the 2 tubes forms a near perfect isolator, heat from the inner glass tube cannot escape back into the atmosphere - even in cold conditions. The heated water inside the vacuum tube rises to the tank causing the colder water in the tank to lower into the vacuum tubes. This process is referred to as the thermosyphon effect. This process results in a very efficient solar water heating system for a wide variety of weather conditions.

2.1.2 Main Tank

The Solar water tank is a no pressure tank and acts as storage and circulation reservoir for the water. The vacuum tubes of the solar collector enter the tank close to the bottom at an angle creating a way for the water in the vacuum tube to enter and exit the storage tank. The main tank has provision for an electrical element to boost the water temperature when needed.

2.1.3 Cistern Tank

The cistern tank is installed on top of the no pressure main tank. This tank acts as an additional reservoir to the main tank. This is needed since heated water is less dense compared to colder water and needs a larger storage area. The extra volume needed for the hot water is provided by the cistern tank. The cistern tank controls the flow of water into the main tank from the main water supply. This flow is regulated by a mechanical float valve.

2.1.4 Frame

The frame of the solar water heater mounts the tank and collector onto the roof. Since the angle of the solar collector influence the efficiency of the heat collection, the frame is reconfigurable to fit a flat and pitched roof.

2.2 Frost Protection

The EHS No Pressure systems are freeze resistant systems when correctly installed. The correct thermal isolation material must be used to isolate the supply and return pipes of the solar water heater.

2.3 System Specifications

System heat performance:

Model	Q Factor*	Energy Rating **
EHS 100 ℓ No Pressure	TBA	12.6 Mj per day
EHS 150 ℓ No Pressure	TBA	18.9 Mj per day

*The thermal performance of the systems have been established by the South African Bureau of Standards in terms of SANS 6211, at an incoming radiation of 16MJ per m² per day, a temperature differential of 10°C and at an inclination of latitude plus 10°.

**Q-factor is calculated in mega-joules whereas the energy rating is calculated in kilo-watt hours. The energy rating is calculated by converting the q-factor into kw/h. The specific thermal capacity of the EHS No Pressure collector is 12.6MJ/D.

Storage Tank	EHS 100 ℓ No Pressure	EHS 150 ℓ No Pressure
Storage Volume [ℓ]	100 ℓ	150 ℓ
Weight empty [kg]	17 kg	22.5 kg
Dimensions [w] x [H] x [L]	470 x 470 x 1160	470 x 470 x 1700
Cold water inlet connection	¾ “	¾ “
Hot water outlet connection	¾ “	¾ “
Supply pressure	2 bar	2 bar
Operating pressure	0 bar	0 bar
Internal electrical element	2 kW	2 kW

3 Health and Safety

3.1 General

This system is capable of heating water above 90 degrees Celsius. Water above 50 degrees can cause scaling and serious burns. Under certain conditions the system can expel excess hot water above 90 degrees as a safety measure to avoid overheating and over pressurizing. This water is expelled through the overflow port on the main tank and/or cistern tank. Never close off these overflow ports. Take care not to come in contact with water expelled from these ports.

3.2 Transport and handling

The following instructions should be considered when transporting and handling the solar water heater:

- Consider the maximum weight of the solar tank and vacuum tubes.
- Take the dimensions of the total system into consideration
- Do not lift the vacuum tube carton by the straps since they can break.
- Avoid impact or mechanical forces on the vacuum tubes. When loose glass is detected, take extreme care when opening the vacuum tube boxes. Use the required safety protection gear.
- Remove any obstacles that could pose a trip hazard.
- Do not damage the main tank or frame, since exposed parts will corrode easy.

3.3 Installation considerations

All installations need to be carried out in accordance with the Occupational Health and Safety Act. Please take note of the following during installation:

- Installation of the Solar water heater must only be performed by qualified installers.
- Installation must comply with local authority regulations.
- Ensure that the installation manual is available during installation.
- Asses site specific risks and eliminate or reduce risk to an acceptable level to satisfy the health and safety requirements.
- Postpone roof work when weather creates unsafe working environment on the roof.
- Do not remove or disable any safety devices.

- Glass vacuum tubes can reach boiling point in a matter of minutes when exposed. Shade vacuum tubes and fill with water before installing as part of the system.
- Take care to use safety gloves and safety goggles to prevent injury due to the risk of breaking glass tubes during installation.
- Be aware of overhead power lines connected through roofs.
- Assess safety issues related to lifting and working on the roof are in place and adequate before commencing installation.
- Inform building occupants to when installation will take place.
- Install necessary safety barrier to keep unauthorised persons from entering unsafe area.
- Ensure installation personnel are trained, well equipped and fit for the installation.

4 System placement and orientation

The following points need to be considered when selecting a suitable installation location for a solar water heater system.

4.1 General

For optimum performance the solar collector needs to face the equator (north in the southern hemisphere). The closer the collector faces true north, the more efficient the total system will perform. Roof locations which face less than 45 degrees from the equator are acceptable.

4.2 Shading

Proper site inspection is needed to ensure that minimal shading is cast onto the collector. More shadows during winter time need to be considered as well as shadows from fast growing trees.

4.3 Collector angle

The angle of the collector needs to be installed between 25 and 45 degrees to ensure optimum solar heating and thermosyphon effect of the water in the vacuum tubes. A collector angle of more than 45 degrees will result in less sun exposed to the collector during summer and a collector angle of less than 25 degrees will reduce the thermosyphon effect resulting in a less efficient heat transfer between the water in the vacuum tube and the water in the storage tank.

The collector angle can be adjusted by adjusting the rear legs (legs under the main tank) of the frame as described in the Installation section.

4.4 Roof location

The location on the roof where the solar water heater needs to be installed should be as close as possible to the location where the most hot water is needed. A large distance between the solar water heater and the location where the water is needed will result in heat loss, especially during colder seasons.

4.5 Structural strength

The roof structure where the solar water heater needs to be installed needs to be inspected for structural integrity. The structure needs to be able to carry the total system weight when filled with water. Special care needs to be taken for on roof installations where the system connects with the roof. The necessary support needs to be installed to ensure a safe installation.

4.6 Mounting methods

4.6.1 Tile roofs

To fix the solar water heater to a tile roof, install hoop iron to the nearest purlin/support brace above where the top frame feed is situated on the roof. The hoop iron passes between tiles to connect with the frame of the solar water heater. Ensure that the heaviest part of the frame is supported by a purlin. If necessary install additional purlins under the tiles to avoid the tiles from cracking and support the weight of the solar water heater. Use this method for all frame mounting points.

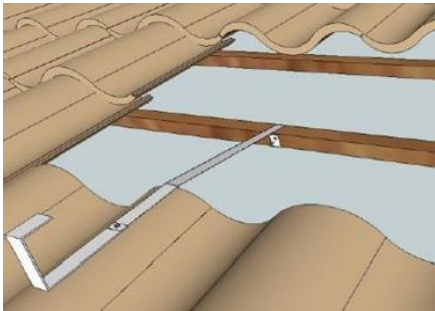


Figure 1 Hoop iron fixed to brandering.

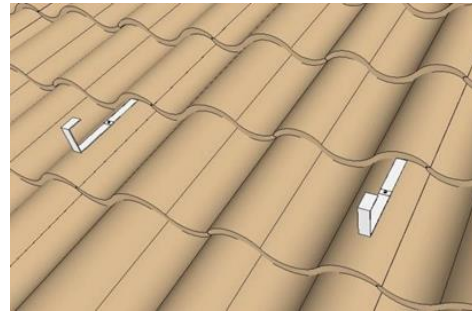


Figure 2 Hoop iron protruding between tiles.

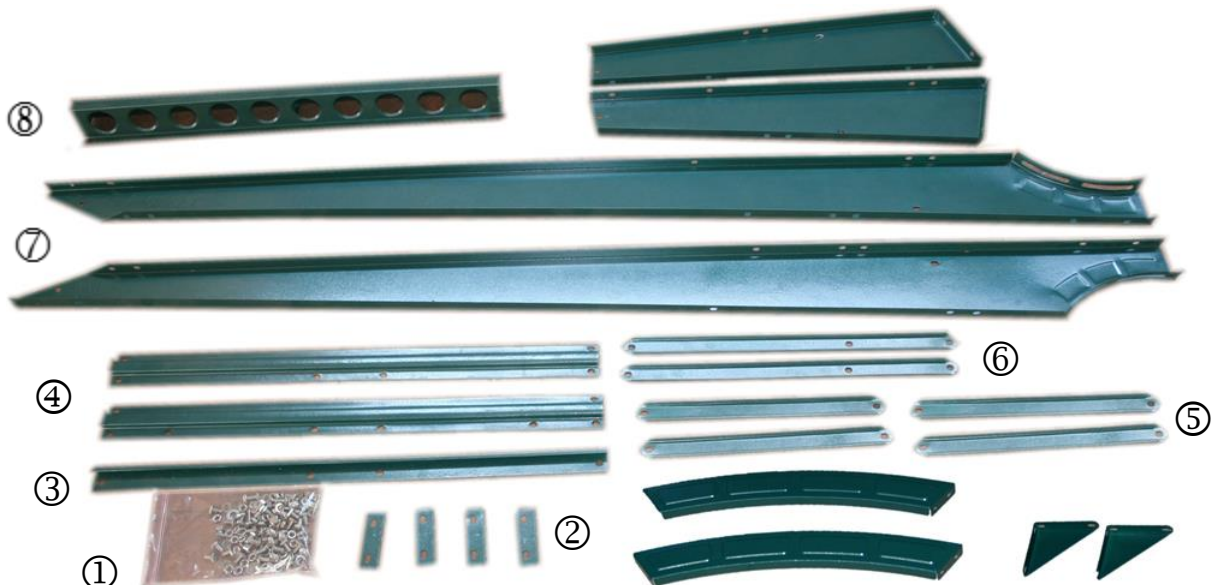
4.6.2 Metal roofs

To fit the solar water heater onto a metal roof, locate the nearest point of a purlin where the top feet of the frame needs to be installed. Secure the top feet of the frame on the purlin. If no purlin is available, support the inside of the metal roof sufficient to be able to carry the weight of the solar water heater. Use the correct roof mounting screws and matching sealing washers to secure the frame to the roof.

5 Installation

During installation and fitting care must be taken that no debris enters the system and pipes. This will cause obstruction in the water supply. All plumbing pipes needs to be flushed before connect ing the solar water heater. Installation instruction of the 100 L and 150 L are identical. The 150 L has a 150L tank with 15 tube holes and 15 tube holes in the bottom support frame, whereby the 100 L tank has 10 tube holes in the tank and bottom support frame.

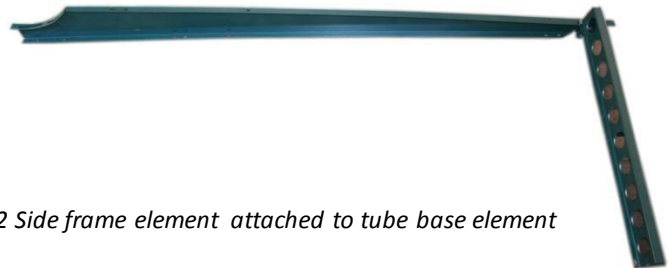
1. Open the long narrow box that contains the geyser frame. The frame should consist of:



Picture 1.1 Geyser frame elements

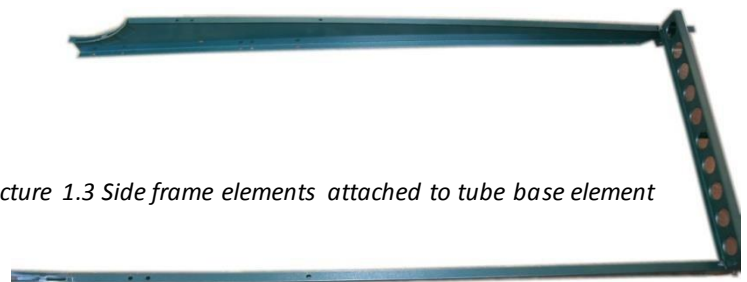
- 1) 1 x Bag of bolts, nuts and washers
- 2) 4 x Foot pieces
- 3) 1 x Bottom horizontal frame (81 cm for the 100L and 121 cm for the 150L)
- 4) 2 x Horizontal frame (81 cm for the 100L and 121 cm for the 150L)
- 5) 4 x Short cross support (38 cm)
- 6) 2 x Long cross support (54.5 cm)
- 7) 2 x Side frame (204 cm)
- 8) 1 x Tube base (82 cm for the 100L and 121 cm for the 150L)
- 9) 2 x Leg (78.7 cm)

2. Attach the one side frame section (7) to the tube base segment (8) using bolts, washers and nuts from the supplied bag (1).



Picture 1.2 Side frame element attached to tube base element

3. Attach the second frame section (7) to the tube base segment (8).



Picture 1.3 Side frame elements attached to tube base element

4. Attach the horizontal frame section (4) together with the 90 degree supports. Note the position of the centre holes in section (4).



Picture 1.4 Horizontal frame element attached to frame

5. Attach the two cross support parts (6) between the horizontal frame section and the side frames.



Picture 1.5 Cross support elements added

NOTE: If the geyser will be mounted flat on a roof without the leg sections, skip to step 12.

6. Attach two foot pieces (2) to the legs (9).



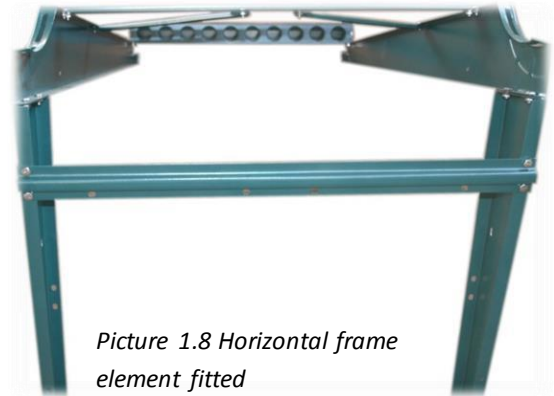
Picture 1.6 Foot pieces attached to the legs

7. Attach the legs to the frame.



Picture 1.7 Leg segments attached to the frame

8. Attach the second horizontal frame section (4) between the legs.



Picture 1.8 Horizontal frame element fitted

9. Attach the side cross support sections.



Picture 1.9 Side cross support sections fitted

- 10. Attach the 2 x short horizontal cross support sections (6).
- 11. Attach the bottom horizontal frame section (3) and the 2 x short horizontal cross support sections (6).



Picture 1.10 Bottom horizontal section fitted

- 12. Attach the frame feet to the roof using appropriate roofing screws.
- 13. Open the box that contains the geyser tank.



Picture 1.11 Tank and isolation material in box

- 14. Remove the thread protecting rubbers from the bolts.
- 15. Remove the nuts from the mounting bolts.



Picture 1.12 Thread protecting rubbers are being removed



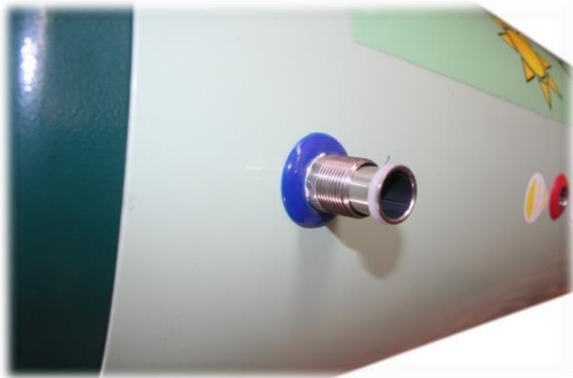
Picture 1.13 Remove the nuts from the mounting bolts

16. Install the tank on top of the frame. Make sure that the four tank mounting bolts fit through the two openings in the frame.



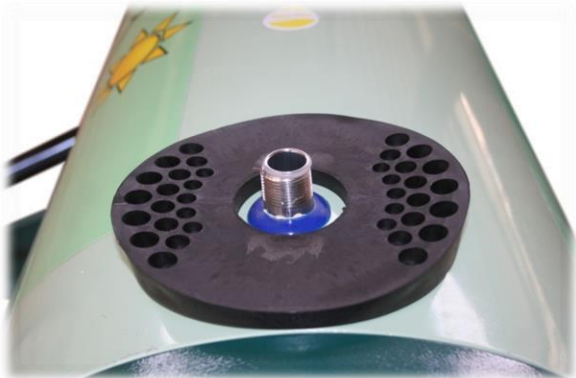
Picture 1.14 Geyser tank installed on the frame

17. Install one of the stainless steel pipes at the cold water inlet at the top of the tank.



Picture 1.15 Stainless steel pipe installed at the cold water inlet of the geyser tank

18. Fit the rubber collar around the geyser's cold water inlet.



Picture 1.16 Collar installed around cold water inlet

19. Apply hem to the thread of the cold water inlet before installing the reservoir tank.

20. Rotate the geyser tank until the reservoir tank is entirely vertical before fitting and tightening the four tank bolts to the frame. (These are located at the bottom of the tank.)



Picture 1.17 Reservoir tank installed

21. Open the box that contains the vacuum tubes. Handle the tubes with care – especially the bottom end since it contains a vacuum. If a tube is damaged, air will be forced in and the bottom end of the tube will change to a milky colour. A faulty tube needs to be replaced.
22. Before inserting a tube into the geyser, fill the tube with water (if a tube is installed without water, it will be hot by the time the cold water is added, and crack). Install the black cover rubber around the open edge of the tube and lubricate the open edge with a dishwashing liquid or window cleaner. This will ease the task of inserting the tube into the geyser.



Picture 1.18 Fill the tube with water, install the rubber and lubricate the open end of the tube

23. Push the open end of the tube carefully into the first hole of the geyser until the bottom of the tube is just over the tube base section (8). Pull the tube a little bit back until the bottom is settled firmly in the base of the frame.



Picture 1.19 Installing the vacuum tube

24. Install the remainder of the vacuum tubes.

25. Cut two pieces of 15mm copper piping: approximately 14cm and 19cm. Use these piping to connect the geyser overflow to the reservoir using the appropriate couplers (not supplied).



Picture 1.20 Connect the geyser overflow to the reservoir

- 26. Install the isolation material before fastening the pipes.



Picture 1.21 Install the pipe isolation.

- 27. If a backup element will be used, install the element and thermostat in the holes on the side of the geyser. Position the seal for the element cover.



Picture 1.22 Install the backup element and thermostat and the seal for the element cover

- 28. Close the element with the element cover and supplied self-tapping screws.



Picture 1.23 Close the element with the cover

- 29. Install a stainless steel pipe into the hot water outlet before connecting the hot water from the geyser to the house.



Picture 1.24 Install a stainless steel pipe in the hot water outlet.

- 30. Connect the cold water supply from the house to the cold water inlet on the reservoir.



Picture 1.25 Connect the cold water supply to the inlet on the reservoir

31. Isolate all piping with the supplied pipe isolation.
32. Open the water supply to the geyser and test for any leaks.
33. Congratulations, you have successfully installed a solar geyser!

6 System commissioning

Ensure that all vacuum tubes have been filled with water before they were inserted into the main water tank. If this was not the case, make sure that all vacuum tubes are completely covered to avoid heat build-up. When confident that the vacuum tube temperature is below 40 degrees, the main water supply to the solar water heater can be opened.

Keep electrical power to the backup element switched off at all times.

Flush all plumbing pipes before connecting the solar water heater.

The cold water will fill the tank and all excess air will exit through the safety overflow port. The cistern tank valve will close when the main tank is full.

Check all piping and joints for water leaks.

Turn on the backup element and check if water is heating up after 10 or more minutes. Make sure the main tank is filled before turning on the backup element.

6.1 Installation checklist

The following checklist should be verified before handing over to the client:

- System has been checked for water leaks.
- Working of the backup element has been checked.
- All air has been bled from the taps.
- Roof tiles are back in position and roof waterproofing has been applied.
- All pipes have been thermally isolated.
- Overflow valves are unobstructed.
- The owner has been instructed on the use of the system.

7 Emergency shutdown procedure

Should an emergency occur and you need to shut down the solar water heater follow the following steps:

- Switch off the electrical supply to the backup element on the distribution board marketed "Geyser".
- Turn off the main water supply to the house if the stop valve supplying the geyser is not in reach.
- Close off the supply valve to the solar water heater and open the main water supply to the house.

8 Troubleshooting

Not sufficient hot water:

- During cloudy or rainy days, there is not sufficient sun energy to heat the water of the solar water heater. Switch on the backup element till the water has reached the required temperature.

Water dripping from the overflow port:

- During extreme temperature variation, the water in the main tank expand and can even exit from the overflow valve. This happens especially when very little or no hot water is used for a few days. This is normal and will stop when hot water is being used.
- When water is being used and excess water is released through the overflow port, it could be due to dirt in the float valve located in the cistern tank. The cistern tank can be opened and the seal be cleaned by a qualified installer.
- Pressure valve towards the solar water heater faulty. The pressure regulator valve supplying water to the solar water heater can become faulty and allow high pressure water to pass to the inlet of the solar water heater, This usually happens during night time when the water pressure is at its highest level.

9 Maintenance and cleaning

The EHS solar water heater is designed in a way that very little maintenance is needed. Natural rain normally cleans the collector from any dust. When heavy bird life is present close to where the solar water heater is installed, more regular cleaning of the collector is required.

Maintenance that should be done once every 3 - 6 months:

- Check all pipes and fittings for leaks and corrosion of the thermal isolation material
- Check if overflow port is properly connected to overflow pipe to avoid water from dripping on the cistern or main storage tank.
- Inspect for any leaks between the cistern tank and main tank.
- Check for any cracks in the vacuum tubes
- Clean the vacuum tubes with a wet cloth when needed.
- Clean the filter at the inlet of the cistern tank only when water flow into the tank is not adequate.

10 Warrantee

The EHS solar water heater has a 2 year warrantee. The conditions of the warrantee are as follows:

10.1 Warrantee nature

- The EHS solar water heater and components thereof are warranted against defective factory parts or factory workmanship. This warrantee is subjected to the water quality supplied to the solar water heater equivalent to water quality in major metropolitan areas classified for domestic water use (and below 600 ppm TDS)
- Damage resulting from improper transportation or installation is not covered by this warrantee.
- The warrantee is only valid upon presentation of the proof of purchase and subject to compliance with the installation, maintenance and service plan as described in this document.
- EHS reserves the right to test the solar water heater and installation prior to any repair/replacement claimed under this warrantee.

- EHS has the right to repair before replacement of any part of the solar water heater.
- Whenever the claim submitted is not covered by the warrantee, EHS has the right to invoice a call out fee for investigating the claim submitted, if needed.

10.2 Date of commencement

The warrantee commences from the date that the installation has been completed and signed off by the end user or the date of purchase. Failing to provide a signed of document (signed the day of commissioning of the solar water heater) or purchase document, voids the warrantee of the system.

10.3 Notification of claim

Any claim under the warrantee must include a detailed description of the defect or abnormality and need to be submitted within 30 days after the defect has been discovered. Failure in submitting the claim within 30 days will void the warrantee. Warrantee claims will only be valid when a warrantee claim form has been completed and submitted by the owner of the solar water heater. A Warrantee claim form can be obtained from EHS upon request.

10.4 Normal intended use

This warrantee is subjected to the normal intended use of the solar water heater and does not apply where the solar water heater or components has been used for a different application or in a different manner.

10.5 Installation of the EHS solar water heater

The installation of this solar water heater needs to comply with the South African National Standards as set by the South African Burro of standards. The standards may change and it is the duty of the installer to ensure that the installation complies with the newest SABS standards. The installation needs to be performed by an EHS approved installer.

The installation cost is not covered under this warrantee. In case of non-complaint installation or installation failure, the original installation service provider is responsible for any warrantee claims.

10.6 Repair and maintenance

Any repair or maintenance work on an EHS solar water heater needs to be conducted by an EHS approved installer. Fitting of any spares or parts not approved by EHS will void the warrantee.

10.7 Warrantee duration

Warrantee duration of solar water heater components are as per below table:

Component	Warrantee time
Main water tank	2 years
Cistern tank	2 years
Frame	2 years
Vacuum tubes	2 years
Element and thermostat	No warrantee

When any solar water heater components are being replaced under warrantee the original warrantee term remains. The replacement part does not carry any additional warrantee.

10.8 Service plan

A limited 2 year warrantee applies to all EHS solar water heater components, subjected to the compliance of the EHS service plan. An EHS approved installer should conduct the inspection of the solar water heater according to the service and maintenance described in this document.

10.9 Area covered

The warrantee is valid in South Africa. Where the solar water heater is located at a distance of more than 20 km from the EHS offices, the owner is responsible for the cost of transportation of any part or components to and from the EHS office and site where the solar water heater is installed.

10.10 Warrantee exclusions

Warrantee to any parts or components of the solar water heater do are not covered during the following instances:

- Acts of God (force majeure), crime and terrorism.
- Accidental damage, abuse, misuse, maltreatment, abnormal stress or strain, harsh or adverse water conditions, contamination or corrosion from particles in the water supply, excessive water pressure, excessive temperature or neglections of any kind to the hot water unit and solar collector or their components.
- Modifications, alterations or repairs not approved by EHS or not conducted by an EHS approved installer.
- Faulty or improper installation as described in this manual.
- Vacuum tube glass is not covered by this warrantee.
- Where the correct pressure valve is not installed on the cold water supply line feeding the cistem tank.
- When the overflow ports are being blocked off.
- Any plumbing or electrical and associated parts are not covered by this warrantee.
- Damage to any parts from incorrect installation or commissioning of the system.
- Electrical elements.
- Damage due to frost when inadequate thermal protection has been used.

10.11 Limitation of liability

EHS's obligation is towards the solar water heater and its components and therefore will not be responsible for loss or damage to furniture, ceilings, carpets, walls, foundation or any other structural damage caused by malfunction of any of the solar water heater components or parts.

11 Contact information

For any queries or information please contact us at:

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