

solar

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solar

## Camel Solar

**Our philosophy is very simple at Camel Solar. The target of our solar thermal collectors is to have the highest coefficient of efficiency, maximize the energy produced by solar collectors, and consequently reduce operational energy costs.**

The “clean energy” future will be a composition of technologies based on renewable energy sources such as solar, wind, water and biomass, which all play an increasingly important role in the new global energy economy.

Camel Solar brings you some of the most advanced solar thermal systems available on the market today through innovation, research and development.

We are experts in the renewable energy industry and have extensive experience designing and manufacturing top of the range heating and cooling technology.

**We work closely with designers, developers and architects to focus on functionality, efficiency and style.**

**Camel Solar’s thermal systems harness the maximum solar radiation to power both commercial and domestic buildings.**

### Consumer Benefits

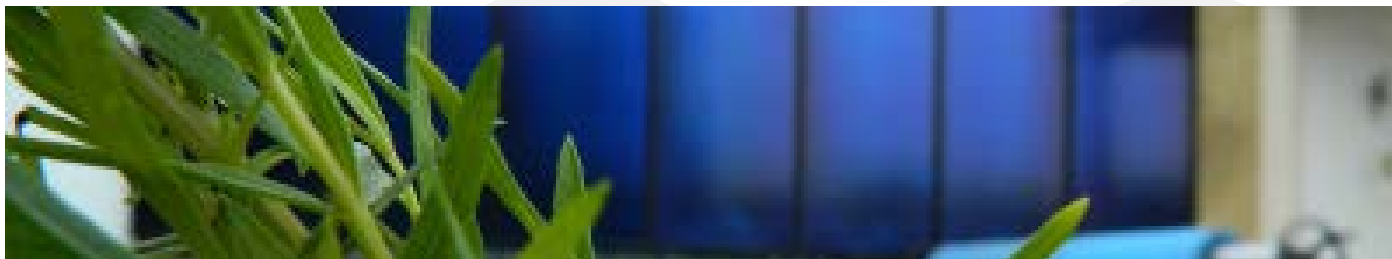
- Green energy source
- Sustainable and renewable
- Self-sufficiency
- Reduced energy bills
- Government incentives
- Require very little maintenance
- Reduced noise pollution
- Modern design features
- Higher Energy Performance Certificate (EPC) rating

### Product Features

- Patented selective coatings
- Patented absorber technology
- New innovations in welding techniques
- Seamless and aesthetic design
- Cost-effective
- Easy to install
- Competitively priced
- Simple and reliable technology
- Automatic and controlled heat settings to work with existing systems



**Camel Solar’s patented formulas improve absorption and insulation to give the most effective results at affordable prices. Camel Solar’s products can be used for different energy and building requirements, maximising the potential of renewable energy.**



## Applications – Commercial and Domestic

- Swimming Pools
- Leisure centres
- Hotels and spa facilities
- Offices
- Schools
- Factories and Retail
- Residential Developments
- Breweries
- Dairies
- Solar Cooling

## Factors to Consider

- Annual solar radiation
- Number of people relying on the solar thermal system
- Patterns of hot water usage
- Available space
- Roof/façade inclination
- Custom solutions available

The products are much more than functioning solar collectors, they are aesthetic design features.

**Professionals can calculate how best to obtain the results you need at an affordable price, so that more people can access solar energy than ever before.**

## Solar Energy

Sunlight is by far the largest carbon-free energy source on the planet. Harnessing solar radiation can provide cost-effective, self sufficient energy and also significantly reduce CO2 emissions.

More energy from the sun strikes the Earth per hour than all other energy consumed on the planet each year, and all the known Earth reserves of coal, oil, natural gas, and uranium combined are more than 10 times smaller than the energy received from sunlight each year.

### Solar energy can be harvested in two ways:

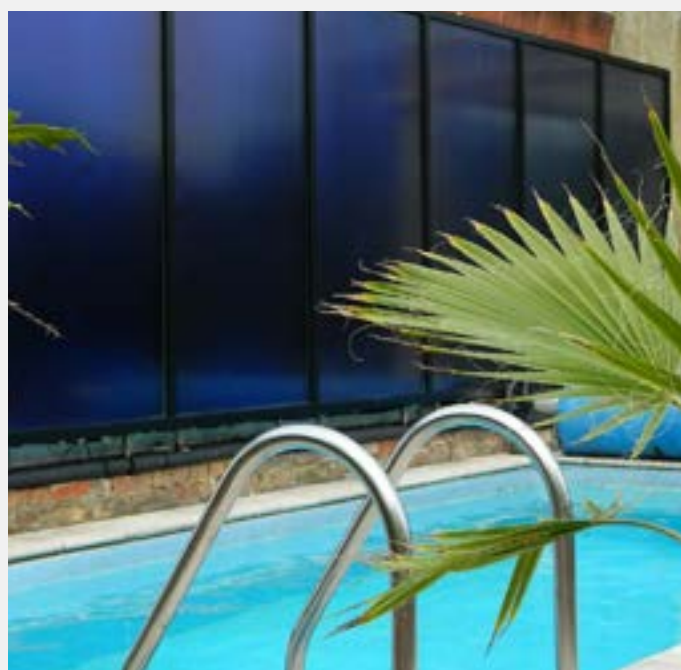
1. Solar thermal collectors transform solar energy into heat.
2. Solar PV modules directly convert the solar radiation into electricity.

The UK receives approximately 900-1200 kW/hrs solar energy per square meter of land area each year.

Using thermal collector systems, there is enough solar radiation in the UK to provide 50%- 60% of its domestic hot water requirements for a whole year.

There is enough direct and diffuse solar radiation to provide heating on cloudy days. In winter, solar energy can relieve the load of boilers or heat pumps, reducing the overall cost of energy bills through stored water.

Camel Solar's advanced technology systems have been developed to optimise solar energy insolation, absorption and transmission; making this renewable energy source a viable alternative.



## Camel Solar Factory

The factory was finished in September 2012.

The factory all together covers more than 2500 m<sup>2</sup>.

The factory has 4 floors:

- 1st floor is where the registers and absorbers are created.
- 2nd floor is where the assembly of the collectors takes place
- 3rd floor is the storage facility
- 4th floor is where the accessories associated with the collectors and raw materials are stored and extra storage if necessary.

The factory's hot water and heating is run by Camel solar Flat plate, Evacuated tube collectors and backup heat pumps.

There are 18 Flat plate collectors and 3 x 78 Evacuated tube collectors. The collectors are connected to a 7 m<sup>3</sup> storage tank which is located under the factory's first floor.

The hot water in the 7m<sup>3</sup> tank supplies the factories under floor heating in the offices and board room areas. The collectors are combined with two fan coil units which supply the production facilities with space heating.

The factory have also installed 9 facade units with a 200 litre tank. The tank is connected to another fan coil unit and has a backup heat pump adding to the space heating in the factory.

These systems together cover all the heating requirements for the building.



## Camel Solar Full Plate Absorbers

Using the latest technology, Camel Solar produces the newest absorbers without out visible welding lines and deformation of the absorber which is commonly seen in most solar thermal collectors.

The Camel Solar absorber uses ultrasonic welding technology. This IS done on the backside of the absorber. For the first time the heat transfer from the absorber Plate to the Copper register is a combination of conductivity and convection. This means the heat transfer is much better than the existing absorbers.

The characteristics and benefits of the Full plate absorber:

- The absorber is composed of 10 ultrasonically welded copper pipes.
- An aluminium absorber with a PVD (Physical vapour deposition) selective coating
- The new welding technique allows for an increase in the heat transfer and improves the co-efficient of efficiency.
- No waves and deformation allow for a very smooth absorber surface which means they are perfect for implementing onto roofs and facades.
- The absorbers can either be implemented in a flat plate collector or into a faced collector for mounting or replacing existing window panels.







## Technical Characteristics

### Evacuated Tubes - Evacuated 10

This is Camel Solar's new Evacuated Tube Collector. The collector is composed of 10 evacuated tubes with highly efficient selective coatings. The Glass tube has a PVD (physical vapour deposition) selective coating inside enhancing the absorption of the tube.

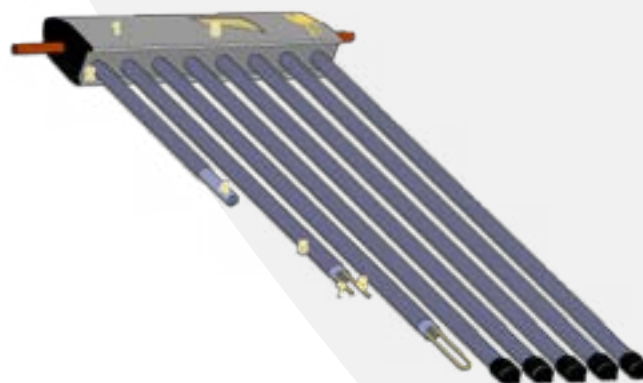
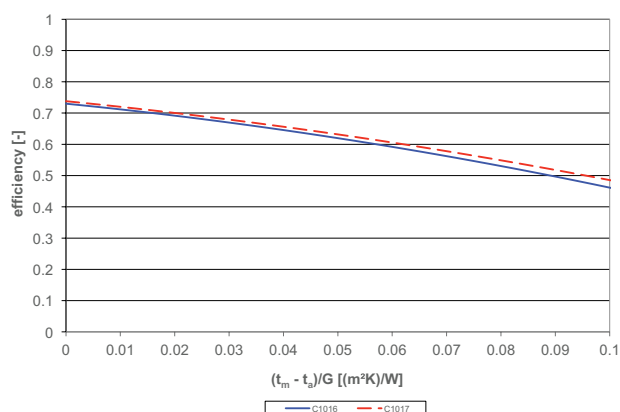
Inside the glass tube are U type copper pipes. These pipes are welded to an additional absorber. This absorber has its own patented selective coating increasing the heat transfer to the copper pipes and intern to the heat transfer fluid.

The U type copper pipes join two separate manifolds which are carefully placed in an anodized aluminum box and insulated with a high density rock wall.

Combining the latest research and technology this is one of the most efficient collectors on the market today and has recieved Solar Keymark Certification.

The Collector is perfect for domestic, commercial and industrial applications with a stagnation temperature of 250°C. Clients are using these panels for swimming pool applications, heating pools past 30°C without any other form of energy.

## Efficiency Curve



- 1 - Aluminium Manifold | 2 - Rubber Seal | 3 - Thermal Sidewall Insulation | 4 - Absorber | 5 - Glass Tube Double Wall Vacuum | 6 - Hot Supply Manifold | 7 - Cold return Manifold

## General Specifications

### Manufacturer

Camel Solar Ltd Velijko Vlahovic 18 (mezanin) 1000 Skopje Republic of Macedonia

Type of Collector CS Vacuum 10

Year of Production 2011

### Dimensions of Collector

Gross Area 1.60 m<sup>2</sup>

Aperture Area 0.95 m<sup>2</sup>

Absorber Area 0.81 m<sup>2</sup>

### Technical Figures

Collector Type Evacuated Tubular Collector With Direct Flow

Length 1988 mm (Determined by Test Lab)

Width 807 mm (Determined by Test Lab)

Height 158 mm (Determined by Test Lab)

Material Aluminium Frame + Manifold

Weight 32 kg

Sealing Material Rubber

Collector Mounting On Roof, Flat Roof

### Absorber

Material Glass

Absorption 0.92 - 0.96

Emittance 0.04 - 0.06

Heat Transfer Fluid 1.74 litres

Number of Absorber Tubes 10

Number of Connections 2

### Glass

Material High Borsilicate Glass

Transmittance 0.92

Outer Diameter Glass Tube 58mm

### Thermal insulation

Material Rock Wool

Thermal Conductivity 0.035w/(mK)

Thickness 20 mm

### Limits

Stagnation Temperature 250 °c

Max. Operating Pressure 10 bar

Heat Transfer Fluid Glycol / Water Mixture



## Technical Characteristics

### Evacuated Tubes - Evacuated 15

This is Camel Solar's new Evacuated Tube Collector. The collector is composed of 15 evacuated tubes with highly efficient selective coatings. The Glass tube has a PVD (physical vapour deposition) selective coating inside enhancing the absorption of the tube.

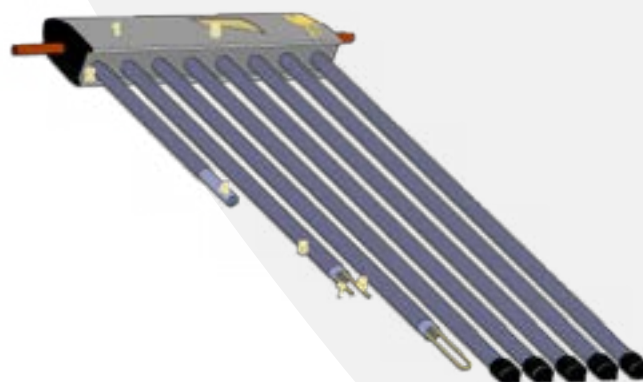
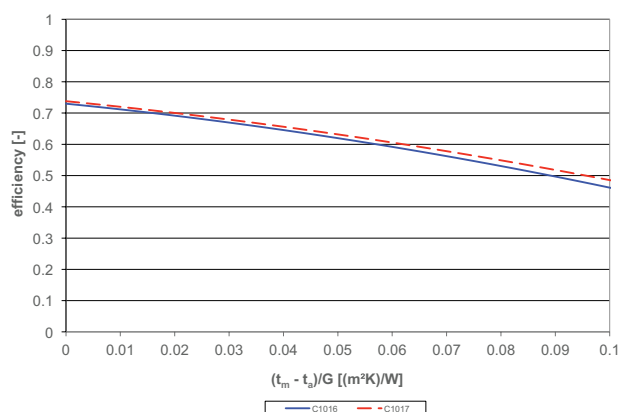
Inside the glass tube are U type copper pipes. These pipes are welded to an additional absorber. This absorber has its own patented selective coating increasing the heat transfer to the copper pipes and intern to the heat transfer fluid.

The U type copper pipes join two separate manifolds which are carefully placed in an anodized aluminum box and insulated with a high density rock wall.

Combining the latest research and technology this is one of the most efficient collectors on the market today and has received Solar Keymark Certification.

The Collector is perfect for domestic, commercial and industrial applications with a stagnation temperature of 250°C. Clients are using these panels for swimming pool applications, heating pools past 30°C without any other form of energy.

## Efficiency Curve



- 1 - Aluminium Manifold
- 2 - Rubber Seal
- 3 - Thermal Sidewall Insulation
- 4 - Absorber
- 5 - Glass Tube Double Wall Vacuum
- 6 - Hot Supply Manifold
- 7 - Cold return Manifold



## General Specifications

### Manufacturer

Camel Solar Ltd Velijko Vlahovic 18 (mezanin) 1000 Skopje Republic of Macedonia

Type of Collector CS Vacuum 15

Year of Production 2011

### Dimensions of Collector

Gross Area 2.35 m<sup>2</sup>

Aperture Area 1.42 m<sup>2</sup>

Absorber Area 1.21 m<sup>2</sup>

### Technical Figures

Collector type Evacuated Tubular Collector With Direct Flow

Length 1990 mm (Determined by Test Lab)

Width 1180 mm (Determined by Test Lab)

Height 158 mm (Determined by Test Lab)

Material Aluminium Frame + Manifold

Weight 45 kg

Sealing Material Rubber

Collector Mounting On Roof, Flat Roof

### Absorber

Material Glass

Absorption 0.92 - 0.96

Emittance 0.04 - 0.06

Heat Transfer Fluid 2.95 Litres

Number of Absorber Tubes 15

Number of Connections 2

### Glass

Material High Borsilicate Glass

Transmittance 0.92

Outer Diameter Glass Tube 58mm

### Thermal insulation

Material Rock Wool

Thermal Conductivity 0.035w/(mK)

Thickness 20 mm

### Limits

Stagnation Temperature 250 °c

Max. Operating Pressure 10 bar

Heat Transfer Fluid Glycol / Water Mixture



## Technical Characteristics Flat Plate 2.0-2

The CS Flat Plate collector is composed of a special façade full-plate absorber, coated with high quality, selective PVD (physical vapour deposition) coating.

The absorber sheet is then welded to a register comprising of 9 copper pipes. The absorber is welded using latest welding techniques to improve the heat transfer from the absorber to the heat transfer fluid in the copper pipes.

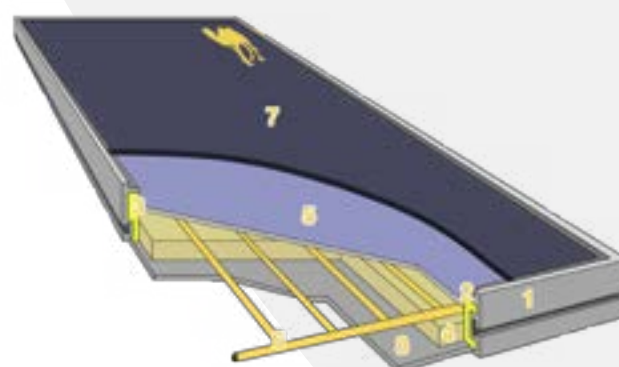
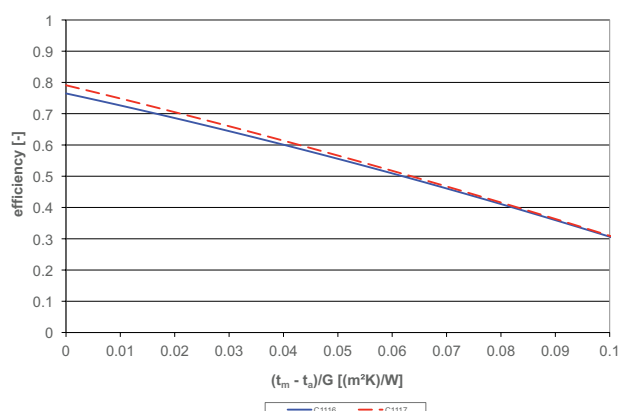
The completed absorber is placed into an aluminium anodized frame box and isolated with high density rock wall rock wool.

The glass is solar glass which is tempered, iron-free ant-reflective. The low-soiling coating on the glass is anti-dust and anti-corrosive. It keeps the glass clear with the same optical characteristics, which means that it can effectively help clean itself.

The sealing between the casing and glass is done using high temperature resistant silicone, for an attractive finish and minimal heat loss.



## Efficiency Curve



1 - Aluminium Frame | 2 - Silicone Seal | 3 - Thermal Sidewall Insulation | 4 - Thermal Insulation | 5 - Copper Tubes | 6 - Glass | 7 - Aluminium Back | 8 - Absorber

## General Specifications

### Manufacturer

Camel Solar Ltd Velijko Vlahovic 18 (mezanin) 1000 Skopje Rpublic of Macedonia

Type of Collector Cs Full Plate 2.0-2

Year of Production 2012

### Dimensions of Collector

Gross Area 2.02 m<sup>2</sup>

Aperture Area 1.82 m<sup>2</sup>

Absorber Area 1.82 m<sup>2</sup>

### Technical Figures

Collector Type Flat Plate Collector

Length 2006 mm (Determined by Test Lab)

Width 1005 mm (Determined by Test Lab)

Height 85 mm (Determined by Test Lab)

Material Aluminium

Weight 33kg

Sealing Material Silicon

Collector Mounting On Roof, Flat Roof

### Absorber

Material Aluminium Sheet and Copper Piping

Absorption 0.95

Emittance 0.05

Heat Transfer Fluid 1.3 Litres

Number of Absorber Tubes 9

Number of Connections 2

### Glass

Material Tempered Low Iron Glass

Transmittance 0.92

### Thermal insulation

Material Rock Rool

Thermal Conductivity 0.035w/(mK)

Thickness 50 mm

### Limits

Stagnation Temperature 197 °c

Max. Operating Pressure 10 bar

Heat Transfer Fluid Glycol / Water Mixture



## Technical Characteristics Flat Plate 2.0-4

The CS Flat Plate collector is composed of a special façade full-plate absorber, coated with high quality, selective PVD (physical vapour deposition) coating.

The absorber sheet is then welded to a register comprising of 10 copper pipes. The absorber is welded using latest welding techniques to improve the heat transfer from the absorber to the heat transfer fluid in the copper pipes.

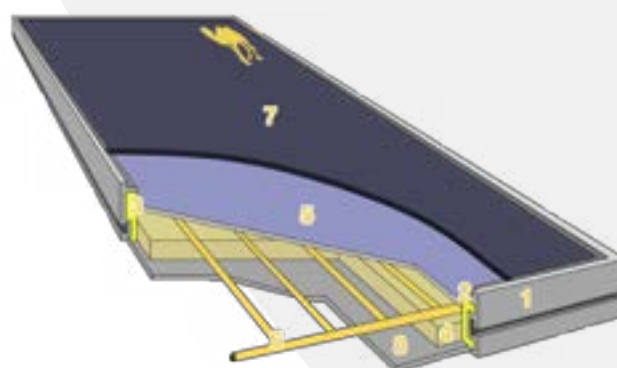
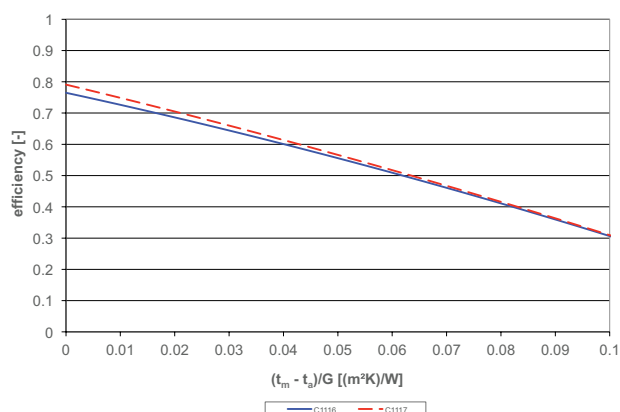
The completed absorber is placed into an aluminium anodized frame box and isolated with high density rock wall rock wool.

The glass is solar glass which is tempered, iron-free ant-reflective. The low-soiling coating on the glass is anti-dust and anti-corrosive. It keeps the glass clear with the same optical characteristics, which means that it can effectively help clean itself.

The sealing between the casing and glass is done using high temperature resistant silicone, for an attractive finish and minimal heat loss.



## Efficiency Curve



1 - Aluminium Frame | 2 - Silicone Seal | 3 - Thermal Sidewall Insulation | 4 - Thermal Insulation | 5 - Copper Tubes | 6 - Glass | 7 - Aluminium Back | 8 - Absorber

## General Specifications

### Manufacturer

Camel Solar Ltd Velijko Vlahovic 18 (mezanin) 1000 Skopje Rpublic of Macedonia

Type of Collector Cs Full Plate 2.0-4

Year of Production 2012

### Dimensions of Collector

Gross Area 2.02 m<sup>2</sup>

Aperture Area 1.83 m<sup>2</sup>

Absorber Area 1.83 m<sup>2</sup>

### Technical Figures

Collector Type Flat Plate Collector

Length 2005 mm (Determined by Test Lab)

Width 1005 mm (Determined by Test Lab)

Height 85 mm (Determined by Test Lab)

Material Aluminium

Weight 33 kg

Sealing Material Silicon

Collector Mounting On Roof, Flat Roof

### Absorber

Material Aluminium Sheet and Copper Piping

Absorption 0.95

Emittance 0.05

Heat Transfer Fluid 1.5 Litres

Number of Absorber Tubes 10

Number of Connections 4

### Glass

Material Tempered Low Iron Glass

Transmittance 0.92

### Thermal insulation

Material Rock Rool

Thermal Conductivity 0.035w/(mK)

Thickness 50 mm

### Limits

Stagnation Temperature 197 °c

Max. Operating Pressure 10 bar

Heat Transfer Fluid Glycol / Water Mixture





## Technical Characteristics Façade

The Façade Collector has seamless connections. The Collector is manufactured using the highest quality materials and the transfer of heat from the absorber to the copper pipes below is optimized using new welding techniques and latest research and development.

The facade module uses the latest absorber technology with one single absorber. This absorber has no welding lines allowing for 6-8% increase in its efficiency.

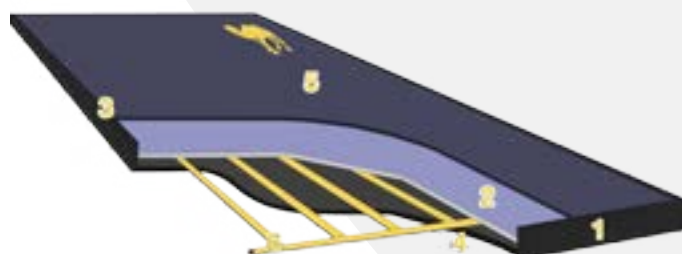
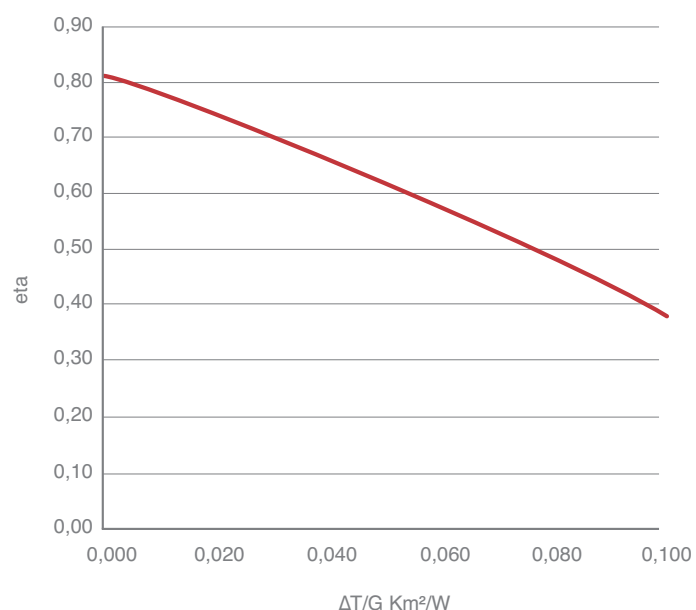
The complete full-plate absorber is welded to a copper register comprising of 10 copper pipes and is then placed in a new Aluminium frame. Behind the window module is high density rock wool and the decorative plate, for efficiency and style.

The glass is solar glass which is tempered, iron-free anti-reflective. The low-soiling coating on the glass is anti-dust and anti-corrosive. It keeps the glass clear with the same optical characteristics, which means that it can effectively help clean itself.

These solar thermal collectors are designed to be integrated and fully functional, using the solar radiation from the sun and transferring that heat energy to heat domestic, commercial and industrial application.



## Efficiency Curve



1 - Aluminium Manifold | 2 - Rubber Seal | 3 - Thermal Sidewall Insulation | 4 - Absorber | 5 - Glass

## General Specifications

### Manufacturer

Camel Solar Ltd Velijko Vlahovic 18 (mezanin) 1000 Skopje Republic of Macedonia

Type of Collector Façade Module

Year of Production 2012

### Dimensions of Collector

Gross Area 1.9 m<sup>2</sup>

Aperture Area 1.8 m<sup>2</sup>

Absorber Area 1.8 m<sup>2</sup>

### Technical Figures

Collector Type Façade Module

Length 1960 mm (Determined by Test Lab)

Width 960 mm (Determined by Test Lab)

Height 29 mm (Determined by Test Lab)

Material Glass / Aluminium

Weight -

Sealing Material Silicon

Collector Mounting Façade / On Roof

### Absorber

Material Aluminium Sheet and Copper Piping

Absorption 0.95

Emittance 0.05

Heat Transfer Fluid 0.8 Litres

Number of Absorber Tubes 9

Number of Connections 4/2

### Glass

Material Tempered Low Iron Glass

Transmittance 0.92/0.96

### Thermal insulation

Material Rock Wool

Thermal Conductivity 0.045w/(mK)

Thickness 50 mm

### Limits

Stagnation Temperature 195 °c

Max. Operating Pressure 10 bar

Heat Transfer Fluid Glycol / Water Mixture

## Case Studies



**Name Of project:** Parrot House  
**Type of project:** Domestic swimming Pool  
**Size of Pool:** 11m x 6m x 1.5m = 99m<sup>3</sup>  
**Size of Storage:** 250 litres  
**Panel Type:** Flat Plate Collector  
**Installed Equipment:** 25 Flat Plate Collectors

The Swimming pool is heated from April to October by the solar thermal system which produces 30kw.



**Name Of project:** Sport Center Trajkovski  
**Type of project:** Swimming pool Complex  
**Size of Pool:** 33m x 25m x 2m = 1650m<sup>3</sup>  
**Panel Type:** Evacuated 15 tube  
**Equipment installed:** 190 Evacuated Tube Collectors

The swimming pool is heated throughout the year by the Solar thermal system which produces 250-300kw



**Name of Project:** Apartment Complex Soravia  
**Type of Project:** Domestic hot water  
**Size of Storage:** 14000 litres  
**Panel Type:** Evacuated 15 tube  
**Equipment Installed:** 80 Evacuated Tube Collectors

The apartment Hot water is heated throughout the year by the solar thermal system which produces 100-120kw



**Name Of project:** Queens Hotel  
**Type of project:** Commerical Hot Water  
**Size of Storage:** 1000 litres  
**Panel Type:** Evacuated CS15 Tube  
**Installed Equipment:** 24 Evacuated Tube Collectors Collectors

Luxurious four star hotel Queens, with 30 rooms and restaurants, located in the very center of the city of Skopje.

The hotel is heated throughout the year by the solar thermal system which produces 30-36kW.



**Name Of project:** Oxted Place  
**Type of project:** Domestic Swimming Pool  
**Size of Pool:** 5m x 3m x 1.5m = 19.5m<sup>3</sup>  
**Panel Type:** Façade  
**Equipment installed:** Façade

The swimming pool is heated throughtout the year by the solar thermal system which produces 12-15kw



**Name of Project:** Camel Solar Factory  
**Type of Project:** Commercial factory  
**Size of Storage:** 7200 litres  
**Panel Type:** Evacuated tube, flat plate, facade  
**Equipment installed:** 3 x 78 evacuated tube collectors 18 x flat plate collectors 9 x facade collectors.

The factory has under floor heating which is done via the solar collectors and has backup heat pumps. The solar thermal system produces

## Solar Keymark

Camel Solar have received the Solar Keymark certification and Camel Solar products are listed on the Solar Keymark international database. This is the European label for quality.

## Building Regulations

All new domestic and commercial properties must obtain an Energy Performance Certificate (EPC) rating.

- Energy inspectors calculate the EPC rating by detailing the energy efficiency and environmental impact of a property.
- The higher the rating, the more energy efficient the property is. The key elements considered in calculating efficiency are: windows, walls, roof, floors, main heating, heating controls, secondary heating, hot water and lighting.
- The installation of solar thermal collectors increases

efficiency and improves EPC ratings on properties, reducing fuel bills, meeting modern building requirements and improving the features of the building.

- The social responsibility to integrate solar panels can be seen by government incentives and feed-in tariffs, to encourage consumers to consider this efficient form of energy generation.
- Approximately 28% of the UK's CO2 emissions come from domestic homes and around 49% of the energy demand of the EU comes from the heating and cooling sector. Solar energy is effective not only for the home, but also for the planet.



Camel Solar's patented formulas improve absorption and insulation to give the most effective results at affordable prices. Camel Solar's products can be used for different energy and building requirements, maximising the potential of renewable energy.



## Renewable Heat Incentive

### What is the RHI?

The renewable heat incentive is a payment scheme established for those generating heat from a renewable source of energy. The RHI has been set up in the UK by the government to help us become more sustainable through reducing our energy bills but also helping the government to meet their CO2 emission targets for 2020.

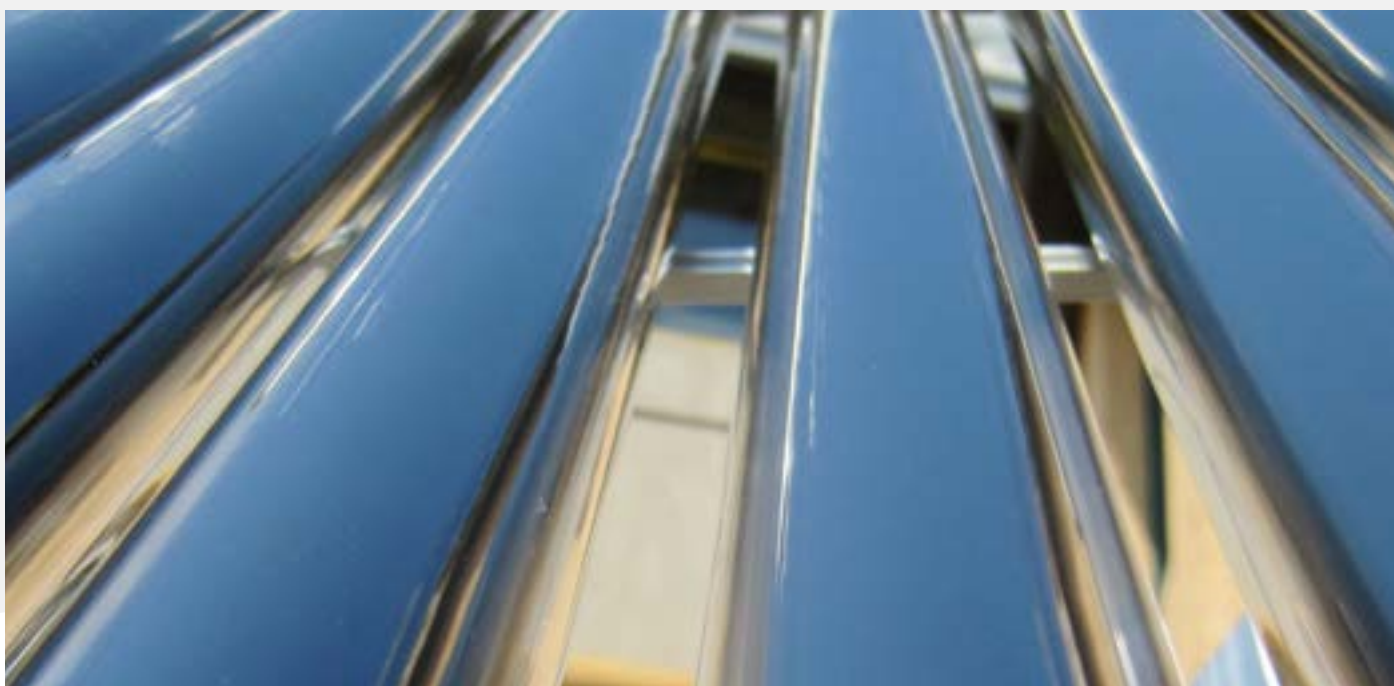
### Benefits?

- Reduced dependence on Fossil Fuels such as oil and gas, both of which are becoming increasingly expensive year-on-year.
- For commercial installation you will be paid up to 8.5p/kWhr for the hot water and heat you generate using the Camel Solar thermal system.
- The RHI payout will last for 20 years from the day that it is registered and will be constantly monitored with inflation.

### Will this shorten the payback period and cover installation costs?

- The RHI does help reduce the payback period making it more attractive to consumers.
- We estimate at Camel Solar that many consumers will gain enough return from the tariffs to cover their installation costs within an estimated period of 5-10 years.

**Investing in Camel Solar thermal and other energy saving products can significantly reduce a company's energy bills, through reduced operational costs and incentives. This also reduces a company's Climate Change Levy, creating savings year upon year.**



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