

## FORCESUN

### Forced Circulation Solar Collectors

AR1.82CF AR2.80CF



#### Solar Keymark certified Factory Made system

The quality of the KIT is guaranteed by the Solar Keymark certification, an official recognition of compliance with international performance and safety standards. This guarantee offers users the certainty of a product that complies with industry regulations.



uses pumps to circulate the heat transfer fluid through solar collectors. Unlike natural circulation systems, which rely on convection, forced circulation offers superior temperature control and higher efficiency.

#### OPERATION

The operation of a **forced circulation** solar thermal system is based on key components that work together to optimise heat transfer. The **FORCESUN** solar collectors, strategically positioned to maximise solar exposure, absorb thermal energy and transfer it to the heat transfer fluid, which can be water or a specific antifreeze. Pumps, controlled by electronic control units, ensure continuous circulation of the fluid through the system, allowing precise temperature control.

A thermal storage tank, or boiler, serves as temporary storage for heated water, maintaining heat availability even during periods of low solar radiation.

and even heat distribution can be achieved. This translates into greater energy efficiency and a more reliable heating system capable of meeting specific temperature requirements.

Temperature sensors located both on the collectors and in the storage tank provide real-time data to the controllers to regulate the operation of the pumps, thereby optimising the energy efficiency of the system.

In addition, advanced systems can include safety mechanisms such as pressure release valves and overheating protection systems, ensuring safe and reliable operation.

Integration with auxiliary heating systems, such as gas boilers or heat pumps, makes it possible to maintain service continuity even in unfavourable climatic conditions, without compromising user comfort.

## **High Energy Yields**

The energy efficiency of **FORCESUN** collectors is improved by an increased absorption surface combined with a thinner frame. This configuration maximises efficiency, allowing superior performance even in variable solar radiation conditions.

## **Elegant and Functional Design**

The design of the **FORCESUN** collectors has been studied with special attention aesthetics, using a uniformity of colour between glass, profiles and cladding. This approach ensures perfect visual integration on any type of roof, making them ideal for modern, aesthetically pleasing architectural projects.

## **Reliable Compression Connections**

Brass compression-fittings ensure a durable seal and no solar fluid leakage.

The standard distance of 55 mm between collectors also facilitates series connection, enhancing the modularity of the system.

## **Solar Glass Roofing**

**FORCESUN** collectors are equipped with a 3.2 mm thick, tempered, low-iron ESG solar single-glazing cover. This type of glass is highly resistant to hail, ensuring longevity and protection against weathering.

## **High Performance Absorber**

The absorber consists of a laser-welded aluminium plate with an 8 mm diameter copper meander coil, treated with a highly selective coating. This combination ensures optimal heat absorption efficiency, increasing the overall efficiency of the solar thermal system.



## Installation flexibility

Due to their design, the collectors can be installed either above or below the tiles of a flat or pitched roof. This flexibility allows for a wide variety of mounting solutions, adapting to the specific requirements of the installation site.

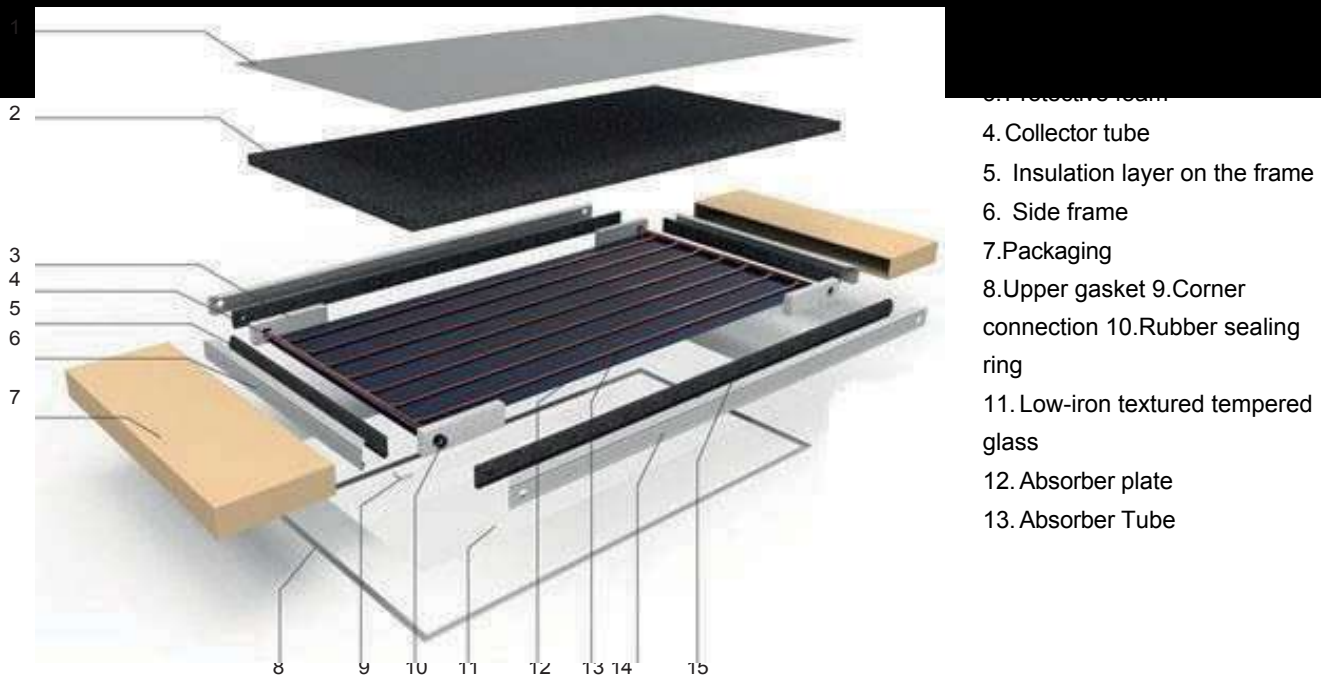
**Availability of Installation on Different Roof Types** The installation of a forced circulation solar thermal system is compatible with wide range of roof types, making it a versatile solution for residential, commercial and industrial buildings. Solar collectors can be mounted on pitched, flat and even irregular roofs, thanks to the use of adaptable support structures that provide the optimal tilt and orientation to maximise solar radiation absorption.

**On pitched roofs,** **FORCESUN** collectors can be installed parallel to the roof surface, using brackets and supports to ensure the stability and safety of the system. In the case of flat roofs, inclined support structures are used to set the collectors at the right angle to optimise solar exposure throughout the year.

**For irregular roofs or roofs with complex geometric shapes,** customised solutions can be designed using special frames and brackets, allowing for harmonious integration with the building's architecture. Pitched roofs also feature dedicated solutions, with mounting options that vary according to the orientation and inclination of the pitch.

The technological and engineering aspect is not the only one to consider; aesthetic impact also plays an important role. Many manufacturers offer solar collectors with elegant and discreet designs, capable of integrating with architectural profile of the building without compromising aesthetics.

## STRUCTURE AND TECHNICAL PARAMETERS OF THE FLAT-PLATE SOLAR COLLECTOR



| TECHNICAL DATA                                      |                                    | AR1.82CF                                         | AR2.80CF      |
|-----------------------------------------------------|------------------------------------|--------------------------------------------------|---------------|
| GROSS LENGTH / WIDTH / HEIGHT                       | mm                                 | 2000*1000*95                                     | 2000*1500*95  |
| GROSS AREA                                          | m <sup>2</sup>                     | 2                                                | 3             |
| OPENING LENGTH / WIDTH / NUMBER                     | mm                                 | 1951*949                                         | 1951*1449     |
| OPENING AREA                                        | m <sup>2</sup>                     | 1.85                                             | 2.826         |
| ABSORBER LENGTH WIDTH / THICKNESS                   | mm                                 | 1951*949*0.4                                     | 1951*1449*0.4 |
| ABSORBER AREA                                       | m <sup>2</sup>                     | 1.85                                             | 2.826         |
| NET WEIGHT                                          | Kg                                 | 35                                               | 52            |
| FLUID CONTENT                                       | L                                  | 1.6                                              | 2.5           |
| COVERAGE LENGTH / WIDTH / THICKNESS                 | mm                                 | 1976*976*3.2                                     | 1976*1474*3.2 |
| CONVERSION FACTOR BASED ON ABSORBER AREA            | ( $\alpha_A$ )                     | 0.805                                            | 0.783         |
| HEAT TRANSFER COEFFICIENT $A_{1A}$                  | W/(m <sup>2</sup> K)               | 3.555                                            | 3.716         |
| TEMP. DEPENDENT HEAT TRANSFER COEFFICIENT $A_{2A}$  | W/(m <sup>2</sup> K <sup>2</sup> ) | 0.029                                            | 0.009         |
| EFFICIENCY ( $\eta_0$ ) BASED ON GROSS AREA         |                                    | 0.776                                            |               |
| COVERING MATERIAL                                   |                                    | Ultra-white tempered glass with low iron content |               |
| SOLAR TRANSMITTANCE OF GLASS ROOFING                | %                                  | $\geq 91,5$                                      |               |
| ABSORBER MATERIAL                                   |                                    | Aluminium                                        |               |
| SOLAR ABSORPTION OF THE ABSORBER [%].               | %                                  | $\geq 92$                                        |               |
| HEMISPHERIC EMITTANCE OF THE ABSORBER [%].          | %                                  | $\leq 10$                                        |               |
| ABSORBER COATING                                    |                                    | Blue coating                                     |               |
| HEADER PIPE MATERIAL                                |                                    | Copper tube TP2                                  |               |
| OUTER DIAMETER/HEADER PIPE THICKNESS                | mm                                 | $\phi 22*0.6$                                    |               |
| UPRIGHT TUBE MATERIAL                               |                                    | Copper tube TP2                                  |               |
| LENGTH / OUTER DIAMETER / THICKNESS OF UPRIGHT TUBE | mm                                 | $\phi 10*0.7$                                    |               |
| NUMBER OF UPRIGHTS                                  |                                    | 9                                                | 14            |
| DISTANCE BETWEEN POSTS                              | mm                                 | 93                                               | 95.5          |
| CONNECTOR DIMENSIONS                                | mm                                 | $\phi 22$                                        | $\phi 22$     |
| THERMAL INSULATION MATERIAL (REAR)                  |                                    | Glass wool and PUR                               |               |
| THICKNESS THERMAL INSULATION (REAR)                 | mm                                 | 46                                               |               |
| THERMAL INSULATION MATERIAL (SIDE)                  |                                    | Glass wool                                       |               |
| THICKNESS THERMAL INSULATION (SIDE)                 | mm                                 | 20                                               |               |
| SIDE CASING MATERIAL                                |                                    | 6063-T5                                          |               |
| REAR CASING MATERIAL                                |                                    | Aluminised zinc plate                            |               |
| SEALING MATERIAL                                    |                                    | Structural adhesive                              |               |
| MAXIMUM OPERATING PRESSURE [KPA]                    |                                    | 800                                              |               |
| MAXIMUM OPERATING TEMPERATURE (°C)                  |                                    | 186                                              |               |
| RECOMMENDED HEAT TRANSFER MEDIUM                    |                                    | Deionised water/Antifreeze fluid                 |               |