



THERMIC
Solar Systems

INSTALLATION AND INSTRUCTIONS MANUAL

FORCED CIRCULATION SYSTEMS

AUGUST 2013

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Introduction

Forced Circulation Solar Water Heating systems are defined as the ones using one or more pumps to circulate heating fluid in the system. This differs to Thermosyphonic solar systems in which the circulation of thermal fluid is natural (thermo syphon phenomenon).

Forced circulation Solar Water Heating systems are mainly composed by:

- solar collectors
- water storage tank
- pump station (incl. thermistors and indicating gauges)
- electronic controller
- expansion tanks
- safety valves
- back up heating element/s

The controller is a **differential controller** that senses temperature differences between water leaving the solar collector and the water in the storage tank near the heat exchanger. The controller turns the pump on when the water in the collector is about 6–10 °C warmer than the water in the tank, and it turns the pump off when the temperature difference approaches 3–5 °C. This ensures the water always gains heat from the collector when the pump operates and prevents the pump from cycling on and off too often.

The Forced Circulation Solar Water Heating systems are custom designed according to application and requirement and can have limitless combinations and variations regarding the number of collectors, storage tanks, additional heating sources, heat exchangers along with according to each variation pumps, controllers, and expansion tanks.

The scope of the present manual is twofold: one to provide the installer with the basic general directions and recommendations for the proper installation and adjustment of a Forced circulation Solar Water Heating system and two, for the operator-maintainer, to explain the features, operation, safety precautions, maintenance and troubleshooting of such a system. Additional more detailed information can and should be obtained by the accompanying instruction manuals of rest components of the system. Electronic controllers pumps expansion tanks.



1. General installation instructions

Before the installation of the solar collectors please read all the information and instructions in the present manual.

In accordance with the designer and/or final user of the system please consider all the details that will ensure safe and proper installation. Such details are the selection of position, the orientation, the layout of the pipes, the suitable surface etc.

The position must not be shaded during the whole year by trees or other obstacles.

The installation should comply with the local electrical and plumbing regulations.

For optimal efficiency the collectors should face South for the North hemisphere and vice versa for the South Hemisphere. In case this is not absolutely possible it can be positioned 30° to the East if the greater demand for hot water is before 14:00 or it can be positioned 30° to the West if the greater demand for hot water is after 14:00. In both cases the loss of thermal gain will not be greater than 6% annually.

If the collectors are to be placed on a roof with inclination angle less than 15° or more than 30° then a special equipment other than the standard support frame must be used. This special equipment is similar to the one used in areas that suffer storms extremely strong wind and hurricanes (Windy Set)

For tilted roof installation it is absolutely essential that the frame should be positioned ensuring that the structure is anchored in such manner considered the total full weight of the collectors preferably over a horizontal post and never between two posts.

If the surface on which the collectors will be installed is not compatible with the standard equipment provided then a different equipment should be used.

This equipment should be suggested, chosen and installed by the installer in accordance with the final user.

When the collectors are to be installed on a tilted roof the brackets must be tighten down with suitable bolts that ensure a proper and safe installation.

In areas of high snowfall extra care must be shown that the snow is not trapped behind the collectors and that the standard frame is capable withstanding the expected weight of snow.

The same care must apply to areas that suffer heavy storms, extremely strong wind and hurricanes. In such areas use the Windy Set.

Both the pipes of the solar unit and the pipes of cold and hot water to the building must be properly insulated.

Only skilled technicians must perform the filling and connecting of the closed circuit. Before the filling of the closed circuit with thermal fluid the water tank must be completely filled with water.

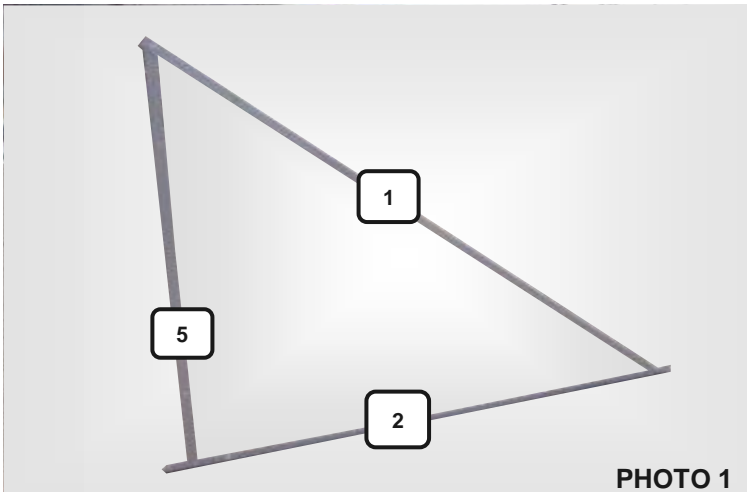
After the installation of the unit clean-up the surrounding area. Fill the guarantee form and mail it to the manufacturer or the local distributor.

Do not destroy this manual. Please read carefully and keep in safe place for future reference

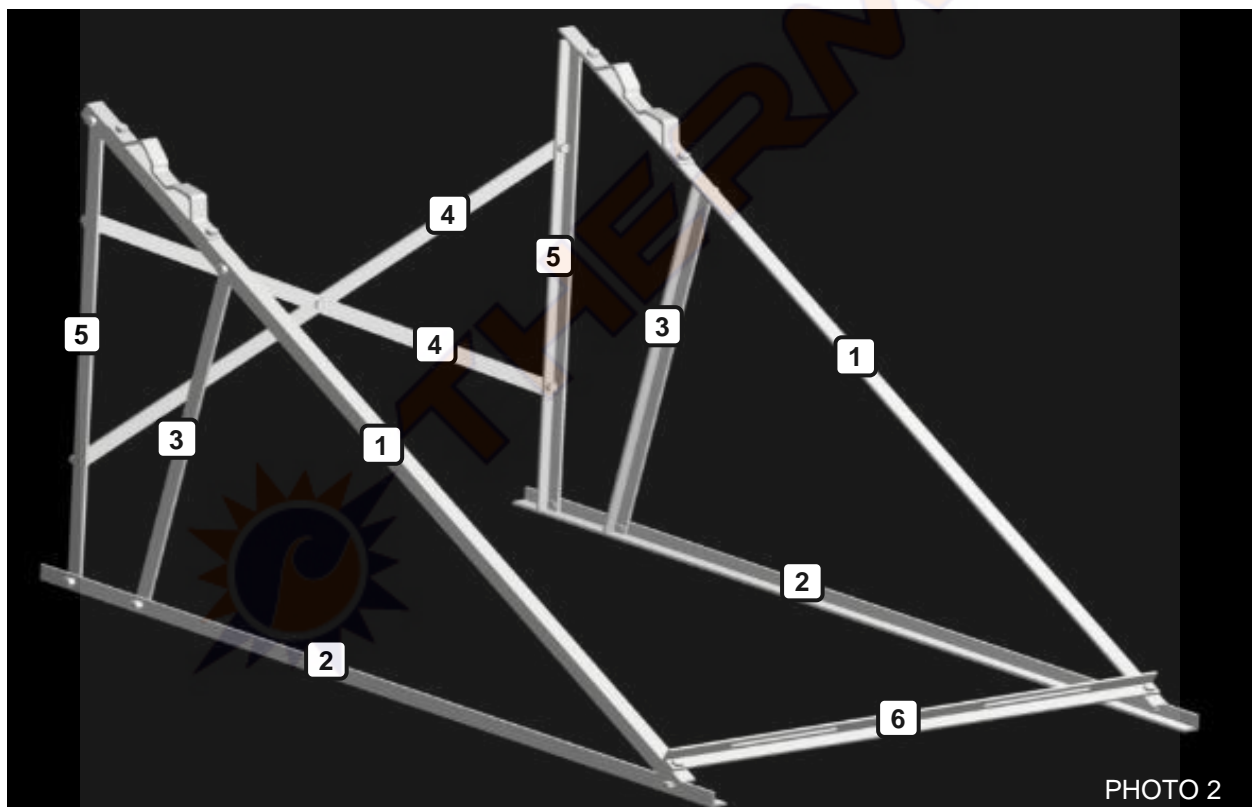
The manufacturer is not responsible in any way for damages caused to the product or others due to wrong installation.

2. Collectors Installation procedure

2a. Installation on flat roof



Using brackets 1,2 and 5 form a triangle as shown in photo 1. Repeat the procedure and form a second identical triangle. These are the two sides of the supporting frame



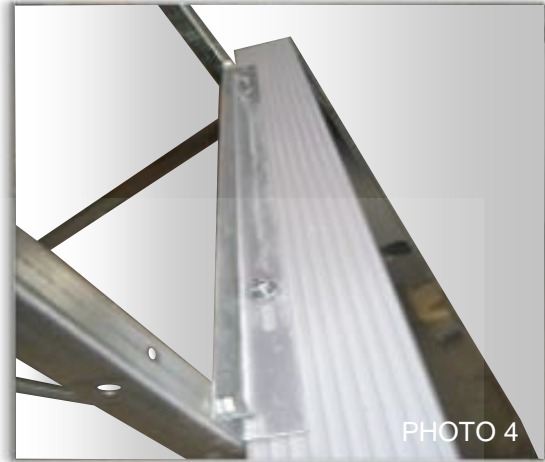
Place the brackets number 3 in the middle of the triangles in order to strengthen the structure. Assemble an X-shaped structure using the brackets number 4.

Assemble the X created on the back of the triangles, using totally five screws and nuts, two on each side and one in the middle of the X.

Place the bracket number 6 on the lower end of the structure. This is the lower bar that holds the collector(s).

Do not tighten the screws at this point.

The assembled support frame should look like photo 2.



Place the collector(s) on the lower side of the support frame (on bracket 6) and secure the collectors on the frame using the bolts (photos 3 and 4). Please do not tighten the bolts at this stage so you can adjust the collector(s) on the frame and move them to connect.



In case of installing more than one collectors using the connectors provided. Connect the collectors between them both on bottom and upper side. Make sure the pipes are well inside the connector (roughly 2,5 cm) in order to avoid any leaks (photo 5).



Make a final check that the collectors and water tank are aligned and evenly positioned on the frame, and TIGHTEN ALL BOLTS (photo 6).

ALWAYS USE A BUBBLE-LEVEL INSTRUMENT TO MAKE SURE THE COLLECTORS ARE HORIZONTAL

2b. Installation on inclined roof

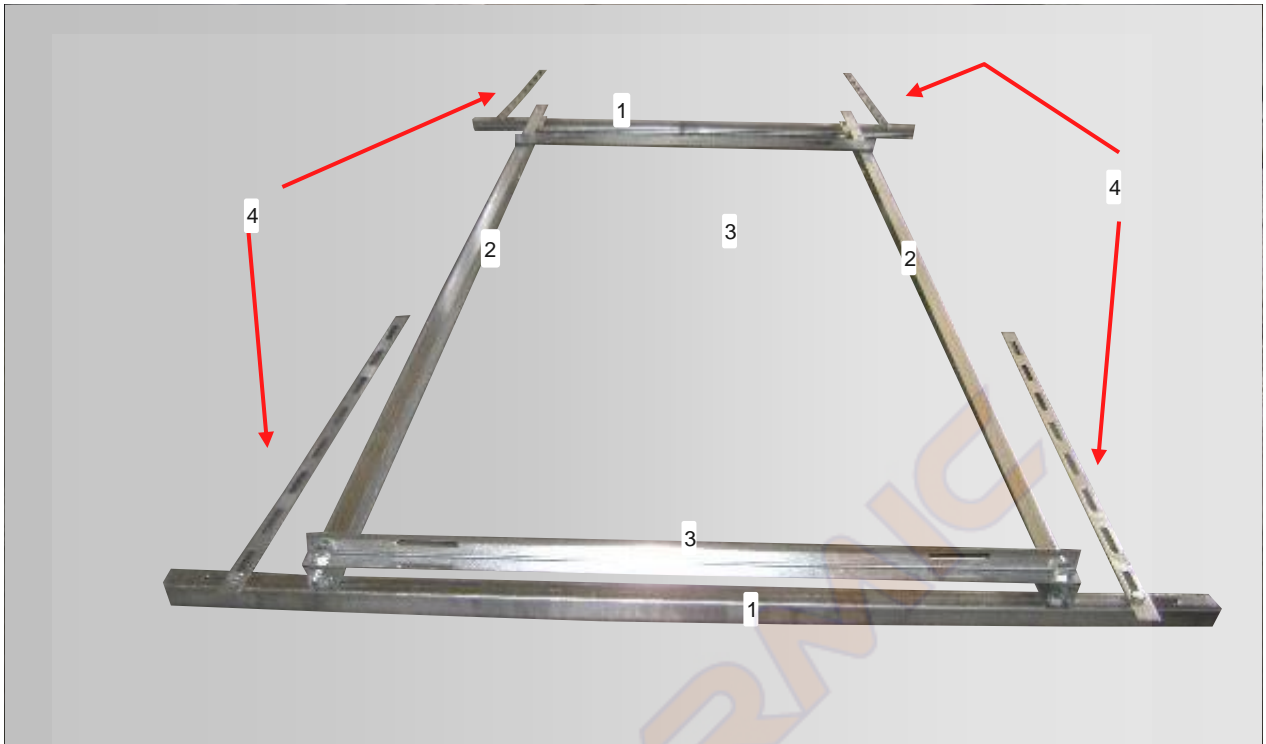
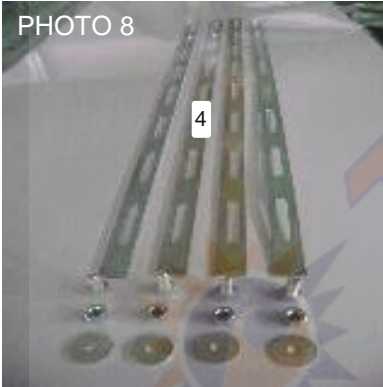
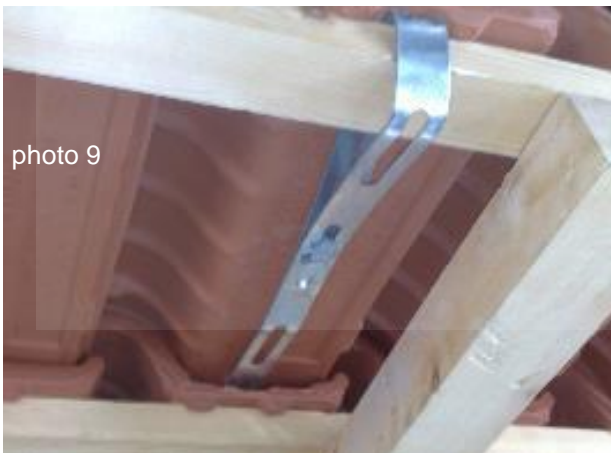


PHOTO 8



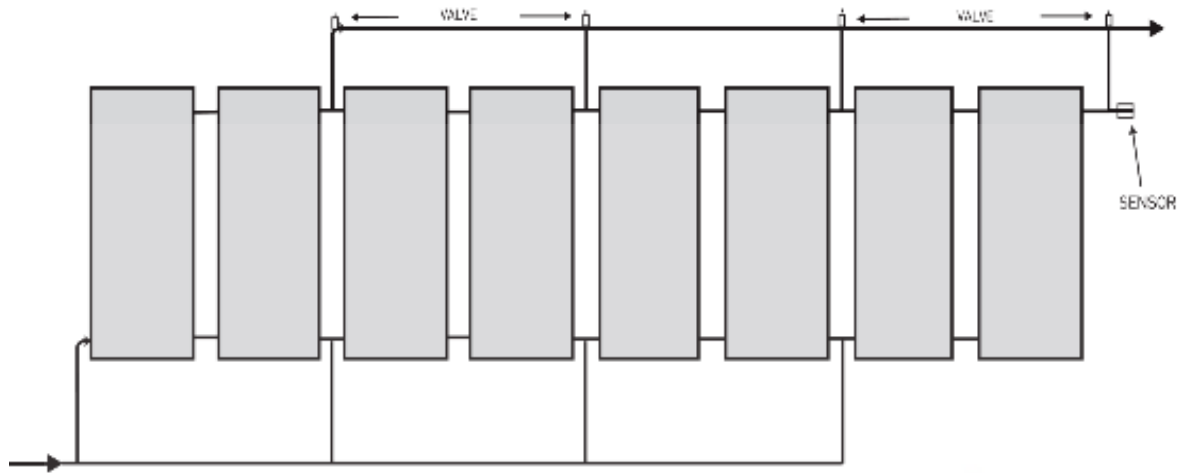
The frame for installation on tilted roof must be assembled as shown on photo No 7. Start formatting a square shape using brackets 1 and 2. Tighten the bolts. On the next step screw on the formatted square the brackets 3. Screw the brackets No 4 with the bolts provided (photo No 8) on the four ends of the frame.

photo 9



Move the roof tiles and anchor the frame using the brackets No 4 as shown in the photo No 9. It is absolutely essential to make sure that the frame should be positioned in such a way that it is ensuring the structure is over a horizontal post and never between two posts. Always take under consideration the overall weight of all full collectors and frames. Make sure that all the bolts are tight and secured and place the collectors on the frame.

3a. Connection of collectors in array



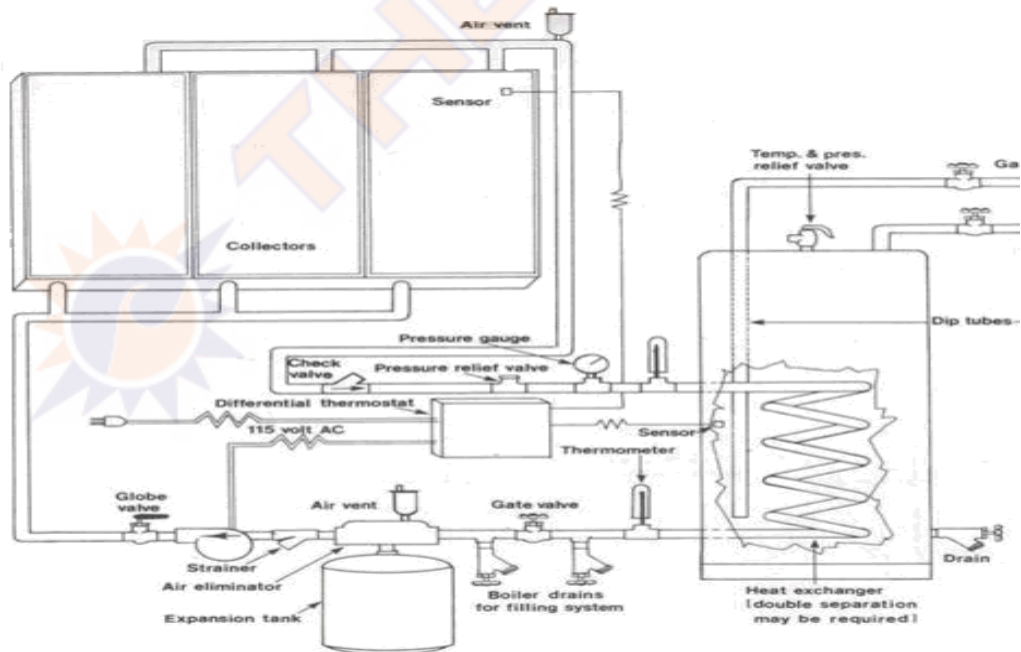
Pipe diameter 20mm is proposed for coupling of the collectors to one another and the connection of the collector field to the heat transfer circuit, for collector arrays up to 20 m².

Pressure drop table

Fluid T ^a (°C)	20°C ± 2°C		T ^a max: 20,53°C		T ^a min: 19,87°C	
Flow rate (kg/min)	3,60	2,90	2,10	1,30	0,60	0,00
Pressure drop (mbar)	3,00	2,00	2,00	1,00	0,00	0,00

NOTE: pressure drop values indicated are for TS-2,5 and apply to all types of collectors

3b. Forced circulation system schematic (basic)



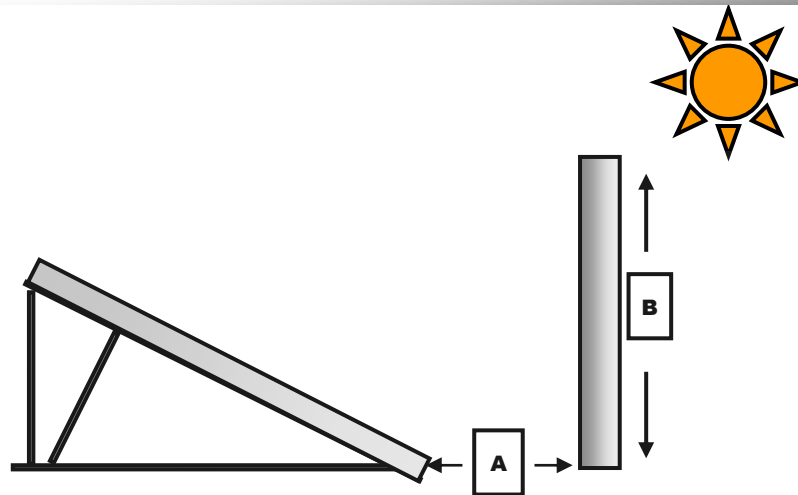
Maximum Operating Pressure

The maximum working pressure of the collectors shouldn't exceed 0,8 MPa.

Wind and snow load

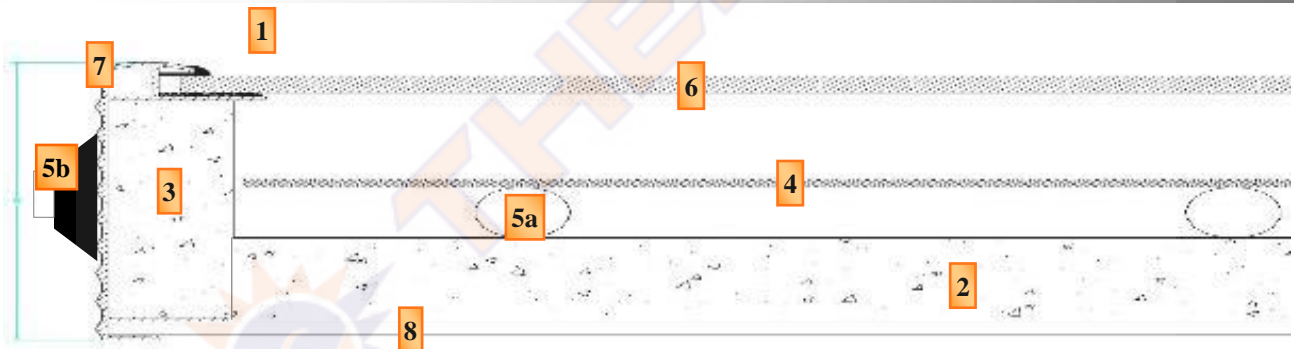
Maximum permissible snow and wind load is 1 kN / m²

4. Shading Obstacle Chart



installation position's latitude	distance between collector/s and obstacle
0° - 25°	A=1,0 x B
25° - 35°	A=1,5 x B
35° - 45°	A=2,0 x B
45° - 50°	A=2,5 x B
50° or more	A=3,0 x B

5. Solar collector components (section)



1. Water seal (EPDM rubber, black silicone)
2. Rear insulation Rockwool (80 kg / m³)
- 3 Side insulation Glass wool (30 kg / m³)
4. Absorber plate - Copper tubes, aluminium sheet, selective coating.
- 5a. Absorber tubes Φ 8 mm
- 5b. Absorber side tubes Φ 22 mm
6. Front cover - tempered glass 4 mm
7. External frame - anodized aluminium, 100 mm
8. Rear cover - galvanized metallic sheet , 0,5 mm

6. Filling instructions of the closed circuit with thermal fluid and properties

For the antifreeze protection of the solar water heater, please follow the ratio of antifreeze protection stated in the table

% vol.	Density at 20 °C [g/cm ³]	Refractive index nD20	Frost protection [°C]
25	1,023	1,3627	-10
30	1,029	1,3690	-14
35	1,033	1,3747	-17
40	1,037	1,3801	-21
45	1,042	1,3855	-26
50	1.045	1.3910	-32
55	1.048	1.3966	-40

Filling and mixing procedure:

Mix well the thermal fluid with water.

Start filling the closed circuit with the mixture, from the pipes. The filling must be done alternatively, from both upper pipes.

During the filling, we advice to shake the system so it will be ensured that no air is trapped inside the collector. Continue this procedure until the close circuit is completely full with mixture.

After the filling of the closed circuit, it is necessary to loose the plug at the top right hand of the collector (not included-to be installed by the installer), until it starts dripping thermal fluid (when installing system with two collectors, loose also the top pipe union) in order to release the air from the collector(s).

Tighten again the plug and the collector connector and check for their complete water tightness.

Add some more fluid in the closed circuit, until it overflows from the tubes. Screw the plug onto the tube and fix the safety valve onto the tube.

Check carefully all the connections for any leaks.

Properties:

Antifreeze fluid is a non-toxic, virtually odourless, hygroscopic liquid. It is based on 1,2-propylene glycol, which poses no hazard to health and which may be used as a coolant or heat-transfer fluid in food processing and water purification applications.

The corrosion inhibitors contained in Antifreeze fluid reliably protect the metals normally used in solar installations and other heating equipment against corrosion, ageing and deposits over long periods.

The antifreeze fluid prevents the surfaces of heat exchangers from becoming fouled, and ensures consistently high thermal efficiency.

The fluid is miscible with water in all proportions. Its mixtures with water protect against frost at temperatures of down to -50 °C, depending on their concentration.

Its performance is not impaired by hard water, and there is no danger of precipitation.

Mixtures of Antifreeze fluid and water do not remix.

Antifreeze fluid does not contain any nitrites, phosphates or amines.

First aid measures:

General advice: Remove contaminated clothing.

If inhaled: If difficulties occur after vapour/aerosol has been inhaled, Remove to fresh air and seek medical attention.

On skin contact: Wash thoroughly with soap and water.

On contact with eyes: Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion: Rinse First mouth and then drink plenty of water.

Note to physician: Symptomatic treatment (decontamination, vital functions), no known specific antidote

7. Packing and handling

COLLECTORS ARE WRAPPED IN STRETCH OR HEAT-SHRINK TRANSPARENT FILM WITH CARTON BOARD PROTECTION AT BOTH ENDS.
HANDLE WITH CARE. MIND THE GLASS SURFACE.
ALWAYS STORE IN UPRIGHT POSITION.
DO NOT STACK COLLECTORS ONE ON TOP OF OTHER.
STORE IN A DRY PLACE AWAY OF ANY MOISTURE.
REMOVE PACKING ONLY IMMEDIATELY BEFORE FINAL INSTALLATION.

FLOOR STANDING WATER TANKS ARE WRAPPED IN STRETCH OR HEAT-SHRINK TRANSPARENT FILM ON WOODEN PALLET .
HANDLE WITH CARE. MIND THE EXTERNAL FOAM INSULATION.
ALWAYS STORE IN UPRIGHT POSITION.
STORE IN A DRY PLACE AWAY OF ANY MOISTURE.
REMOVE PACKING ONLY IMMEDIATELY BEFORE FINAL INSTALLATION.

CONTROLERS AND PUMP STATIONS ARE PACKED IN CARTON BOX.
HANDLE WITH CARE.
STORE IN A DRY PLACE AWAY OF ANY MOISTURE.
REMOVE PACKING ONLY IMMEDIATELY BEFORE FINAL INSTALLATION.



NOTE:

Properly maintained solar water heater system will provide years of dependable trouble free service

8. Instructions and maintenance

General instructions and maintenance

- The system will reach optimum performance two days after installation.
- We recommend to inspect the glass cover of the collectors periodically ,clean them in case there is dust or snow or anything else that might interfere the solar rays, see any cracks on the surface and replace it as soon as possible if you see any possible damage.
- Check the antifreeze liquid of the circuit at least once per year and add the necessary quantity to fill the system.
- Check at least once per year all valves, check if any bolts and nuts are well tightened and generally check the stability of the support frame.
- If you decide to leave the house for a long period ,cover the collectors ,it is essential for the well being of the circuit.
- Check periodically for any leaks ,any bended tubes ,air bubbles trapped in the system ,check if all tube connections are in the proper outlets and inlets.

Replacement of magnesium anode.

For inspection and / or replacement of magnesium anode rod the water tank should be drained. See steps and precautions below:

1. Cut off the electric supply
2. Drain the water from the boiler
3. Remove the inspection port cover
4. Disconnect the ground-negative and power
5. Remove the plate loosening the holding bolts
6. Replace the magnesium rod on the flange
7. Reposition the plate with a new rubber gasket
8. Fill the tank with water from the building supply while having open any hot water faucet in the establishment to allow the air to vent from the solar system and piping.
9. Check for any leaks in the system
10. Reconnect electrical connections
11. Check the secure attachment of thermistor/s
12. Reposition the protective cover
13. Supply the unit again with electric power



CAUTION: before draining the tank the pressure on the closed loop must be relieved or the loop may collapse



CAUTION: shut of power to the heater before draining water



DANGER: Make certain no one will be exposed to the water discharged. Water might be hot enough to present a scald hazard and should be directed to suitable drain using a proper hose.

Important notice:

The protective magnesium anode rod will only function when grounded. Make sure that the grounding point on the magnesium anode plate is connected to appropriate grounding of the building.

The anode must be grounded even if the appliance is not connected to electric power source. Operation with anode not grounded will greatly shorten the life of the tank and will exclude warranty coverage

MAINTENACE SCHEDULE TABLE

action	frequency	performed by:	remarks	precautions
collectors glass cleaning	monthly (considered the dust acumulation in Gulf Countries)	user/technician	with water and brush	 collectors must be cool before cleaning/washing
pressure relief valve/s functionality	annually	technician	lift and release the lever on the temperature and pressure relief valve to ensure valve operartes freely	discharged water might be hot enough to present a scald hazard and should be directed to suitable drain using a proper hose.
electric element	annually	technician	testing with electrician's multimeter	 shut off power before accessing and testing the element
electronic controller	annually	technician	Incoming and outgoing signals check. Conections and terminals	
hydraulic and piping leak check	annually	user/technician		 caution for hot fluid or surfaces
electrical connections	annually	technician		 shut off power
piping insulation condition	annually	user/technician		
visual check for collector's glass condition	annually	user/technician		
stability of collectors support frames	annually	technician		
stability of water storage tank	annually	technician		
expansion tank/s	annually	technician	Leaks check.Pressure check at idle position. (2,5 bar solar circ. 1,5 bar water circ.)	
thermal fluid level	annually	technician		 see properties and precautions on page 10
thermal fluid pump/s	annually	technician	Leaks check. Incoming and outgoing signals check. Conections and terminals	
magnesium anode rod	annually	technician	magnesium anode rod is designed to prolong the life of the glass lined tank. It is slowly consumed thereby eliminating or minimising corrosion of the tank	the tank should be drained to inspect and/or replace the magnesium anode rod. See procedure and precautions on page ???



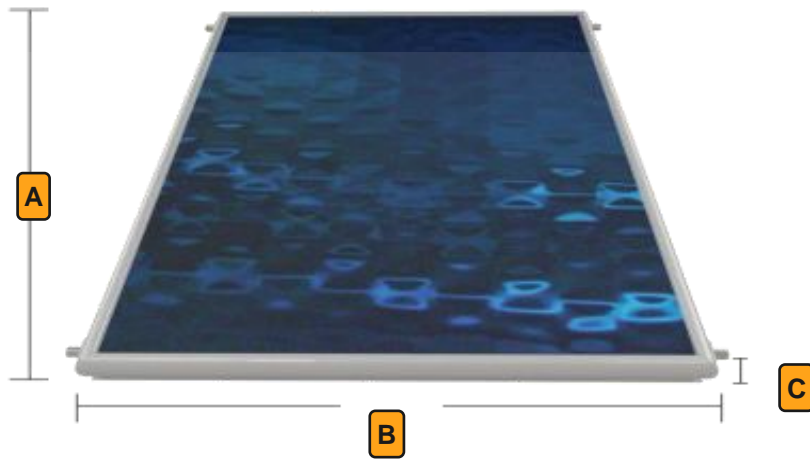
CAUTION: before draining the tank the pressure on the closed loop must be relieved or the loop may collapse
CAUTION: shut of power to the heater before draining water



DANGER: Make certain no one will be exposed to the water discharged.Water might be hot enough to present a scald hazard and should be directed to suitable drain using a proper hose.



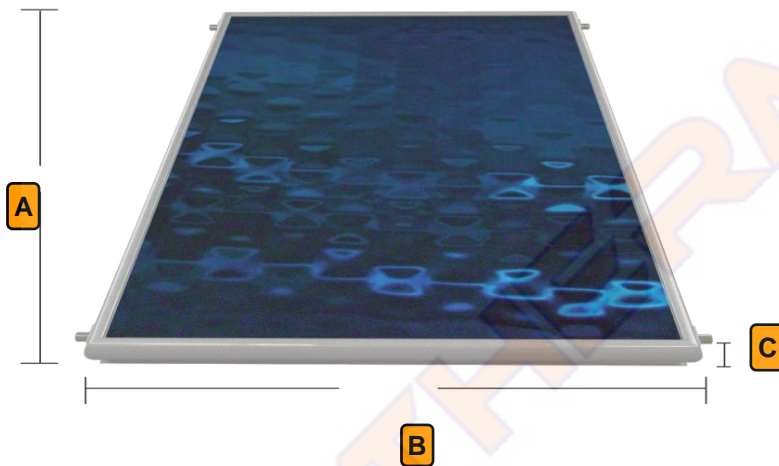
9. Dimensions of collectors



TS - 2.5 2,5 m²

Gross Area: 2,5 m²
 Length (A): 200 cm
 Width (B): 125 cm
 Height (C): 10 cm
 Net Area: 2,30 m²
 Length : 192 cm
 Width: 120 cm
 Weight: 49 kg

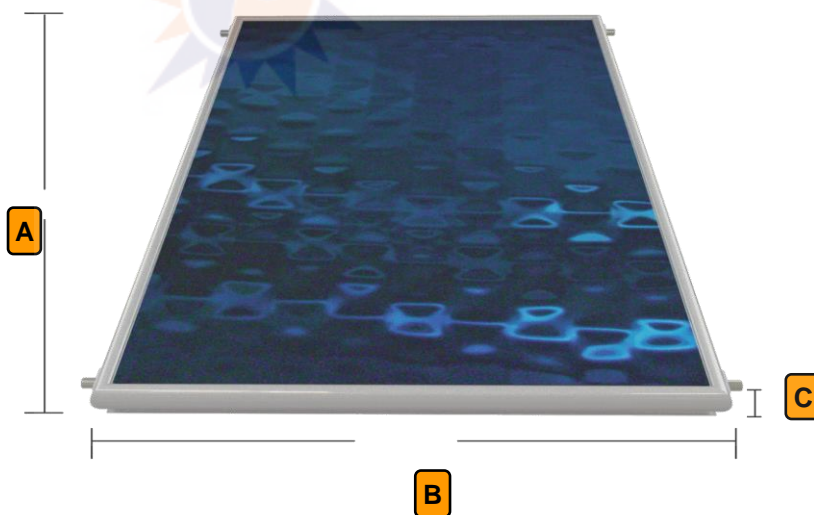
No of vertical tubes: 14



TS - 2 2 m²

Gross Area: 2 m²
 Length (A): 200 cm
 Width (B): 100 cm
 Height (C): 10 cm
 Net Area: 1,81 m²
 Length : 193 cm
 Width: 94 cm
 Weight: 41kg

No of vertical tubes: 9



TS - 1,5 1,5 m²

Gross Area: 1,5 m²
 Length (A): 150 cm
 Width (B): 100 cm
 Height (C): 10 cm
 Net Area: 1,33 m²
 Length : 143 cm
 Width: 93 cm
 Weight: 29kg

No of vertical tubes: 9

10. Lightning protection

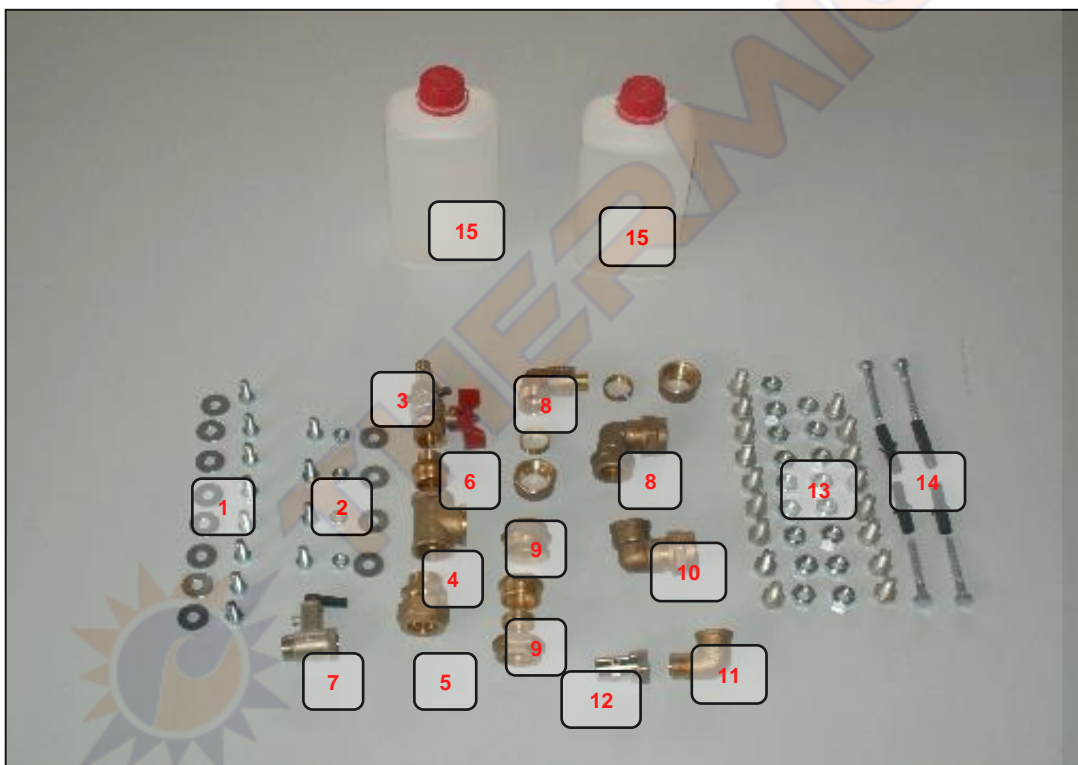
The collectors should always be connected (the metallic parts) through a copper conductor 16mm with the lightning conductor system, if there is any, if not the collectors should be connected with any conductor system using the same copper conductor from the collectors.

The conductor should not go through the inner space of the building and it should be installed by a certified electrician.

Collectors are installed on top of a metallic support base and the installer should check if the collector is attached with a secure manner, checking all the bolts and screws if they are well placed.

Always trust a certified installer to do the proper maintenance of the system, in case there is an electrical issue please call a certified electrician.

11. List and photo of the installation kit contents




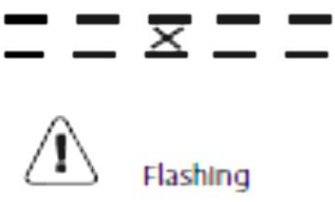


1. Bolts and washers 8 pairs (for securing the collectors on the support frame).
2. Bolts nuts and washers 4 sets (for securing the boiler on the support frame).
3. 1/2" ball valve and inlet for filling of the closed circuit system.
4. T-shaped brass connector 3/4".
5. Male Rakord-type connector 3/4" (between No 4 and Φ 22mm plastic pipe).
6. Connector to be used between No 3 (1/2") and No 4 (3/4").
7. Non returning valve and safety valve (8 bar) 1/2".
8. Brass 90° connectors Φ 22mm copper pipe / Φ 22mm plastic pipe.
9. Cap Φ 22mm.
10. Brass 90° connector 3/4" brass pipe (boiler outlet) / Φ 22mm plastic pipe.
11. Brass 90° connector 1/2".
12. Safety valve 1,5 bar 1/2".
13. Bolts and nuts 17 pairs (for assembling the support frame).
14. Screws and plastic plugs for anchoring the support frame.
15. Thermal fluid (propylene-glycol)

TROUBLESHOOTING

Problem	Possible cause	Corrective action
Sun is out Pump is off	Electrical outlet is not alive	Check outlet for power Fix or plug into a live outlet
	Check thermistors are placed in appropriate locations on collectors array and water tank	Position thermistors in correct locations
	Check thermistors are connected to the proper terminals	Connect to proper terminals
	Check thermistors for resistance versus room temp. (10,000 Ω)	Replace any bad thermistor
	Check if thermistor connections are tight	Tighten connections
	Controller malfunctioning. (See below controller troubleshooting)	Reset or replace controller
Sun is out Pump is on Temp. reading is below 60°C	Air trapped in the pump	Vent solar circuit
	Air sucked in the system from expansion tank/s	Vent solar circuit
Sun is not out Pump is on	Check thermistors are placed in appropriate locations on collectors array and water tank	Position thermistors in correct locations
	Check thermistors are connected to the proper terminals	Connect to proper terminals
	Check thermistors for resistance versus room temp. (10,000 Ω)	Replace any bad thermistor
	Check if thermistor connections are tight	Tighten connections
	Controller malfunctioning. (See below controller troubleshooting)	Reset or replace controller



TROUBLESHOOTING (controller)

Fault message	Possible cause	Action
 <p>Flashing</p>	A sensor line is interrupted.	Make sure that the sensor lines are intact.
	A sensor is faulty.	Check the sensor resistance. If necessary, replace the sensor.
 <p>Flashing</p>	A short circuit has occurred in the sensor line.	Make sure that the sensor lines are intact.
	A sensor is faulty.	Check the sensor resistance. If necessary, replace the sensor.
 <p>Flashing</p> <p>Circulation fault: No flow</p>	A fault has occurred in a pump connection.	Make sure that the pump wiring is intact.
	A pump is faulty.	Replace the pump.
	There is air in the system.	Vent the system.
	A sensor line is faulty.	Make sure that the sensor lines are intact.
	A sensor is faulty.	Check the sensor resistance. If necessary, replace the sensor.
 <p>Flashing</p> <p>Energy output measurement: No flow is detected</p>	A sensor line is faulty.	Make sure that the sensor lines are intact.
	A fault has occurred in a pump connection.	Make sure that the pump wiring is intact.
	A pump is faulty.	Replace the pump.
	There is air in the system.	Vent the system.

No indication on the display.	There is no mains voltage.	Switch on the controller or connect the controller to the mains voltage.
		Make sure that the main fuse for the mains connection is switched on.
	The controller's fuse is faulty.	If necessary, replace the controller's fuse. Use a type 2A/T fuse. Check the 230 V components for a short circuit. In the event of a short circuit, contact the manufacturer.
	The controller is faulty.	Contact the manufacturer.
The pump fails to switch on.	Manual mode has been activated.	Exit manual mode.
	The preconditions for the pump to be switched on have not been met.	Wait until the preconditions for the pump to be switched on have been met.
	The temperature limit for a storage tank (95 °C) has been exceeded.	Make sure that the wiring is intact. Make sure that the system components are intact.



EMERGENCY CONTACT DETAILS:

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*5 years
Guarantee*

Thank you for choosing one of THERMIC products. This product is guaranteed for the above mentioned time period. If during this period a malfunction occurs due to defective material and/or manufacturing failure the authorized service centers will repair this product according to the terms described hereunder.

Purchase Date:	Distributor:
Buyers Data Name: Address: Postal code: City: Tel:	Installation date: Installer: Address: Postal code: City: Tel:
Appliance model: Serial number/s:	

Please fill and return by mail to the company/distributor this part

Buyers Data Name: Address: Postal code: City: Tel: Buyer's signature	Purchase Date:
	Appliance model: Serial number/s:
	Distributor:

GUARANTEE TERMS

- The guarantee time is considered starting with the installation and commissioning of the appliance:
- Damages caused by calamity, force major, earthquake, extreme frost are not covered.
- Damages caused by misuse, wrong installation, wrong electrical wiring are not covered.
- Guarantee is not valid in case the appliance is installed or serviced by unauthorized personnel
- Secondary damages caused by water leaks etc. are not recognized.
- Claims are not covered if the guarantee document is not filled and sent to the manufacturer and/or the authorized local distributor or reseller.
- Guarantee is not valid if scheduled every year maintenances are not performed.
- Guarantee is not valid if the used water's salinity does exceed 500 ppm
- The electronic controls, pumps, electric elements and expansion chambers are covered by back-to-back according to manufacturer guarantee and terms
- The time validity of the guarantee is not renewed after possible repair within the covered period
- The guarantee is limited to the defective parts replacement and/or repair labor cost if any. Secondary losses or damages are not covered.
- Transportation costs for defective materials, traveling and accommodation for technicians are not covered.
- The scheduled maintenance is mandatory for the validity of the guarantee.

MAINTENANCES

	DATE	TECHNICIAN		DATE	TECHNICIAN
1 st maintenance			5 th maintenance		
2 nd maintenance			6 th maintenance		
3 rd maintenance			7 th maintenance		
4 th maintenance			8 th maintenance		

Fill your data at the first page of the guarantee document

- a) Detach the card below and mail or hand it to the local Thermicsol distributor.
- b) Keep the guarantee document and stamp upon each maintenance.

<div style="border: 1px solid black; padding: 5px; min-height: 60px;"> <p>Sender:</p> </div>	<div style="border: 1px solid black; width: 80px; height: 40px; margin: 0 auto 20px auto;"></div> <div style="border: 1px solid black; padding: 5px; min-height: 60px;"> <p>Seller / Distributor:</p> </div>
--	--