

VACUUM TUBE SOLAR COLLECTOR CS 58/1800



manual

installation

operation

maintenance

CE

- Carefully read the instructions in this manual as it provides important information about the safe installation, use and maintenance work.
- Instruction booklet is an integral part of the product and must be kept carefully by the user to be able to consult later.
- If the unit will be sold or moved to another owner, always ensure that accompany manual device that can be consulted by the new owner and / or installer.
- Installation and maintenance must be performed in accordance with the law, according to the manufacturer's instructions, they must be performed by qualified personnel.
- Incorrect installation or poor maintenance of the device may cause damage to people, animals and objects surrounding.
- The manufacturer assumes no responsibility for any damage caused by installation and usage errors or inattention given instructions provided by the manufacturer.
- Before carrying out any cleaning or maintenance disconnect the machine from the electrical power supply switch and / or through the relevant organs of separation.
- In case of failure and / or malfunction of the device, disable it but do not attempt to repair or intervene directly on him. Ask only qualified personnel.
- A possible repair - replacement products will be performed only by qualified personnel exclusively using original spare parts. Failure to follow the above instructions may compromise the safety of the unit.
- To ensure optimum operation qualified personnel must make an annual audit.
- This appliance must be used only for the purposes for which it was designed. Any other use is improper and therefore dangerous
- After removing the packaging, make sure the integrity of the content
- The packaging must be kept out of reach of children because it can be dangerous.
- If in doubt do not use the appliance and contact the supplier

DECLARER

SUPPLIER

S.C. PANOSOL POWER S.R.L.
Spataru, No. 285A, Buzau, Romania



COMPLET
DESCRIPTION
OF PRODUCT

Name : Vacuum tube solar panel - Heat Pipe

Model : CS 58/1800 **Execution standard :** DIN EN 12975, DIN 1055

Data according to the Pressure Equipment Directive (97/23/CE):

- Heated pressure vessel.
- First category in accordance with Annex II, Figure 5.
- Module A in Annex III.
- Marking separate appliances with capacities below 2 liters as modular unit pursuant to Article 3 (2).

The device was tested with pressurized equipment (safety features). Before installation and operation, the pressure vessel must be equipped with safety features provided by the local legal regulations.

In assessing the energy provided by the regulations in force for heating and ventilation can be considered for product PANOSOL settings in the process for EC According to the Efficiency.

We, PANOSOL Power Ltd, declare that the products that we mention by this statement are under the conditions and requirements of the client with the description, quantity and specification indicated.



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1. PRODUCT INFORMATION

1.1 Overview

This manual contains explanations on the installation, commissioning, maintenance and use of solar vacuum tube PANOSOL. This manual is CS series 58/1800 of collectors PANOSOL.

Please before start installation and assembly read carefully this manual.

The solar collector with vacuum tubes is the most efficient type of solar panel heating. This collector is suitable for applications in the temperate zone, the application temperature is between 50-95 ° C. Selective layer 3 levels of absorption of solar vacuum tubes captures very little heat loss even at negative temperatures.

Functional up to -30 C and the starting time under 60 seconds PANOSOL solar panel is designed to work in any climate. Each tube operates independently and does not cause damage to a malfunction of the solar system but reduce the absorption capacity and heating.

The solar collector with vacuum tubes can be used in hot water heating systems of houses, industrial buildings, as well as indoor and outdoor heated pools.

The solar collectors are manufactured in compliance with CE Quality: DIN EN 12975-1 and DIN EN 12975-2, AS2712: 2007. Production quality control is done in accordance with ISO 9001:2008 standards. The average lifespan of a solar collector PANOSOL is 20 years old, requiring minimal maintenance.

1.2 Technical data

General Specifications:

- Maximum pressure: 800kpa/116Psi
- Maximum flow: 18 l / min
- Maximum power: 650 W / sqm (at 1000 w/sqm irradiation)
- η_{0} : 0.687
- a_1 (W/m²K) : 1.505
- a_2 (W/m²K) : 0.0111
- vacuum tubes stagnation temperature: 280 ° C
- stagnation heat-pipe temperature: 180°C

Detailed specifications :

Model	CS 12	CS 15	CS 20	CS 25	CS 30
Number of tubes	12	15	20	25	30
Dimensions (m)	1,0x2,0x0,17	1,3x2,0x0,17	1,6x2,0x0,17	2,0x2,0x0,17	2,4x2,0x0,17
Total area (sq m)	2,0	2,6	3,2	4,0	4,8
Absorption area (mp)	1,2	1,5	2,0	2,5	3,0
Weight(kg)	35	44	58	73	87
Liquid capacity (ml)	350	440	500	605	710
Ideal flow (l/min)	1,5	2	2,5	2,5	3
Maximum power (W / Btu)	780/2652	975/3315	1290/4420	1615/5525	1940/6630
Daily capacity heating - $\Delta 45^{\circ}\text{C}$ (L)	80-120	105-150	140-200	175-250	210-300

Construction materials

- Vacuum tube: borosilicate glass type 3.3 to 1.8 mm thick
- Material absorption tube: Cu / SS-ALN (H) / SS-ALN (L) / ALN
- Heat pipe copper of high purity capacitor $\Phi 22\text{mm}$ and length of 60 mm
- Radiator heat transfer: aluminum (0.2 mm thick)
- Components sealing: silicone rubber
- Grip frame: aluminum U profile 30x30x2
- Collector Case: Aluminum 1050A to EN 485/573, H24
- Thermal Insulation: Flame retardant rigid polyurethane foam (density 50kg/mc)

1.3 Components

The collector box:

- Collector manifold
- Solar panel framework
- Heat-pipes
- Fixing accessories for vacuum tubes
- Accessories for sealing and protection of vacuum tubes
- Mounting kit for terrace mounting(optional)
- Mounting kit for tile roof mounting (optional)

Vacuum tubes box:

- 3 layer vacuum tubes 58x1800 Cu/SS-AIN(H)/SS-AIN(L)/AIN

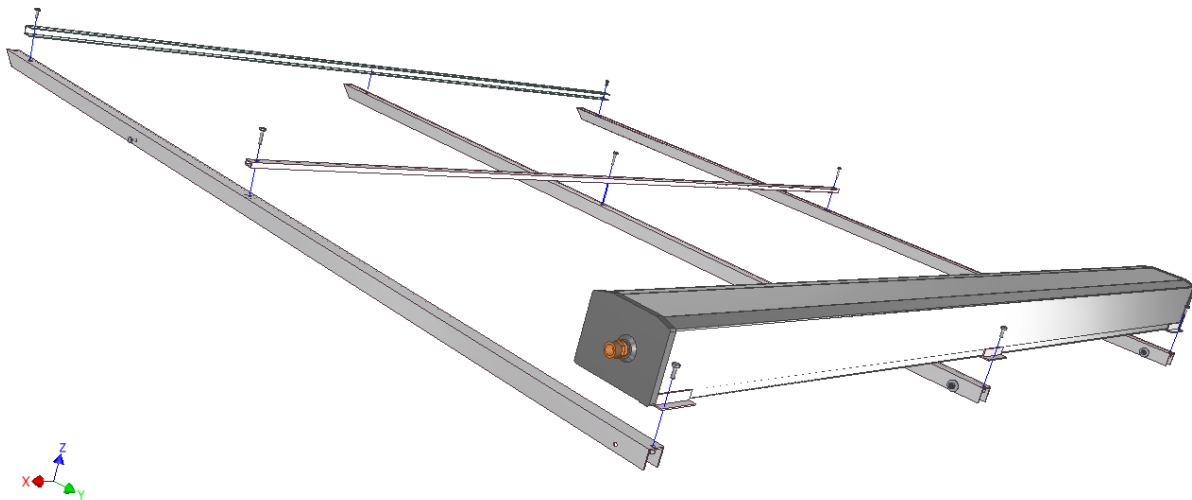
2. INSTALLATION INSTRUCTIONS

2.1 Assembling the collector

Installation should be performed by qualified personnel specialized. Inform yourself about the local rules and regulations applicable before installing and operating the solar system.

Solar collector can be installed on both tilted roof and roof terrace. For the different types of roof drains and itself is made of clamping frames are identical, but differ from the rest of the mounting components that are appropriate to various mounting modes:

- inclined tile roof bitumen, metal roofing, corrugated etc. necessary for fixing **profiles L, bolts, washers, and nuts** (optional)
- inclined roof tile is provided a **set of bores** (optional)
- roof terrace comes a **suitable support** (optional).



Installing the collector on a sloping roof means we have intervened in the existing roof covering. This is why places should ensure a tight seal against penetration covering water leakage.

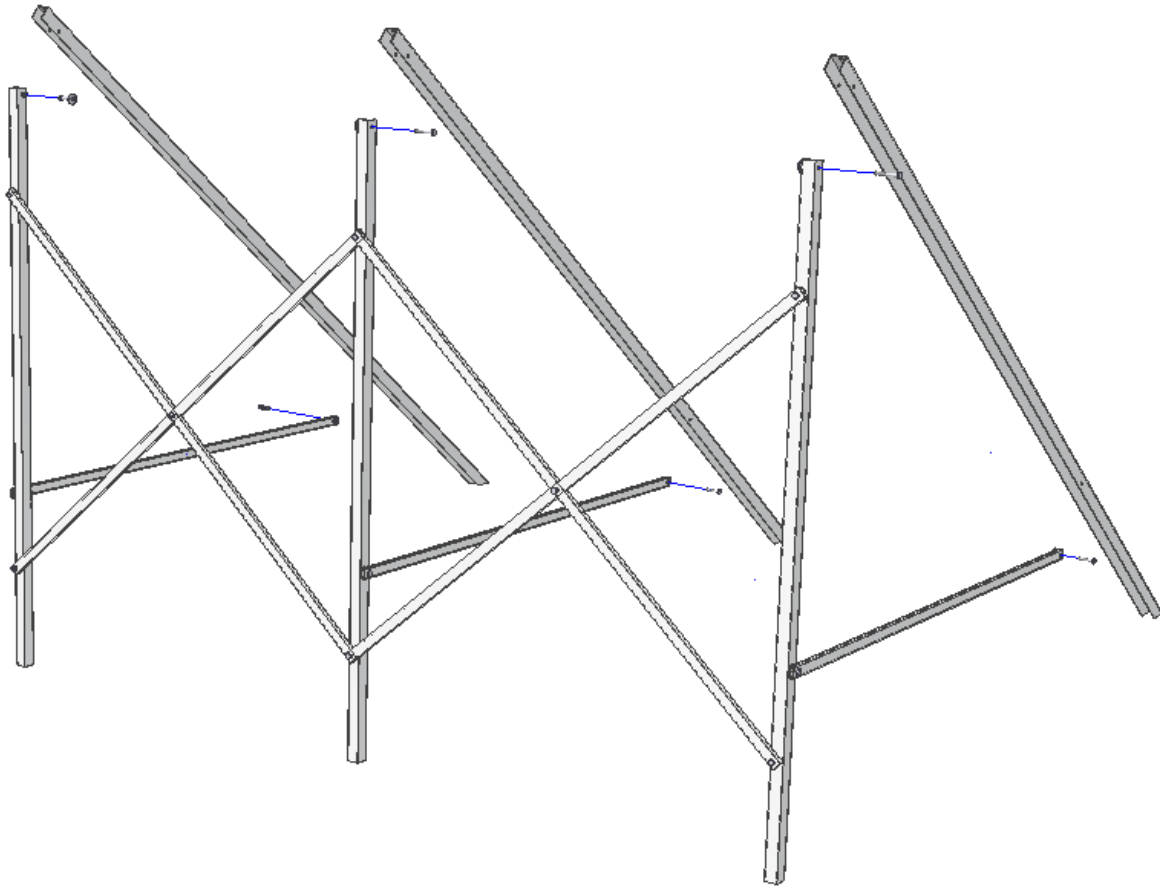
Clamp subassembly must be adapted so the heating system and the portion of the roof structure, depending on the concrete.

The whole subassembly must be able to withstand the loads caused by wind and snow that may occur in the area.

Also to be considered local, and if the regions with specific weather conditions: heavy snow or strong winds, etc.

Solar collector assembly is recommended frame ground and further raising the roof. To raise the roof collector and other components, the use straps but without that relate to threaded connections. To avoid any shock or mechanical impact, in particular screw heads.

2.2 Assembling support for terraces



1. Install hind legs (the two sides and the middle)
2. Install rear crossbars between the legs (in the form of X)
3. Short link bars are mounted between front and rear legs

2.3 Positioning collector

Solar collector will be positioned at a distance as close to the storage tank.

The direction and collector angle

The collector is oriented south direction to ensure efficient heating. To obtain maximum efficiency heating accept a deviation of 10° from the axis of the South.

Mounting angle of the collector will be appropriate to the latitude of the installation position. It can be obtained by the difference between 90 and latitude of the installation position (e.g.



Egypt is recommended for installation at an angle of 28-32 °). In order not to reduce solar heating capacity specified by the manufacturer, allowed angle is $\pm 10^\circ$ from the calculated. It is not recommended that the manifold assembly at an angle less than 20 °.

2.4 Installation on pitched roof with insulation board or bituminous

After the measurements required for the collector assembly, appropriate measurements are made on the roof in order to determine the fixing points (the distance between the rafters of the structure, the more convenient location, and so on).

It runs determined using drill holes in places suitable covering material.

Silicone insert into the hole and then screw bolt 8 mm bolt, using tapered rubber sealing washer, flat washer and nut.

After execution and proper sealing holes, the collector roof rises assembled and positioned in studs already attached (required collector slope) then provides using washers, nuts, and nuts. Optional studs can be installed on fixed Profiles L to depart the roof panel surface.

2.5 Installation on pitched roof with tiles



Pasul 1



Pasul 2



Pasul 3



Pasul 4



Pasul 5



Pasul 6

2.6 Hydraulic diagram of solar system

The configuration of the solar system will be customized to meet the requirements necessary for installation. It is recommended that the design of the hydraulic system to perform in accordance with local building regulations and water quality regulations.

The main components of a solar installation are:

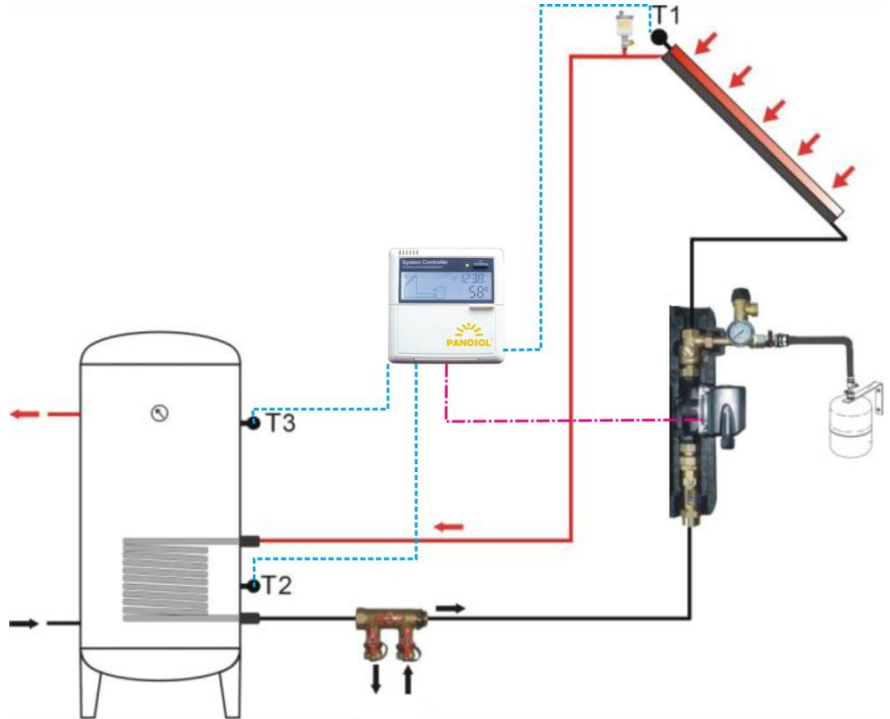
1. Solar Panel
2. Storage tank with heat exchanger (heater coil)
3. Pump Group and control (pump, pressure gauge and pressure relief valve)
4. Automation system (controller)
5. Expansion
6. Vent
7. Drain valve / filling plant

Drain valve / filler will be installed in the lowest point of the solar system to allow full draining the solar circuit.

Pump, pressure gauge, pressure relief valve and expansion vessel will be fitted solar circuit return. Air vent will be installed on the highest point of the solar circuit.

The automation system will connect:

- Temperature sensor for collector array (T1)
- Temperature sensor to the bottom of tank (T2)
- Temperature sensor for the upper tank (T3)
- Circulation pump



2.7 Installation and welding pipes

Flow and return pipes should be of copper or stainless steel finish and they are secured by the purchaser. If the roof tile is advisable to use the pipes in the building for the roof tiles ventilates the corrugated pipe is recommended to be fitted over an external wall.

Gaskets used in fittings mounted solar installation shall withstand at high temperatures (up to 250 ° C).

The 15 mm or 18 mm pipe is recommended to the hydraulic system for the solar installation. Because of low flow, the use of larger diameter pipe will increase both system cost and heat loss.

Hydraulic installation will be insulated over the entire length circuit. To avoid damaging the insulation where heat stagnates, we recommend the use of insulating materials capable of withstanding temperatures above 250 ° C and ultraviolet radiation (e.g. mineral wool covered on the outside with aluminum foil).

IMPORTANT: The tube are isolated only after pressure testing and filling system

2.8 Connecting the collector

Collectors on the hydraulic connection is recommended to run a piece of corrugated stainless steel flexible pipe which blends using compression fittings or directly by the Dutch collector connection with flat seal. The connection is covered with insulation resistant to UV radiation. The collector connections are 1/2 "internal thread.

Collector **temperature sensor** is inserted into place specifically at the proper depth. The sensor will be sealed with silicone to prevent water sanitary storm in sensor sheath. Collector sensor used must withstand temperatures of 250 ° C (e.g., PT 1000).

Metal pipes of the solar circuit must be connected to the electrical outlet by equipotential bonding through a copper conductor green / yellow with a minimum diameter of 16 mm² (HO7 VU or R). If a lightning protection system installed, solar panels can be integrated into it. The ground connection may be achieved using a ground rod. Table conductors must be installed on the outside over the building. Earth ground must also be connected to a grounded mains equipotential conductor of the same diameter.

2.9 Fitting the vacuum tubes

To avoid the risk of overheating, vacuum tubes are not exposed to sunlight until their erection.

At the bottom of the tube is vacuum indicator. The appearance of silver - shiny indicator provides warranty void between the walls of the tube. If it loses vacuum tube becomes

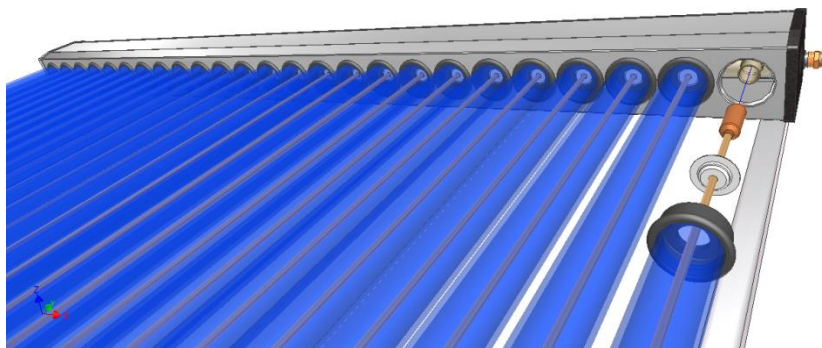


ineffective. We recommend handling the attention of the vacuum tubes, protecting the lower tip predilection.

Heat-pipe sites will be equipped with overheating protection element and gasket, then vacuum tubes will be placed in the center of the aluminum

plates.

Installation steps

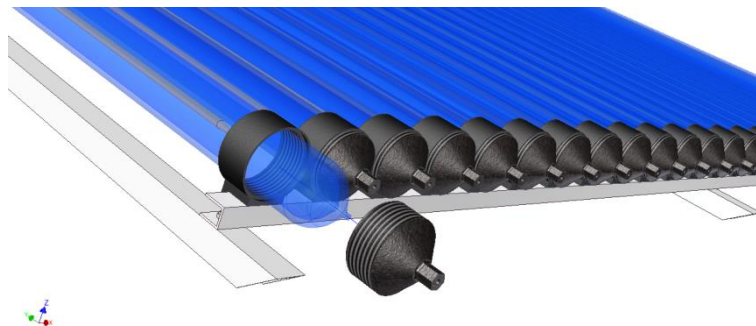


Step 1 – To equip the heat-pipe gasket sealing and protection of aluminum

Step 2 – place in the heat-pipe vacuum tube.

Step 3 – vacuum tube is inserted through the tube bracket

Step 4 - Enter in the heat-pipe ramp and push tube collectors hill until the gasket seals on the outer surface of the header casing



Step 5 – tube is fixed by screwing the fixing nut. Screw will be done free hand and gathering will be moderated.

3. COMMISSIONING INSTRUCTIONS

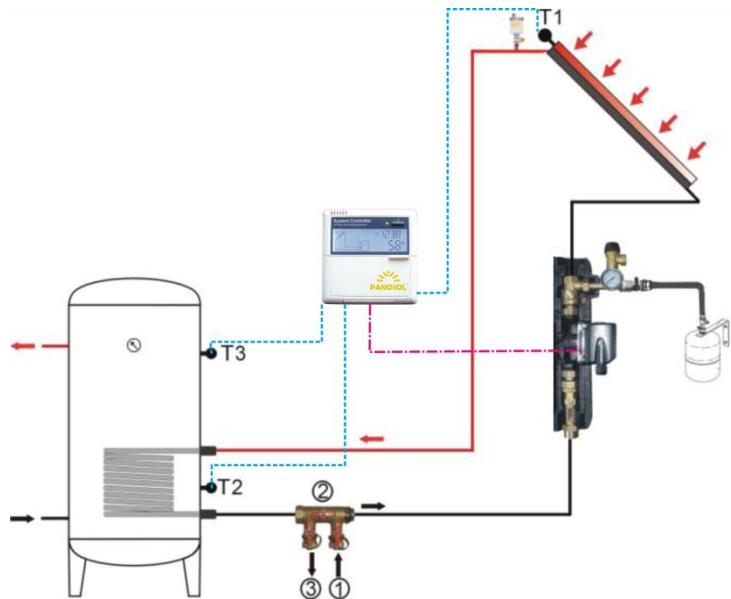
3.1 Charging the solar circuit

WARNING: Charging the solar circuit is made with special applications for solar liquid to withstand freezing to -30°C and to prevent corrosion of equipment.

Charging via solar circuit will drain valve / filling plant using a submersible pump, garden pump or hand pump.

Filling solar circuit steps are:

- Disconnect the expansion vessel
- Connect the pump to the valve 1
- Connect the drain hose to the valve 3
- Close the valve 2
- 1st and 3rd valves are opened
- The liquid circulates through solar installation for 5-10 minutes to remove all air from the system, during which weakens the vent valve to ensure the elimination of air bubbles.
- Close the valve 3 and continue pumping until the system pressure reaches 2 bar (check the air gauge)
- Close the valve 1 and stops the pump
- Check the pressure air gauge to detect pressure leaks. It will eliminate leaks, if necessary
- Reconnect the expansion vessel and reopen valve 2



3.2 Flow and pressure in the system

PANOSOL solar panels have been designed to withstand pressures up to 8 bar. To protect plant and the solar panel is necessary to provide safety valves that trigger at a pressure up to 6 bar.

The pressure in the circuit must be checked regularly. Pressure must be at least 1.5 bar when the system is cold (temperature below 30°C), but it is recommended to 2-3 bar pressurized solar circuit.

The flow rate to a single solar collector of 1.5 - 3 l / min. If the system contains two collectors, the flow rate is 3.0 to 6.0 l / min, etc.

4. APPENDIX

4.1 Protocol installation and commissioning

MOUNTING	Done	Comments
The solar panel is mounted correctly		
The panel is secured properly a stable		
The solar panel is connected to ground		
The roof was insulated and		
Replace tile was right after mounting frame		
Temperature sensors were fixed and insulated panel and boiler		
Roundtrip pipe insulation was done properly		
Hydraulic scheme was set correctly		
Vacuum tubes were mounted without damage		

POWERD COMMISIONING	Done	Comments
The plant was filled with liquid prescribed		
Solar circuit was fully ventilated		
Tightness was checked at fitting / glued		
The pump rate was adjusted as collectors	l/min
System pressure (cold)	bar
Temperature sensors indicate actual values		
Solar pump works		
The boiler heats		

Beneficiary

Plant location

Plumber

Signature / Stamp

Date of commissioning

4.2 Maintenance protocol

Failure inspection / maintenance at regular intervals may damage components in the solar system and the loss of the manufacturer's warranty

Maintenance solar circuit	Interval
Checking the system pressure	quarterly
Checking circulation pump operation	quarterly
Vented	annually
Flow verification	annually
Checking the pressure in the expansion tank	annually
Check insulation solar circuit	annually
Check the temperature indicated by thermal sensors	annually
Check the pump (on / off / auto)	annually
The solar Maintenance	Interval
Check the vehicle's annual collector	annually
Cleaning vacuum tubes	annually

Nr. Crt.	Verified on
1	
2	
3	
4	
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9	
10	

4.3 Certificate of warranty

CERTIFICATE OF QUALITY AND GUARANTEE

This certificate certifies product quality guaranteed by the manufacturer in terms of proper use, in accordance with the installation manual, operation and maintenance. The product complies with European security, conformity assessment is attested by the CE mark on the product label, according to Ordinance no. 20 in 2010. PANOSOL guarantee that the products to which this declaration relates are in conformity with Directive 89/392 EC in terms of alignment of Member States of the EEC on:

- Performance (DIN EN 12975-1, DIN EN 12975-2, AS 2712:2007)
- Materials (DIN EN 10204)

The average use of the product is 20 years, during which provide fee maker, outside the warranty period, service necessary related parts or equivalent products instead.

PANOSOL provide product warranty for material or manufacturing defects occurring in a period of 120 months from the date of its sale to the end user, hereinafter referred to as the "Warranty Period" under the following conditions:

- The solar system to be operated by a licensed plumber by manufacturer
- Solar only be filled with antifreeze for solar installations (based on propylene glycol).
- Every 60 months an installer authorized by the manufacturer will completely replace the antifreeze solution.

The warranty period, as it is stated above extends the time from the date the End User Product failure and complained to his reinstatement in service.

End User means the person or entity that owns the product and not purchased for resale. If there is a defect that is responsible PANOSOL, it can have a long charge, and no additional payment, repair or replace the product, if this situation is attributable to the entity end-users or put into service the product. Warranty does not cover the cost of delivery of spare parts or products replaced, needed to repair the defective product purchased by the end user.

During the warranty period, the repair of the product is ensured by PANOSOL. If the situation requires finding and installation requirements of product defect, the user is required to provide access PANOSOL representatives from its mounting position. To invoke the guarantee, the user must submit a written complaint if the product is under warranty, the dealer from whom the product was purchased or PANOSOL as soon as it is found in Product failure. Written notification shall be accompanied by documents proving the purchase product, the invoice and certificate of quality and warranty.

PANOSOL reserves the right to refuse warranty service (free) if you cannot submit the above documents or the information contained is incomplete or illegible. The warranty must be carefully kept and presented to PANOSOL required for enrollment to service performed.

After expiration of the warranty repair, PANOSOL will paid product ensure repair. PANOSOL declines any responsibility for damage to persons, facilities or equipment that can be caused by breaches of security or safety.

GENERAL CONDITIONS OF WARRANTY

- A.** Warranty is only for construction defects, and not for improper use of the solar panel. The warranty covers defects in material (parts) and workmanship. Solar Panel considered defective will be sent to finding the workshop. Service establish whether the defect is subject to warranty: product service PANOSOL declared as defective under warranty will be repaired or replaced free of charge if necessary. In no warranty defects can involve the levying of penalties or damages for any damage caused directly or indirectly by the malfunction of the products.
- B.** Warranty is no provided for:
 - a)** Damage and defects due to handling, transport or physical damage to the solar panel

- b) The operating conditions other than those provided by the technical documentation
- c) The product removed (or tried to remove) and / or repair by unauthorized persons PANOSOL
- d) Situations in which the collector has failed due to faulty connection of the hydraulic
- e) Where the equipment was damaged due to improper anchoring, in conditions of instability
- f) Product damage and malfunction due to operation outside the operating range recommended by the manufacturer in the technical documentation or due to contact with fluids other than those for which it was built (corrosive liquids, viscous or abrasive containing fibers) and
- g) Damage to the product due to lack of minimum protection: lack of fluid in the solar circuit, hydraulic Group inability to circulate the solar fluid.
- h) Damage to thermal, mechanical or plastic product due to fires, accidents, bad weather, lightning or negligence and carelessness in use or as a result of installation, modification or improper adjustments.
- i) The non-compliance of the conditions of the end user, operation and maintenance of technical documentation provided by or under conditions contrary to the technical standards of Romania.

NOTES ON THE ACTIVITIES OF SERVICE RENDERED TO THE PRODUCT

Nr Crt	Identification elements	Failures	Executed	date of service activity	Observations / signature	Service unit owner's mental
1.						
2.						
3.						

SELLER

Signature and stamp

BUYER

Signature and stamp

SC PANOSOL POWER SRL

Responsible for quality

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