TECHNICAL PASSPORT

INSTALLATION and OPERATION MANUAL

For SOLAR COLLECTORS - PK SL AL
With full plate aluminum absorber

model: .....

serial number: .....

version 01/SRCC-2-2011/

Table of contents

1. Safety instructions

1.1. Requirements to solar collector installation place

This manual contains important information for the safe and correct installation, start-up and trouble-free operation and maintenance of the solar collector.
The solar collector can be used to produce domestic hot water and support of space heating system only in the manner described in this manual.
The application and any other was the area of operation is not recommended by the manufacturer and is not responsible for the occurrence of defects or failures.
Note the collector type data on the factory rating label and the technical data provided in this manual in order to ensure proper operation of the product.

1.1.1. Instructions to collector installer

During installation and operation, the country-specific requirements and regulations must be observed:

- local construction regulations on installation on building – mass of the system to comply with the building structure.

⚠	Fixation of support must be in compliance with local regulations and requirements regarding wind/snow load resistance (if necessary take measures to make them compliant)

- regulations and norms concerning safety installation and operation of solar collectors - protective gloves, eyewear should be used; make sure collector is securely attached to the building.

ⓘ	Use only original parts

⚠	**DANGER of structure damage / injury from fall.** The weight of collector/collectors must comply with the building structure, namely the distribution of weight; strong and secure fixation of collector support to the roof/façade of building. We recommend the securing of the area during installation and the construction of roof barriers protecting against downslide of snow mass. Failure to comply with these recommendations can lead to fatal consequences.

	**Risk of injury, burn** upon installation and maintenance of solar collectors: - On contact with broken glass/vacuum tube - On contact with collector in function because of its high temperature. We recommend the use of protective equipment, gloves, eyewear (goggles), clothing. Installation and maintenance of collectors must be carried out in the early morning hours. When the collector is still cold you can cover it with tarpaulin to avoid its heating by direct sunlight.

	**FIRE HAZARD** through contact of accumulated waste (dry leaves, plastic bags, paper) with the hot parts of the collectors. We recommend the regular inspection and cleaning of collector installation sites.

	**DANGER of slipping, fall.** In most cases, collectors are installed in hardly accessible and dangerous places. We recommend that installation and service maintenance be carried out by authorized service technicians observing all safety measures.

1.1.2. Instructions to installation user

	CAUTION! Danger of injury / damage of system due to incompetent operation. - The solar collector must be serviced only by persons familiar with the operation manual. - Structural changes to collector by user can cause damage to equipment or injury.

Safety rules for user operation:

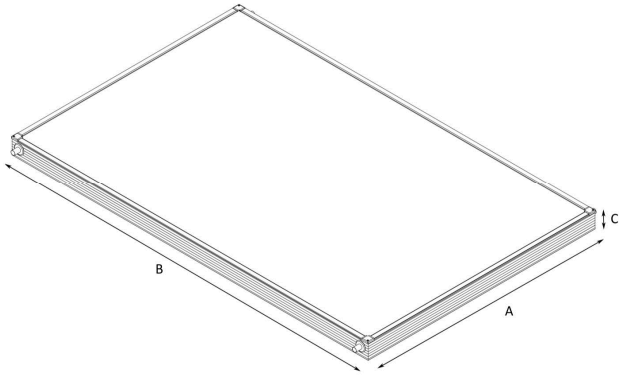
- The solar collector can be used to produce hot water and support the heating system only in the manner described in this manual.
- Installation and maintenance must be performed by a technician / service shop authorized for such operations.

2. MAIN TECHNICAL SPECIFICATIONS

Table. 1

Model	**ABSORBING *SURFACE***	**DIMENSIONS *AxBxC (mm)***	**WEIGHT OF EMPTY COLLECTOR (kg)**	**THERMAL LIQUID CAPACITY (Lt)**	**MAXIMUM WORKING PRESSURE (bar)**
PK SL AL 2,00 м²	ALUMINUM SELECTIVE	1010x1980x86	34	1,75	10.
PK SL AL -2,4 м²	ALUMINUM SELECTIVE	1230x1930x86	43	2,03	10.
This manual is also valid for all collectors in the a/m dimension with standard casing profile with thickness 86mm and 100mm.					

Scheme 1



3. Description

The solar collectors PK SL AL are designed to function as part of thermosiphonic solar systems or as part of forced circulation central system for heating sanitary water, space heating, air conditioning and pool heating.

The collectors PK SL AL are flat solar collectors with Aluminum high selective absorbing surface, copper risers and header tubes, clear tempered glass, rock mineral wool insulation and aluminum frame.

For all flat solar collectors including Ultra series, there is the possibility to include other type of absorbing surfaces like copper full plate selective, copper fins black paint, copper fins black paint, aluminum full plate black paint and other solutions according to customers' demands.

Flat solar collectors with selective absorbing surface perform higher efficiency under diffuse solar radiation weather conditions.

Antifreeze liquid mixture is absolutely necessary in any case.

4. Transport. Handling.

Collectors are packed in cardboard or with stretch film, carton on glass surface and hard polystyrene on the corners and must always be transported in vertical position.
Palletizing of collectors. Upon request special pallets for horizontal packaging are available.
Scheme 2

During installation, keep the upper carton or plastic film in place up to the moment the circuit is filled with thermal fluid.

5. Collector protection against lightning

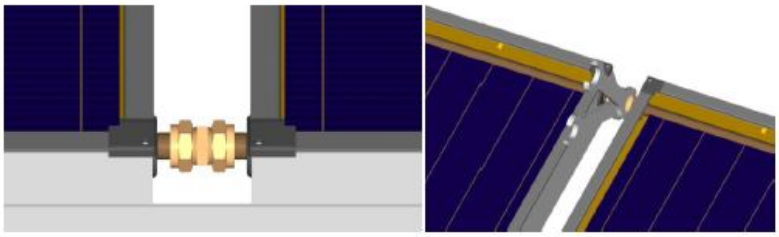
Use a copper wire 16 mm² to connect the collectors (metal parts) with lightning protection system if existing or earth them to an earth rod using wire of the same size. The route of this wire should be always outdoors. Ask specialist for more information.

6. COLLECTORS INTERCONNECTING IN A FIELD WITH 20m²

For collectors PK SL AL -2,00 m² and PK SL AL -2,4m ², the optimal arrangement is in five arrays connected in parallel with maximum two collectors in each array connected in series. For Mediterranean countries, all collectors must be connected in parallel to prevent over heating as much as possible during summer. Use brass joints for copper tube Ø 22 and copper tubing properly insulated to make all connections.
Collectors are delivered bare copper tube Ø 22 without any threading or union nuts.

Scheme 3

Scheme 4

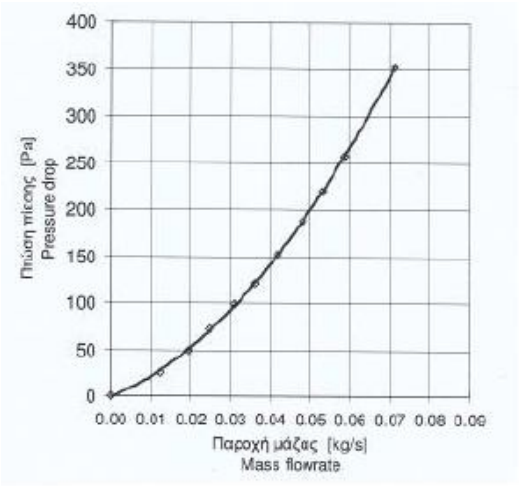


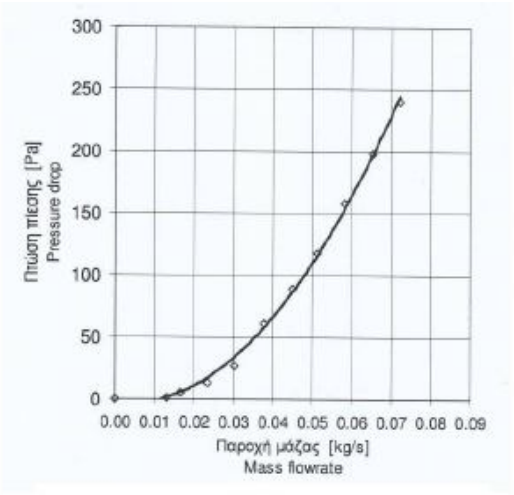
ATTENTION: When screwing the connection fittings of the collectors (plugs, raccords, connectors, etc.) use divert force to avoid damaging the header tube connections inside the collector.

7. Pressure loss

For the dimensioning of the circulating pump, the following tables which show the pressure drop against flow of thermal fluid through the collector must be taken under consideration:

Scheme 5. Pressure loss of collectors PK SL AL 2,0 и 2,4





8. Recommended angle of installation of the collector

The angle of the collector referred to the horizon must be the latitude of the place plus 5°. At this angle the maximum of the year around efficiency is achieved.

In case of difficulty to follow the above rule, try to keep the inclination between 30° and 50° in order to benefit a minimum year around efficiency (for places with latitude 40°).

9. Collector protection against frost

To protect the collector against frost (closed loop) Propylene Glycol PG heat-carrier fluid is recommended:

Table. 2

PG / Propylene Glycol /: Water	Freezing point
20% : 80%	- 7 ℃
30% : 70%	- 13 ℃
40% : 60%	- 23℃
50% : 50%	- 34℃

If you choose water as heat carrier, it is recommended to connect to the system a controller unit supporting antifreeze function working with water as heat-carrier.

10. Maintenance

Our collectors require the minimum maintenance and attendance such as summarized below. Every two years the following actions must be taken:

I. Check that all the fastening screws of the supports and the screws of the collectors' holders are well tightened. If not, fix them properly or change them if necessary.
II. Clean the glass of the flat plate collectors from dust to increase efficiency.
III. Check the level of the thermal fluid and fill the system if necessary using the upper point (venting point) of it or use any other convenient method.
IV. Check for any leakage in the collectors and joints.
V. Check again the slope of the collectors to avoid any formation of air traps.

10.1. Installation of collectors PK SL AL AS PART OF A FORCED CIRCULATION CENTRAL SOLAR SYSTEM

Safety instructions:

1. In case of using ladders, check them in order not to be damaged, and place them on secure surfaces in inclination ≈70°. For maximum protection use safety belts.
2. We suggest the installer to wear protective gloves, safety shoes and helmet. Also protective glasses are necessary in some cases.
3. In case that the place of installation is near electrical wires, keep safety distance (minimum 5 meters) and pay maximum attention when handing long parts of the support structures or tools for the installation.

10.2. Selection of installation area

Check with the constructor of the building that the roof can withstand the load of the collectors full of water and ask for a written confirmation. Check the same with the local technical authorities if needed.
Our collectors can be installed on flat roofs or on the ground or on sloped roofs with defined orientation and slope.
For optimum performance, the collectors must face the south, for counties located in the Northern hemisphere and north for counties located in the Southern hemisphere. In case that it is not totally possible for the collectors to face the equator, you can turn it towards East up to 30° if major hot water draw is before 2 p.m. or towards West u p to 30° if major hot water draw is after 2 pm. In both cases, the losses of the total annual solar contribution, is no more than 6%. To compensate energy losses there is the option to increase the number and surface of the collectors' that are going to be installed.

<u>The following points must be considered when selecting the installation area:</u>

The position you will choose for the installation of the solar water heater, should not be shaded by any obstacles (trees, buildings, etc.) all around the year.

The distance from an obstacle being at East, South or West must be :
- at least 1,5 time the height of the obstacle for countries with latitude 30°
- at least 2 times the height of the obstacle for countries with latitude 40°
- at least 2,5 times the height of the obstacle for countries with latitude 50°

For optimum performance the collectors must have inclination to the horizon of 45° (countries with latitude 40°). In general the inclination of the collectors should be 5° higher than the latitude of the place. Any change of the above mentioned condition causes a reduction to the average annual gain of usage that must be considered.

The distance between the collectors and the boiler or other heat exchanger must be the shorter possible.

The area of collector's installation should have an easy and safe access for maintenance.

The static resistance of the surface that the installation will take place must be considered in relation with the total weight of the collectors and other parts that will be installed.

The installation should be done according to the electric, plumbing and town planning regulations applicable in the installation area.

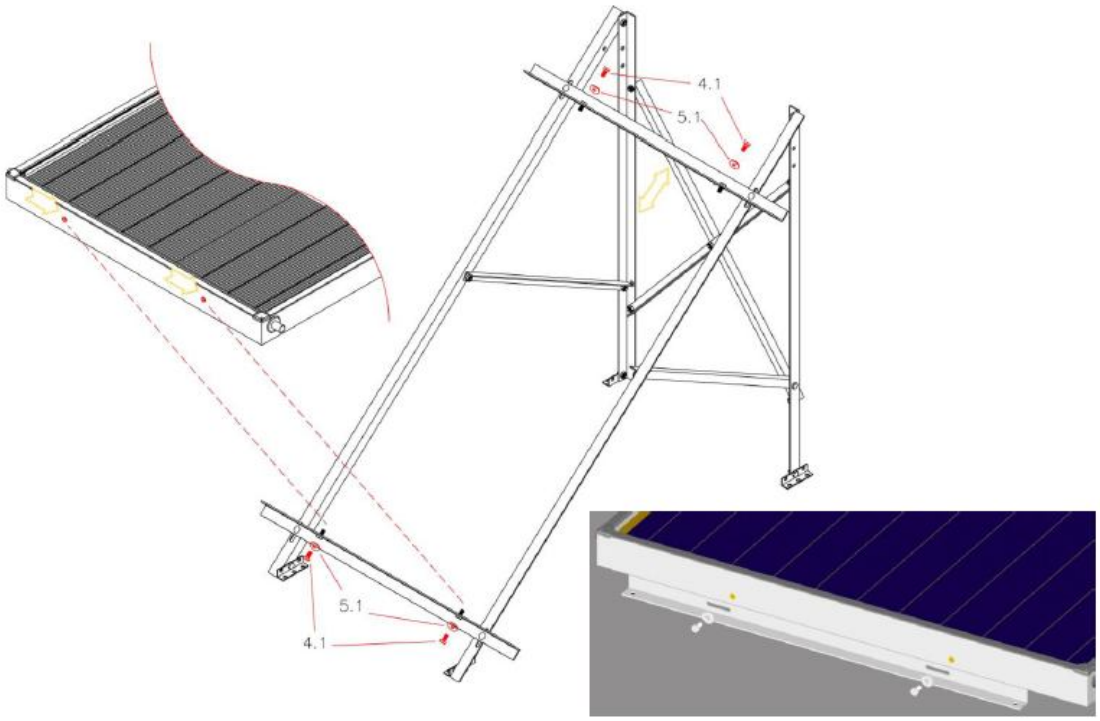
11. Maximum limit of snow load and wind speed

It is admitted that our collectors can resist without any failure to a snow load of up to 500 Pa. The support systems may only be installed in locations with a value of possible snow load lower than 500 Pa. According to the characteristics of their support frame and the standard ENV 1991, Solar Flame systems may not be installed in locations where the maximal mean wind velocity exceeds 55 m/s (value for islands exposed to high winds).

12. Installation

Installation, connections and starting of the system should be made by specialized, experienced and authorized technicians as necessary.

As soon as the support structure is ready to fix the collector/s we have to use the M8 screws and flat washers M8. Each collector has 4 receptions for M8 screws (2 on the upper side and 2 on the down side) as indicated in the following drawing. After placing the collector on the support structure these receptions have to align with the oval holes of the collectors holders.



13. Important recommendations when installing the collector

- It is very critical to keep the front cover on until the whole circuit is full of thermal fluid otherwise very high temperatures may appear on the collectors which can damage them.
- Verify again that the inclination towards the outlet of about 1-2% exists. The inclination is imperative for the air venting of the closed circuit through a venting valve installed at the highest point of the system.
- If more than one is installed, connect the collectors with appropriate joints thermally insulated. The distance between them must be kept at the minimum. The system of collectors should be connected to the hot water tank (heat exchanger of the tank) with tubing properly insulated. When installing collectors in parallel, it is more practical to use the four outlets available for the middle ones, connect the lower inlet of the first one on the left to the discharge of the circulating pump and on the right close with a cap its upper inlet. Then connect the upper outlet of the last one to the heat exchanger of the tank and close the lower outlet with a cap.

A circulation pump with appropriate automatism must be used for the circulation of the thermal liquid in the closed circuits.

Attention must be given so that all collectors have an interrupted slope.

- Prepare the mixture using the thermal fluid and water - please see the PG label

- Start pouring the anti-freezing and anti-corrosive brine in the system using the venting upper point of the system or other appropriate method. A good air venting of the system is critical for any solar installation.
- Check again inclination and tightness of the system.

14. Warranty terms.

⚠	Failure to observe the installation and operating requirements described in the manual and the service booklet voids the warranty.

14.1. Manufacturing defects and materials guarantee

The manufacturer expressly guarantees that the products it manufactures shall be free from defects in materials and workmanship which can prevent from normal operation under proper and normal use, installation and maintenance for the intended functions of the products for a period set out in the warranty certificate of the respective model of the collector you have bought.
The warranty period begins from the date indicated in the purchase invoice. If a product or any component thereof is determined to be defective in manufacture or materials, manufacturer will repair or replace the defective component or product.

14.2. Exclusions and Limitations of Warranty Coverage

14.2.1. The customer can claim warranty during warranty period of respective product immediately after any defects have been determined, except for in case of noticeable defects at the moment of purchase, in which case the customer must make the claim at the shop immediately after noticing the defect, as it is provided for in the general conditions of sale.
14.2.2. This warranty certificate is considered void in cases when defects and errors in functioning of products are caused by:

- Accidents as a result of improper storage, transportation, unsuitable or incorrect use.
- Failure to observe the installation, use, and maintenance instructions set forth in the installation manual of respective product.

- Improper installation or use as well as changes especially if they are not made by authorized after-sale service personnel of manufacturer.
- Testing and operation pressures greater than the values established by manufacturer and set forth in product manuals.

Freeze, flood, natural disasters or third party actions as well as any interventions into normal functioning conditions of collectors and the control of manufacturer.

14.2.3. The warranty certificate is considered void as well for collectors whose serial identification number has been modified, removed or blurred, or cannot be expressly attested.
14.2.4. Damages in the appearance of products shall not be considered as defects giving right for laying claim except for those ones which cause problems in functioning or change technical characteristics of collectors.
14.2.5. The manufacturer preserves the right, in case of replacement, to deliver another model of collector in order to fulfill approved warranty claims in case the original model is not being manufactured.

14.3. Claiming warranty

Every customer who has purchased a collector from manufacturer, and who has good reasons to lay a warranty claim, shall proceed as follows:

14.3.1. Immediately notify in writing:

- The installer, or the company that has sold the collector to him;
- The distributor firm;
- The commercial representative of manufacturer in the region.

For this purpose the claimant shall fill out a claim form; the latter shall be accompanied by the document proving the purchase of the collector (invoice) with the date of purchase in it.

14.3.2. After receiving the claim form, manufacturer considers it and makes decision whether the claim has grounds or not, and whether the defect is within the scope of the warranty set forth in this certificate for limited warranty; after which informs the customer as to its decision.

14.3.3. The return of a product cannot be done without written authorization issued by the Claim Department.

14.3.4. If on customer's request, and when there is reason for urgency, the customer demands immediate replacement of the product he has claimed warranty for, before receiving the decision as to the claim, said request shall be accompanied by a Purchase requisition from the Commercial Department. After decision for satisfaction of the claim has been made, the Purchase requisition mentioned above will be annulled by issuing a receipt for returned goods; with this receipt the customer can purchase another product with the same price in case the claim has proved grounded.

15. Technical features of collectors PK SL AL

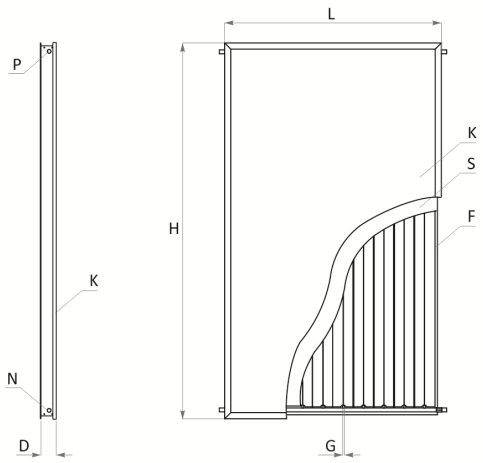


Табл 3

		PK SL AL 2.0	PK SL AL 2.4
Overall dimensions			
Width L	mm	1010	1230
Height H	mm	1980	1930
Thickness D	mm	86	86
Overall surface	m^2	2.00	2.37
Aperture/Absorber surface	m^2	1.86/1.86	2.23/2.23
Volume of heat carrier	L	1.40	1.70
Test pressure	Bar	15	15
Max. Operating pressure	Bar	10	10
Weight (empty collector)	kg	35	43
Thickness of solar glass	mm	4	4
Material of solar glass	K	Heat tempered prismatic glass	
Material of pipes	F	Copper	
Absorber pipes, pcs/diameter	G	9 x ø8	11 x ø8
Manifold pipes, pcs/diameter		2 x ø22	
Inlet / Outlet	P/N	ø22	
Material of absorber	S	Aluminum, thickness 0,5mm	
Coating of absorber		PVD high efficient (α=95%, ε=5%).	
Thermal loss coefficient -κ_1	W/m^2K	5.140	
Thermal loss coefficient -κ_2	W/m^2K^2	0.017	
Efficiency factor -η_0	η_0	0.788	
Insulation		Black mineral wool g=50kg/m3 δ=30mm	
Heat carrier fluid		Propylene Glycol PG 50% (freezing point - 34 ° C)	
Stagnation temperature	°C	152	
Resistance to hail snow mass wind		Size up to 25 mm Load up to 1,25 kN/m2 Speed up to 150 km/h	
Certificates		EN 12975:2006; OEM 9949/2/2	

16. RECYCLING AND WASTE DISPOSAL

16.1. Recycling of collector packaging

Parts of the packaging made of wood or paper can be used as combustible for the boiler. Submit the rest of the packaging material for recycling according to the local regulations and requirements. Replaced heating installation components must be submitted for processing to an authorized factory which complies with the environmental protection regulation.

16.2. RECYCLING AND WASTE DISPOSAL

At the end of life cycle of each product its components are due to be disposed of in conformity with regulatory prescriptions.

According to Directive 2002/96/EC on waste electrical and electronic equipment (WEEE) they are to be disposed of outside the normal flow of solid domestic waste.

Obsolete equipment shall be collected separately from other recyclable waste containing materials with adverse effect on health and environment.

Metal details, as well as non-metal ones shall be sold to licensed recyclable metal or non-metal waste collection organizations. Those should not be treated as domestic waste**.**

Notes