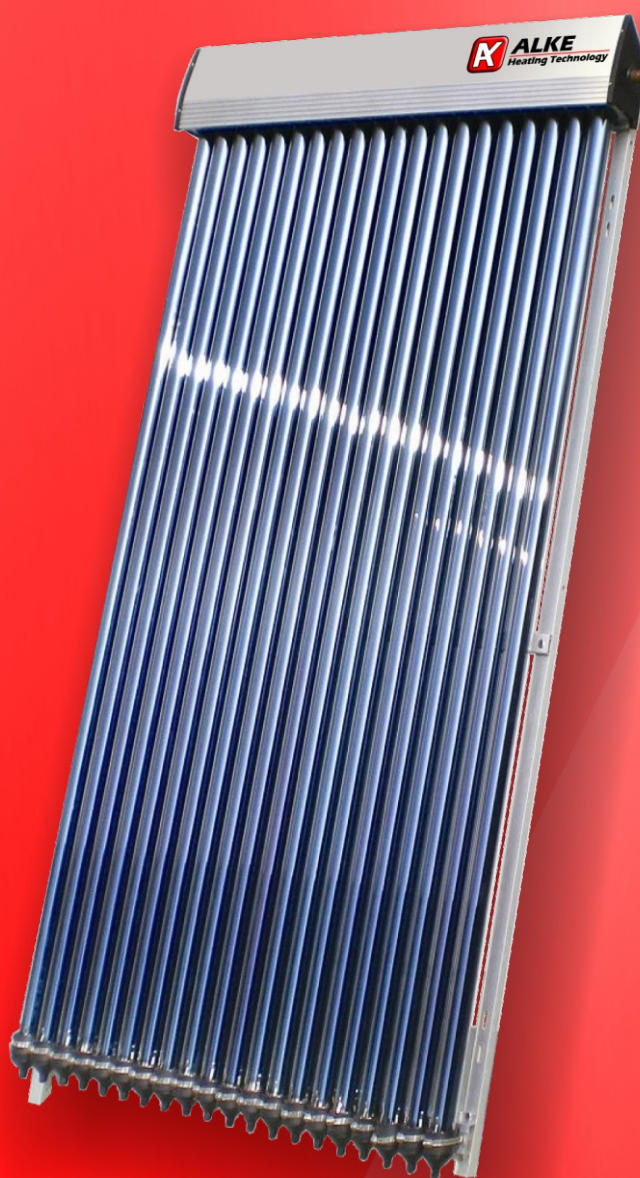




ALKE

Heating Technology



Solar Collector Systems



Green Line



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Solar Water Heating Reduces CO2 Emissions and saves you a lot of money

There has been a great deal of information in the media over the past few years about global warming and the role of CO2 emissions. 2003 saw extreme weather conditions and a heat-wave throughout Europe, clear evidence of the realism of this problem, commonly referred to as the "green house effect." Burning fossil fuels such as coal for electricity production, and gas for water heating both release large amounts of CO2 into the atmosphere, thus contributing to this environmentally harmful phenomenon.

By using renewable energy sources such as Solar Thermal, Solar PV, Wind, Hydro and Geothermal, reliance on fossil fuels can be minimised, thus directly reducing CO2 emissions. On average for every 1kWh of energy produced by a coal power station, 1kg (2.2pound) of CO2 is produced. Burning natural gas for electricity production or water heating produces about 450grams of CO2 for every kWh of energy produced.

In the average household, water heating accounts for around 30% of CO2 emissions. By installing a solar water heater, which can provide between 50-70% of your hot water heating energy needs, you can reduce your total CO2 emissions by more than 20%.

Solar Collector Systems

Evacuated Tubes

Evacuated tubes are the absorber of the solar water heater. They absorb solar energy converting it into heat for use in water heating. Evacuated tubes have already been used for years in Germany, Canada, China and the UK. There are several types of evacuated tubes in use in the solar industry. Alke collectors use the most common "twin-glass tube". This type of tube is chosen for its reliability, performance and low manufacturing cost.

Each evacuated tube consists of two glass tubes made from extremely strong borosilicate glass. The outer tube is transparent allowing light rays to pass through with minimal reflection. The inner tube is coated with a special selective coating (Al-N/Al) which features excellent solar radiation absorption and minimal reflection properties. The top of the two tubes are fused together and the air contained in the space between the two layers of glass is pumped out while exposing the tube to high temperatures. This "evacuation" of the gasses forms a vacuum, which is an important factor in the performance of the evacuated tubes.

Why a vacuum? As you would know if you have used a glass lined thermos flask, a vacuum is an excellent insulator. This is important because once the evacuated tube absorbs the radiation from the sun and converts it to heat, we don't want to lose it!! The vacuum helps to achieve this. The insulation properties are so good that while the inside of the tube may be 150°C / 304°F, the outer tube is cold to touch. This means that evacuated tube water heaters can perform well even in cold weather when flat plate collectors perform poorly due to heat loss (during high Delta-T conditions).

In order to maintain the vacuum between the two glass layers, a barium getter is used (the same as in television tubes). During manufacture of the evacuated tube this getter is exposed to high temperatures which causes the bottom of the evacuated tube to be coated with a pure layer of barium. This barium layer actively absorbs any CO, CO₂, N₂, O₂, H₂O and H₂ out-gassed from the evacuated tube during storage and operation, thus helping to maintaining the vacuum. The barium layer also provides a clear visual indicator of the vacuum status. The silver coloured barium layer will turn white if the vacuum is ever lost. This makes it easy to determine whether or not a tube is in good condition. See picture below.

Evacuated tubes are aligned in parallel, the angle of mounting depends upon the latitude of your location. In a North South orientation the tubes can passively track heat from the sun all day. In an East West orientation they can track the sun all year round.

The efficiency of a evacuated water heater is dependent upon a number of factors, one important one being the level of evacuated radiation (insolation) in your region.



Evacuated Tube Basic Specifications

Structure	All-glass concentric dual tube geomer
Glass material	Borosilicate glass
Outer tube diameter and Thickness	$F = 47 \pm 0.7\text{mm} \ \& \ = 1.5\text{mm}$ $F = 58 \pm 0.7\text{mm} \ \& \ = 2\text{mm}$ $F = 70 \pm 0.7\text{mm} \ \& \ = 2\text{mm}$
Inter tube diameter and Thickness	$F = 37 \pm 0.7\text{mm} \ \& \ = 1.5\text{mm}$ $F = 47 \pm 0.7\text{mm} \ \& \ = 1.6\text{mm}$ $F = 58 \pm 0.7\text{mm} \ \& \ = 1.6\text{mm}$
Tube Length	200($\pm 5\text{mm}$) 1500($\pm 5\text{mm}$) 1700-1800($\pm 5\text{mm}$) 2000($\pm 5\text{mm}$)
Average heat loss coefficient	<0.8W (M2C)
Lifetime	15 years





Solar Collector Systems

Heat Pipes

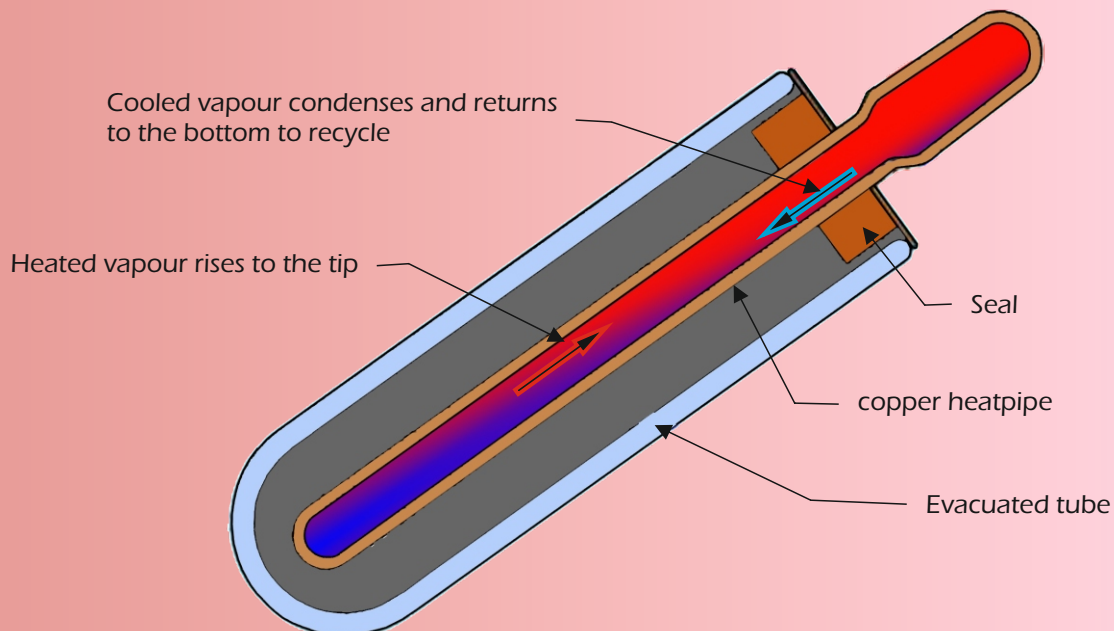
Heat pipes might seem like a new concept, but you are probably using them everyday and don't even know it. Laptop computers often use small heat pipes to conduct heat away from the CPU, and air-conditioning systems commonly use heat pipes for heat conduction. The principle behind a heat pipe's operation is actually very simple:

The heat pipe is hollow with the space inside evacuated, much the same as the solar tube. In this case, insulation is not the goal, but rather to alter the state of the liquid inside. Inside the heat pipe is a small quantity of purified water and some special additives. At sea level, water boils at 100°C (212°F), but if you climb to the top of a mountain, the boiling temperature will be less than 100°C (212°F). This is due to the difference in air pressure.

Based on this principle of water boiling at a lower temperature with decreased air pressure, by evacuating the heat pipe, we can achieve the same result. The heat pipes used in SC solar collectors have a boiling point of only 30°C (86°F). So when the heat pipe is heated above 30°C (86°F), the water vaporizes. This vapor rapidly rises to the top of the heat pipe, transferring heat. As the heat is lost at the condenser (top), the vapor condenses to form a liquid (water) and returns to the bottom of the heat pipe to once again repeat the process.

At room temperature, the water forms a small ball, much like mercury does when poured out on a flat surface at room temperature. When the heat pipe is shaken, the ball of water can be heard rattling inside. Although it is just water, it sounds like a piece of metal rattling inside.

This explanation makes heat pipes sound very simple. A hollow copper pipe with a little bit of water inside, and the air sucked out! Correct, but in order to achieve this result, more than 20 manufacturing procedures are required and with strict quality control.



Solar Collector Systems

Quality Control

Material quality and cleaning is extremely important to the creation of a good quality heat pipe. If there are any impurities inside the heat pipe it will effect the performance. The purity of the copper itself must also be very high, containing only trace amounts of oxygen and other elements. If the copper contains too much oxygen or other elements, they will leach out into the vacuum forming a pocket of air in the top of the heat pipe. This has the effect of moving the heat pipe's hottest point (of the heat condenser end) downward away from the condenser. This is obviously detrimental to performance, hence the need to use only very high purity copper.

Often heat pipes use a wick or capillary system to aid the flow of the liquid, but for the heat pipes used in Alke solar collectors no such system is required as the interior surface of the copper is extremely smooth, allowing efficient flow of the liquid back to the bottom. Also ALKE heat pipes are not installed horizontally. Heat pipes can be designed to transfer heat horizontally, but the cost is much higher.

The heat pipe used in Alke solar collectors comprises two copper components, the shaft and the condenser. Prior to evacuation, the condenser is brazed to the shaft. Note that the condenser has a much larger diameter than the shaft, this is to provide a large surface area over which heat transfer to the header can occur.

The copper used is oxygen free copper, thus ensuring excellent life span and performance.

Each heat pipe is tested for heat transfer performance and exposed to 250°C (482°F) temperatures prior to being approved for use. For this reason the copper heat pipes are relatively soft. Heat pipes that are very stiff have not been exposed to such stringent quality testing, and may form an air pocket in the top over time, thus greatly reducing heat transfer performance.

Freeze Protection

Even though the heat pipe is a vacuum and the boiling point has been reduced to only 25-30°C (86°F), the freezing point is still the same as water at sea level, 0°C (32°F). Because the heat pipe is located within the evacuated glass tube, brief overnight temperatures as low as -20°C (14°F) will not cause the heat pipe to freeze. Plain water heat pipes will be damaged by repeated freezing. The water used in ALKE heat pipes still freezes in cold conditions, but it freezes in a controlled way that does not cause swelling of the copper pipe.

Models	SC-C011-15	SC-C011-20	SC-C011-25	SC-C011-30
Tube Spe	Φ58X1800			
Number of tube	15	20	25	30
Gross Area	2.52m ²	3.53m ²	4.39m ²	4.901m ²
Aperture Area	1.399m ²	1.867m ²	2.333m ²	2.791m ²
Absorber Area	1.209m ²	1.612m ²	2.015m ²	2.411m ²
Fluid Content	0.83L	1.1L	1.4L	1.7L
Fluid Type	Glycol solution or pure water			
Flow range recommendation	50-150L/m ² h			
Insulation Material	Rockwool			
Insulation Thickness	40mm			
Inlet/Outlet Pipe	1"			
Copper Manifold Header Pipe	Φ38x1mm			
Heat Pipe Condenser	Φ14x60mm			
Operating fluid pressure	76 kg/cm ³ 76 Bar			
Maximum fluid pressure	9 kg/cm ³ 9 Bar			
Maximum operating pressure	6 Bar			
Maximum service temperature	95			
Stagnation temperature	200			
Cover material	Aluminium Alloy 81.8			
Transfer sheet	Aluminium Fin			
Frame material	Aluminium Alloy 82.8, 1.5mm			
Kind of mounting	Flat roof-mounted on the roof, Tilted roof-integrated			
Frame Inclined Angle Range	15°- 75°			
Reflector	Without reflector			
Sealing Rubber	110 Methylsilicone Rubber with Vinyl			
Dustproof Rubber	EPDM			
Tail Stock	ABS Plastic material			
Daily Efficiency	>70%			
Packaging Method	Carton for FCL/ Carton+plywood for LCL			
Warranty for Main Body	5 Years			





Solar Collector Systems

SC-C01 (Separate Pressurized Solar Collector)

The pipeline is made of red copper and conducted by heat transfer medium liquid. Water cannot flow in vacuum tubes and operated when confined. The crust uses aluminum alloy mould material of high strength with air flow design. It is furnished in good style. Can endure high pressure when it works. Module design, optional combination, which can meet the demand of large water consumption.

- * Material: Aluminum alloy
- * Solar vacuum tube with heat pipe
 - a) Size: 58 x 1,800mm
 - b) Qty of tube: 15 / 20 / 25/30pcs
 - c) Hail resistance: diameter 25mm
- * Insulation layer in chest
 - a) 50mm thickness imported polyurethane, machinery overall for keeping same temperature and high pressure foam
 - b) Heat preservation: 72 hours
- * Max. pressure bearing: 0.6MPa
- * ISO9001 / CE certificate/EN-12975
- * 3 years international responsibility for free repairing or exchange due to original quality problems

- 1, Manifold : red copper
- 2, Manifold Casing: aluminum alloy
- 3, Glass tube dimensions: 58mm x 1.8m / 47mm x 1.5m
- 4, Heat preservation: 72hrs
- 5, Hail resistance: 25mm
- 6, max pressure: 10 bar
- 7, working pressure: 6 bar
- 8, Coating of vacuum tube: SS-C/CU
- 9, Heat Pipe: anti-freezing > -35°C

Working Principle:

ALKE solar thermal collectors use fluid circulation (usually water or an antifreeze solution) to transfer the heat for direct use or storage in an insulated tank. Water/glycol has a high thermal capacity and is prefer in cold climates. The direct radiation is captured via the evacuated tubes absorbs the radiation as heat and conducts it to heat pipe then the transfer fluid in the manifold made of copper. Metal makes a good thermal conductor, especially copper and aluminium. The fluid carries away the absorbed heat, thus cooling the manifold (see fig 2 above). The warmed fluid leaving the collector is either directly stored, or else passes through a heat exchanger to warm another tank of water, or is used to heat a building directly. The temperature differential across an efficient solar collector is usually only 10 or 20°C. While a large differential may seem impressive, it is in fact an indication of a less efficient design.



Solar Collector Systems

Separate Pressurized Solar Collector SC-C01 Series (Heat Pipe)

Item No.	Solar Vacuum Tube			Absorber Area (m ²)	Daily Output (50-90 °C)
	qty / pcs	size / mm	coating		
SC-C011-15	15	Φ58 X 1800	Cu-S/S-AL-N Heat Pipe	1,21	120-150L
SC-C011-20	20	Φ58 X 1800		1,61	160-200L
SC-C011-25	25	Φ58 X 1800		2,02	200-250L
SC-C011-30	30	Φ58 X 1800		2,41	240-300L

Commodity *Separate Pressurized Solar Collector*

Material *Flowing passage: High quality rose copper (TU1)*

Outer chest: Aluminum alloy

Bracket: Aluminum alloy

Heat insulation layer: Imported polyurethane (Bayer, Germany)

Thickness *Flowing passage: 1.0mm*

Heat pipe holes: 0.8mm

Bracket: 1.8mm

Heat insulation layer: 50mm

Working Temp. *99 celsius degree*

Working Press. *0.6MPa (6 bars)*

Coloration *Metal gray, coffee brown, rust red, shining black*

Accessories *plastic bottom support, silicic gasket*

Quality Certificate *ISO9001:2000, CE, KEYMARK*

Warranty *5 years for full system*





Solar Collector Systems

SC-S01 (Separate Pressurized Solar Water Heater)

The separate pressurized solar water heater compose of solar collector, storage tank, controller, working station and installation parts.

- **Working principle:**
- When the discrepant temperature of the solar collector and water tank reaches the set value, the controller shall start the circulation pump automatically
- The circulation pump makes heat-conducting liquid circulate automatically
- The heat-conducting liquid transfers heat to water by heat exchanger in the water tank
- In case the temperature of the water tank does not reach Tmax, then start the auxiliary heating device
- If discrepant temperature of the collector and the water tank does not reach the set value, the circulation pump shall be shut automatically.



Feature:

- Collector separates with the storage tank. The tank can be put anywhere of the house
- And the collector can be put on both tilted roof and flat roof
- Module design, arbitrary combination, harmony with the building perfectly
- Intelligent control and automatic operation
- Anti-freeze: no water inside the tubes when it works
- The system controller has the anti-freezing function is that the temperature circulation will operate while it reaches the fixed temperature
- Multifunction: Bathing, washing, domestic heating
- Workable at anytime and enjoyable

Features of separate pressurized system:

- Strong hydraulic pressure makes your bath more comfortable
- Modularized collector, arbitrary combination
- Intelligent controlling and multiple functions
- Arbitrary combination with structure of your beautiful constructions

- Separate installation conveniently
- Working with assistant resource
- Full set of original equipment, the life time will be much longer to ensure better using

* Material

- Inner water tank: imported SUS304 stainless steel
- Outer water tank: galvanized steel alloy
- Bracket: aluminium alloy

* Solar vacuum tube with heat pipe

- Size: 58 x 1,800mm
- Qty: 15 / 20 / 25 / 30pcs

* Temperature insulation layer

50mm thickness imported polyurethane, machinery overall for keeping same temperature and high pressure foam

* Capacity: 150 / 200 / 250 / 300 liters

* Max. pressure bearing: 0.6MPa

* **3 years'** international warranty for free repairing or exchange due to original quality problems

Solar Collector Systems

Separate Pressurized Solar Water Heater SC-S01 Series

Item No.	Solar Vacuum Tube		Collector	Absorber Area(m ²)	Tank Capacity
	qty / pcs	size / mm			
SC-S01-15-150D	15	Φ58 X 1800	1 pc	1,20	150L
SC-S01-20-150D	20	Φ58 X 1800	1 pc	1,60	150L
SC-S01-20-200D	20	Φ58 X 1800	1 pc	1,60	200L
SC-S01-25-200D	25	Φ58 X 1800	1 pc	2,00	200L
SC-S01-25-250D	25	Φ58 X 1800	1 pc	2,00	250L
SC-S01-30-250D	30	Φ58 X 1800	1 pc	2,40	250L
SC-S01-30-300D	30	Φ58 X 1800	1 pc	2,40	300L
SC-S01-40-300D	40	Φ58 X 1800	2 pcs	3,20	300L
SC-S01-60-500D	60	Φ58 X 1800	2 pcs	4,80	500L

Copper coil 62/pc (15meters), SUS304 coil 145/pc (20meters) SUS316 coil 203/pc(20meters)

Commodity Separate Pressurized Solar Water Heater

Material Inner tank: SUS304 stainless steel

Outer tank: Galvanized steel alloy

Bracket: Aluminum alloy

Heat insulation layer: Imported polyurethane

Thickness 1)Inner tank: 2mm 2)Outer tank:0.4mm
3)Bracket: 1.8mm 4)Heat insulation layer: 50mm

Working Temp. 99 Celsius degree

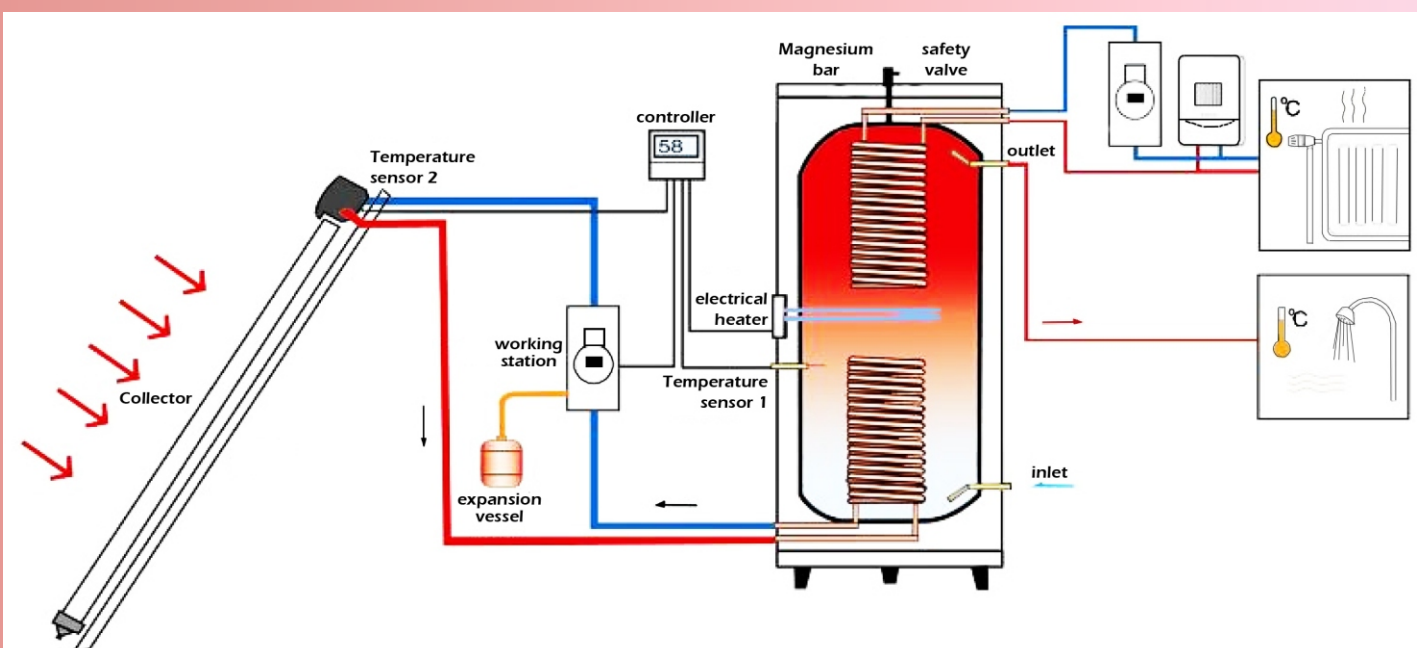
Working Press. 1.0 Mpa (10 bars)

Coloration Metal gray or electric light white

Accessories Circulation pump,expansion jar,piezometer,flowmeter

Quality Certificate ISO9001:2000, CE, KEYMARK

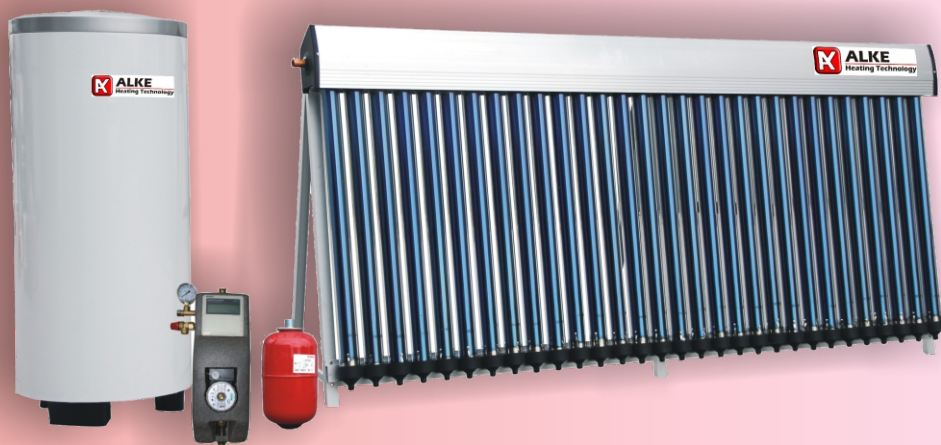
Warranty 5 years for full system / 15 years for vacuum tube





Solar Collector Systems

SC-B01 (Balcony Solar Collector System)



Features:

- Pipeline is made of all red copper and conducted by heat transfer medium liquid
- To save place and simple to install
- Suitable for families who can not put vacuum tubes on their roofs
- Stable and reliable performance
- Fashionable and beautiful
- It is harmoniously blended with architecture
- Environmental protection and energy saving

Material:

- Inner water tank: imported SUS304 stainless steel
- Outer water tank: galvanized steel alloy
- Bracket: aluminium alloy

Solar vacuum tube with heat pipe

- Size: 58 x 850mm
- Qty: 8 / 10 / 12pcs
- Hail resistance: diameter 25mm

Temperature insulation layer

- 50mm thickness imported polyurethane, machinery overall for keeping same temperature and high pressure foam
- Temperature conservation: 72 hours* Capacity: 80 / 100 / 120 liters

* Max. pressure bearing: 0.6MPa

* ISO9001 / CE certificate/EN-12975

* 3 years international responsibility for free repairing or exchange due to original quality problems

Solar Collector Systems

The returns

Beside the profit for the environment, the reduction of CO2 emmissions, it is important to know what the solar system will give you in return when it is operational. Based upon the number of tubes used in your system and the area the system is positioned, you can estimate your savings on gas consumption. The table below was calculated with the average sunshine over ten years, recorded by NASA.

Tube Specifications			Φ58X1800							
Number of tubes			15		20		25		30	
Gross Area (m ²)			2,52		3,52		4,39		4,90	
Aperture Area (m ²)			1,40		1,87		2,33		2,79	
Absorber Area (m ²)			1,21		1,61		2,02		2,41	
Fluid Content			0.83L		1.1L		1.4L		1.7L	
			Approximate Yearly savings (m ³)							
Country	City	Sol	Nat.gas	Propane	Nat.gas	Propane	Nat.gas	Propane	Nat.gas	Propane
AT	Vienna	3,52	143,4	60,0	191,2	80,0	239,0	100,0	286,0	119,6
BE	Bruxelles	3,02	123,1	51,5	164,1	68,6	205,1	85,8	245,4	102,6
BG	Sofija	3,99	162,6	68,0	216,8	90,6	271,0	113,3	324,2	135,6
CY	Limassol	5,61	228,6	95,6	304,8	127,4	381,0	159,3	455,9	190,6
CR	Zagreb	3,72	151,6	63,4	202,1	84,5	252,6	105,6	302,3	126,4
DE	Hamburg	2,52	102,7	42,9	136,9	57,2	171,1	71,6	204,8	85,6
DE	Munich	2,98	121,4	50,8	161,9	67,7	202,4	84,6	242,1	101,3
ES	Madrid	4,62	188,2	78,7	251,0	105,0	313,7	131,2	375,4	157,0
ES	Malaga	5,16	210,3	87,9	280,3	117,2	350,4	146,5	419,3	175,3
ES	Barcelona	4,6	187,4	78,4	249,9	104,5	312,4	130,6	373,8	156,3
ES	Alicante	4,94	201,3	84,2	268,4	112,2	335,5	140,3	401,4	167,8
FX	Lyon	3,74	152,4	63,7	203,2	85,0	254,0	106,2	303,9	127,1
FX	Paris	3,34	136,1	56,9	181,5	75,9	226,8	94,8	271,4	113,5
FX	Toulouse	3,75	152,8	63,9	203,7	85,2	254,7	106,5	304,7	127,4
GR	Athens	4,56	185,8	77,7	247,7	103,6	309,7	129,5	370,5	154,9
HU	Budapest	3,17	129,2	54,0	172,2	72,0	215,3	90,0	257,6	107,7
IE	Dublin	2,39	97,4	40,7	129,8	54,3	162,3	67,9	194,2	81,2
IT	Milan	3,33	135,7	56,7	180,9	75,6	226,1	94,6	270,6	113,1
IT	Rome	4,21	171,5	71,7	228,7	95,6	285,9	119,6	342,1	143,0
NL	Amsterdam	2,67	108,8	45,5	145,1	60,7	181,3	75,8	217,0	90,7
NO	Oslo	2,27	92,5	38,7	123,3	51,6	154,2	64,5	184,5	77,1
RO	Bucharest	3,47	141,4	59,1	188,5	78,8	235,7	98,5	282,0	117,9
PT	Lisboa	4,43	180,5	75,5	240,7	100,6	300,8	125,8	360,0	150,5
PT	Oviedo	3,93	160,1	67,0	213,5	89,3	266,9	111,6	319,3	133,5
UA	Odessa	3,41	138,9	58,1	185,3	77,5	231,6	96,8	277,1	115,9
UK	Edinburgh	2,26	92,1	38,5	122,8	51,3	153,5	64,2	183,6	76,8
UK	London	2,61	106,3	44,5	141,8	59,3	177,2	74,1	212,1	88,7
SZ	Bern	3,14	127,9	53,5	170,6	71,3	213,2	89,2	255,1	106,7
SZ	Lausanne	3,17	129,2	54,0	172,2	72,0	215,3	90,0	257,6	107,7
YU	Beograd	3,39	138,1	57,8	184,2	77,0	230,2	96,3	275,5	115,2



Solar Collector Systems

Spare parts & accesories

	SC-A018	
	Separate Control system	
	Max. working Pressure	: 10 bars
	Max. working temp.	: 120 oC
	Size	: 1/2" x 1/2"

	SC-A019	
	Medium Liquid Feeding Pump	
	Voltage	: 220V/50Hz
	Lifting	: 15m
	Power	: 370W

	SC-A021	
	Expansion Jar	
	Max. working temp.	: 120 oC
	Sizes	: 5, 8, 18 L

	SC-A020	
	Circulation Pump	
	Voltage	: 220V/50Hz
	Lifting	: 15m
	Power	: 46-93W

	SC-868C1	
	Controller	
	Voltage	: 220V/50-60Hz 110V/50Hz

	SC-618C1	
	Controller	
	Voltage	: 220V/50-60Hz 110V/50Hz

	SC-609	
	Controller	
	Voltage	: 220V/50-60Hz 110V/50Hz

	SC-A22	
	Electrical Heater	
	Capacity	: 1.5 kW 2.0 kW 3.0 kW

In order to keep your solar collector system up to your needs, for maintenance, or to expand your system with more options, all necessary parts are available.

Contact your local dealer for more information on systems and parts.



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