EVERHOT

Forced Circulation Systems

Technical Manual

Installation, Maintenance and Use Instructions

ENGLISH

A company that proposes sunny solutions, working with passion and devotion, for three decades now, to always offer the best.

A philosophy that leads our steps, and makes us, as professionals, feel the weight of responsibility and obligation to offer products and services that are in harmony with the environment and man. So that we hand over a better world to our children.

We live in times with great ecological problems. Planet Earth is sounding the alarm of ecological danger. The thoughtless use of mineral energy sources is resulting in increased pollution of the atmosphere, above tolerance levels.

Ecosystems are either being transformed or destroyed. While mineral energy reserves are continuously decreasing and prices continuously rising, we look at the sun and consider that it radiates over 15.000 times the energy needs of our planet.

So why not direct ourselves to the inexhaustible, free, and above all clean solar energy?

Why should we use a Solar System

a solar system Is Ecologically friendly. Economical, Simple, aesthetic, Effective and autonomous:

• ***Ecologically friendly:***
With a Everhot 500E system, the emissions of $C0_2$ Avoided Annually are equivalent to the fuel emissions of a car having run for 10.000 km.

• ***Economical:***
will decrease your cost for energy by 70 -100% because the burner and electric resistance will not need to operate for at least 7-12 months of the year, depends on the sun radiation of each area and the size of the system.

• ***Simple:***
The well-studied selection of materials of Everhot make Its Installation safe and easy, reducing the time needed for Its Installation to a minimum.

• ***Aesthetic:***
The excellent exterior design of the Everhot collectors in combination with their well-studied support base, offer the possibility of a tangent Installation on tiled roofs matching aesthetically with every architectural building design.

• ***Effective and Autonomous:***
You have hot water at will 7-12 months per year. During winter time you secure the pre-heating of the water, and the extra hot water needed is secured from conventional energy.

The forced circulation system EVERHOT consists of

Thank you for choosing to buy a solar system EVERHOT Bl1 or Bl2.

Every system which you acquire consists of:

1. Boiler with one tube heat exchanger (type BL1) or with two tube heat exchangers (type BL2) on a wooden palette and wrapped with stretch film.
2. One (1), Two (2), or Three (3) collectors which are protected during their Transport with 4 plastic elbows of hard plastic.
3. Cardboard box with all of the accessories (except pipes and wires) which are required for the installation of the system like hydraulic kit, expansion vessel, differential thermostat with plastic case, antifreeze liquid and various connection accessories in individual plastic packaging. Externally the box refers to the model of the system for which the accessories are for.
4. Cardboard box with the metal plates of the support base, the screws, moly plugs, the bolts etc…

General Information on needs of hot water

General Information

When choosing a solar system for hot water we must first determine our needs for hot water, in quantity as well as in preferred temperature of consumption. The typical calculation for the temperature for consumption is 45ºC, but for the calculation of required quantity you must take into account the daily needs.

Calculation of needs for hot water usage

1) RESIDENCES

In family residences, the needs for hot water remain stable during the whole year. An indication for the needs is given by the number of individuals living in the building (or apartment). Usually, the per capita daily consumption of hot water at 45ºC is calculated taking into consideration the following:

Low consumption:	35 liters per capita / day
Medium consumption:	60 liters per capita / day
High consumption:	80 liters per capita / day

In the case where we want to connect to the solar installation the washing machine and the dishwasher, we would have to increase the calculated daily needs of consumption as follows:

Washing Machine:	20 liters / day (1 wash per day)
Dishwasher:	20 liters / day (1 wash per day)

Example:

A family of 4 persons needs around 240 liters of hot water daily in order to have a medium daily consumption. (60 liters per capita x 4 persons). If we include a washing machine and dishwasher, then we must calculate a consumption of 280 liters per day.

2) HOTELS - HOSTELS

In buildings such as hotels, hostels, etc…, the needs for hot water are related to the amount of customers. In this case the daily consumption is calculated by the average occupancy of the rooms, from the period of May up until August. Using this basis, the size of the proposed installation is determined. Here below we indicate the per capita daily need for hot water at 45ºC

Hostels with rooms with shared bath:	35 liters / person / day
Hostels:	40 liters / person / day
2 Star Hotels:	50 liters / person / day
3 Star Hotels:	80 liters / person / day
4 Star Hotels:	100 liters / person / day
Camping:	60 liters / person / day

General Information on needs of hot water

Example:

An installation of agro tourism is maintained by a family of 4 persons that live in the residence. During the period between May and August the average occupancy is 15 clients per day. For the occupants 2 meals are prepared per day and the dishwasher washes 5 times per day.

Needs of family:	4 x 60 lt = 240 litres / day
Needs of the clients:	15 x 50 lt = 750 litres / day
Kitchen:	30 x 10 lt = 300 litres / day
Dishwasher:	5 x 20 lt = 100 litres / day
Total:	**1.390 litres / day**

3) OTHER APPLICATIONS

In the next table we present the daily consumption for other applications:

Hospitals and clinics:	80 litres / bed
University residences:	80 litres / bed
Dressing rooms, public showers:	20 litres / person
Schools:	5 litres / student
Restaurants:	8 to 15 litres / meal
Bars:	2 litres / client
Prisons:	30 litres / person
Factories:	20 litres / persona
Offices:	5 litres / employee
Gymnasiums:	30 litres / user

The information of the above table can also be used in combinations so that in every case the average daily consumption can be properly calculated.

FACTORS OF INCREASED NEEDS

In the case that a recirculation system exists for the hot water usage, you will also have to take this into account for the needs. The calculation will have to be made every time individually from the above tables and depends on the dimensions of the circuit and it's thermal insulation. Additionally, in the determination of the total needs, the thermal losses of the total distribution circuit from the point of storage to the points of final consumption must be taken into consideration.

REAL NEEDS

In every case, the real needs for hot water are related to the personal attitude, the possible special characteristics and habits of every place and application and also the way each application functions.

For this reason, a specific calculation can be made by using the information on the gas/ petrol or electric bill. A flow meter installed on the hot water pipes could also be used.

Forced circulation kit

Function

When the difference in temperature between the sensor located in the solar collectors and the sensor located in the storage tank is greater than the 'Differential Temperature', adjusted on the differential thermostat, the circulator of the closed circuit starts up. This is located in the hydraulic kit. The circulator functions only for the period of time that the above situation exists and only then the water in the boiler is being heated from the solar system (BL1 or BL2).

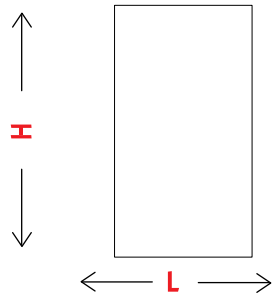
Especially for the system BL2 (with a helping / secondary source of energy - central heating boiler) in the case where the above mentioned circumstances do not exist, the storage tank can heat up from secondary source of energy (for example: central heating boiler). This occurs through the second tube heat exchanger of the boiler. In this case we must use an additional electric connection / start up order of the burner and the circulator of the central heating boiler.

For both systems - models (BL1 and BL2) an electric resistance as a secondary source of energy can be used. (upon a special order).

The circulator for recirculation (optional) is used for the re-circulation of the hot water between the storage tank (boiler) and the usually far off distributors of the hot water.

Dimensions of installed collectors

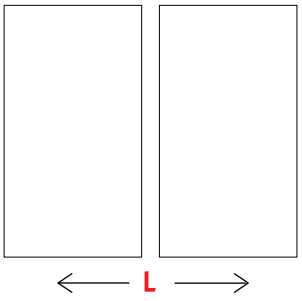
1 Collector



ST - 2000	
H:	2050 mm
L:	1010 mm

ST - 2500	
H:	2050 mm
L:	1275 mm

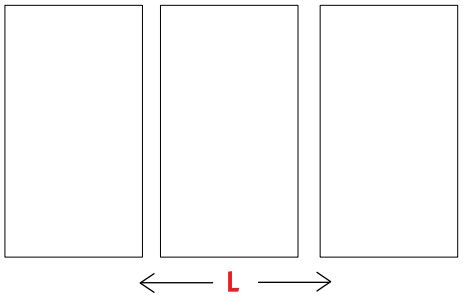
2 Collectors



ST - 2000	
H:	2050 mm
L:	2060 mm

ST - 2500	
H:	2050 mm
L:	2590 mm

3 Collectors



ST - 2000	
H:	2050 mm
L:	3110 mm

ST - 2500	
H:	2050 mm
L:	3905 mm

SOLAR COLLECTORS MODELS ST-2000 AND ST-2500

Collector with black coating

Description

Flat solar collector, firmly built, of new technology suitable for all forced circulation solar systems. The production process and the raw materials that are used produce a high thermal energy efficiency even during periods with insufficient radiation.

Models

The solar collectors EVERHOT are produced in two types, ST-2000 (2,10 m^2) and ST-2500 (2,61 m^2), with blue titanium selective absorber or black selective coating which either in solo or in combinations cover all of the requirements of solar systems.

Basic Technical Characteristics

- Frame made from anodized aluminum, which is extremely durable to adverse climatic conditions (high humidity - coastal areas).
- Strong side and back insulation (20mm glass wool and 40mm rock wool), minimize Thermal losses in areas with low seasonal temperatures.
- Special prismatic glass, resistant to hale (solar tempered glass).
- Absorber made from one unique sheet absorber with blue colour titanium selective coating or with black selective coating. The absorber with titanium coating is ideal for regions with high diffused radiation and low temperatures, absorbing up to 16% more solar radiation in winter months compared to simple black chrome absorbers. This method of coating is non toxic and does not pollute the environment, while keeping stable its mechanical and optical properties during high and low temperatures.

DIMENSIONS OF THE SOLAR COLLECTORS

TyPE SEIECTIVE	Dimensions (m^2)	Gross Surface (m^2)	Net Surface (m^2)	weight (kg)	Capacity (l)	Test Pressure (bar)	max. working Pressure (bar)	absorber a	absorber e
ST-2000	2050x1010x90	2,10	1,80	43	1,67	10	7	95%±2%	5%±3%
ST-2500	2050x1275x90	2,61	2,31	51	2,09	10	7		

SOLAR COLLECTORS MODELS ST-2000 AND ST-2500 SELECTIVES

Technical Characteristics:

Absorber:	a unique sheet
Thermal Absorption:	95%
Thermal loss:	5%
Thickness:	0,2mm
Coating:	selective titanium

Characteristics of the tubes:

Diameter of the horizontal tubes:	(∅ 22mm)
Diameter of the vertical tubes:	(∅ 10mm ou ∅ 8mm)
Material:	copper
Test Pressure:	10 bars
Maximum functional pressure:	7 bars

Frame:

Material:	anodized aluminum profile
Back insulation:	35-40 mm insulation
Side insulation:	20 mm glass wool

Cover:

Material:	solar tempered glass
Thickness:	4mm
Water tightness:	joint EPDM and transparent silicone

Collector
with titanium
selective treatment

General Characteristics:

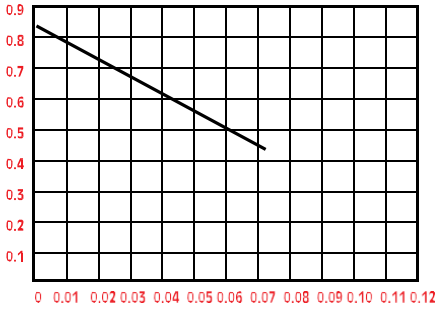
Total thermal efficiency:	95% ± 2%
Total thermal losses:	5% ± 3%
Antifreeze:	glycol appropriate for solar systems

Support base:

The characteristics of the support base for the collector(s) with the ways of installation on the various types of roofs, are described analytically on page 28 Installation Instructions.

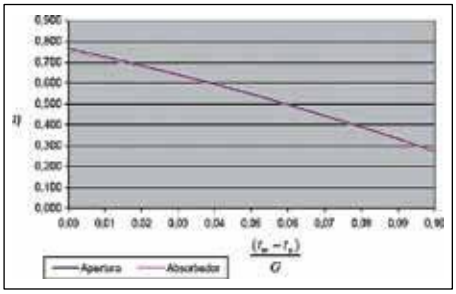
Efficiency curves of MEGASUN solar collectors

ST 2000 Selective (2,10m², 24 C)



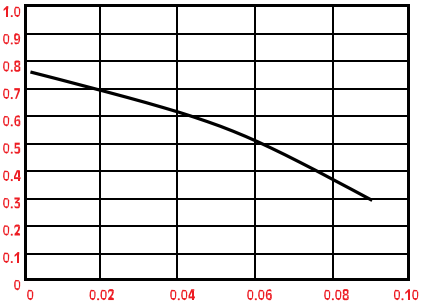
a. Test Nr: 1021

ST 2500 Selective



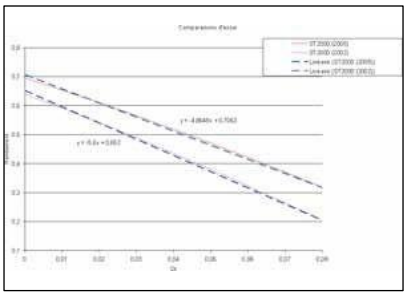
b. Test Nr: 30.0012.0-3

SUN-POWER Selective



c. Test Nr 28601068

- **Curve a:**
Test by DEMOKRITOS (Greece) n= 0,85 - 5,44 T*
- **Curve b:**
Test by CENER (Spain) n= 0,767-0,37 (tm - ta)/G
- **Curve c:**
Test by TÜV Bayern (Germany) n=0,794-3.907 T*- 0,0157 (θm-θL)T*
- **Curve d:**
Calculus CST Bat (France) y = -4,8648x + 0,7063



d. Avis Technique 14/05-947

Procedure for the calculation of estimated energy output of collector

The collector instantaneous efficiency curve is expressed by the following relation in linear or second-order form:

$$n_o = n_o - U_o \frac{Tm - Ta}{G} \qquad n = n_o - a_1 \frac{Tm - Ta}{G} - a_2 \frac{(Tm - Ta)^2}{G}$$

where n is the collector instantaneous efficiency, Tm is the mean temperature of water inside the collector, in ºC, Ta is the ambient air temperature, in ºC and G is the total solar radiation that falls in the collector, in W/m2. The parameters of the above equations of the instantaneous efficiency curve n0 and U0 are determined by testing according to the standards EN 12975-2 and ISO 9806-1.

The estimated energy output of the collector is calculated using the values of parameters n0 and U0, as these have been Determined by testing from several accredited laboratories of Europe, for a number of cities and under the following conditions:

- solar radiation, ambient air temperature and temperature of cold water (average monthly values as given in the tables of the following page)
- Temperature of hot water delivered by the collector to the user equal to 45ºC and 40ºC.

For every day of the month the efficiency of the collector is calculated, where the maximum efficiency and the heat losses of the collector are taken into account depending on the existing climatic conditions of the day and the desired temperature of hot water delivered by the collector to the user. Also, the latitude of the area of installation and the slope of the collector are taken into account. Following this, the mean monthly output of the collector is calculated using the climatic data of the month. Finally, the sum of the mean monthly outputs of the collector gives the total annual output. It is noted that the values of the estimated energy output of the collector that are calculated and given in the next tables are the maximum estimated and therefore they are achieved only by the optimum design and installation of the solar collector and the solar system. This means that that there must not be any shading of the collector during the hours of sunshine and operation of the system, any water penetration inside the collector from the rain, any accumulation of water in the inside part of the collector cover, any accumulation of dust or other substances on the outside part of the collector cover, any deformation of any part or area or material of the collector and system, any leakage in the hydraulic connections in any part of the collector or system, bad or no insulation of the piping of the solar system, bad operation of the valves of the solar system, non proper maintenance of the collector and the system and problems caused by deposition of salts within the tubes of the collector by the usage water.

CLIMATIC DATA OF SELECTED WORLD CITIES

Daily solar radiation in horizontal level, MJ/m²

No	CITY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
1	Habana, CUBA	13.9	16.4	20.6	21.9	21.9	21.0	22.9	21.9	18.5	16.9	15.4	14.4	18.8
2	San Juan, PUERTO RICO	15.1	17.4	20.3	21.5	20.6	20.6	21.3	20.9	19.0	17.2	15.5	14.0	18.6
3	Mexico City, MEXICO	16.5	18.3	21.4	21.8	20.1	19.6	18.5	17.7	15.9	16.5	15.7	15.6	18.1
4	Miami, USA	12.0	14.9	18.2	21.1	20.9	19.4	20.0	18.5	16.5	14.8	12.7	11.6	16.7
5	Los Angeles, USA	10.5	13.8	18.4	22.2	23.4	24.1	26.2	23.6	19.1	15.0	11.4	9.6	18.1
6	Honolulu, Hawaii, USA	13.4	15.9	18.4	20.4	22.1	22.8	22.7	22.3	20.6	17.5	14.4	12.9	18.6
7	DOMINICAN REPUBLIC	17.3	19.8	22.2	23.9	24.5	24.6	24.7	23.6	22.3	19.6	17.9	16.7	21.4
8	Barbados, WEST INDIES	18.4	20.0	20.8	21.3	22.3	19.9	22.3	21.7	20.6	18.6	18.3	17.3	20.1
9	Lamentin, MARTINIQUE	16.0	17.3	18.8	20.3	19.8	19.8	19.9	19.0	18.3	16.2	15.2	14.7	17.9
10	Buenos Aires, ARGENTINA	25.2	22.9	18.5	13.4	9.7	7.4	8.2	11.5	15.0	18.9	24.0	24.7	16.6
11	Santiago, CHILE	21.9	18.0	14.5	9.8	6.5	5.2	6.3	9.1	12.3	15.5	19.4	21.3	13.3
12	Quito, ECUADOR	15.2	14.8	14.6	13.5	14.8	14.6	15.2	16.0	16.1	15.0	15.0	15.2	15.0
13	Lima, PERU	26.6	24.2	23.6	23.6	22.2	22.6	22.7	24.3	25.8	26.9	27.9	26.0	24.7
14	Caracas, VENEZUELA	14.7	16.2	16.9	16.2	15.9	16.1	16.9	17.1	16.8	15.1	14.2	13.5	15.8
15	Tahiti, FRENCH POLYNESIA	25.8	23.4	22.4	24.3	20.2	21.6	21.2	23.1	25.8	27.5	27.5	26.1	24.1
16	Nandi, FIJI	19.6	19.2	17.2	15.9	14.2	13.1	13.7	16.0	18.0	19.7	20.9	21.2	17.4
17	Perth, AUSTRALIA	25.1	24.1	19.6	13.9	10.6	8.8	10.2	13.5	17.9	21.7	23.4	25.9	17.9
18	New Delhi, INDIA	11.3	13.8	16.2	19.9	21.1	18.7	18.0	16.9	18.0	15.6	12.4	10.5	16.0
19	Gillot, REUNION	23.2	21.1	20.7	16.8	15.1	14.0	14.5	17.1	19.1	21.1	23.2	22.9	19.1
20	Tokyo, JAPAN	4.5	7.2	11.4	14.7	17.2	17.1	17.4	16.2	13.1	9.9	5.4	3.8	11.5
21	Beijing, CHINA	8.5	10.0	12.8	14.2	15.2	14.7	17.1	17.8	14.0	12.4	9.3	8.2	12.9
22	Kuala Lumpur, MALAYSIA	17.7	19.1	19.4	18.8	17.7	16.8	17.1	17.4	17.2	18.3	15.5	16.7	17.6
23	Colombo, SRI LANKA	16.6	17.4	19.6	19.6	18.1	16.9	16.0	16.0	15.5	16.3	17.1	16.8	17.2
24	Bangkok, THAILAND	16.6	17.4	19.6	19.6	18.1	17.0	16.1	16.0	15.5	16.3	17.2	16.4	17.2
25	Jakarta, INDONESIA	18.0	19.7	19.1	19.5	18.5	17.9	18.7	17.4	18.1	17.5	16.3	16.4	18.1
26	Manila, PHILLIPINES	13.8	16.3	18.8	20.6	18.9	17.4	15.6	14.2	15.3	14.1	13.6	12.8	16.0
27	Gaborone, BOTSWANA	25.1	24.3	21.2	18.5	16.5	14.6	16.0	19.1	22.1	24.2	24.9	26.2	21.1
28	Cairo, EGYPT	11.8	15.6	19.3	23.2	26.3	28.0	27.1	25.2	22.0	17.9	13.2	11.1	20.1
29	Nairobi, KENYA	23.2	23.6	22.3	18.9	16.7	15.1	12.9	14.2	19.0	20.2	19.1	22.1	18.9
30	Casablanca, MOROCCO	9.7	12.9	17.0	21.0	23.0	24.3	24.8	23.1	19.6	14.6	10.9	8.5	17.4
31	Benin City, NIGERIA	15.4	16.8	17.3	17.1	17.2	15.4	12.8	12.7	13.9	15.9	17.3	16.0	15.6
32	Dakar, SENEGAL	18.4	22.0	24.3	25.4	24.9	23.0	20.3	19.1	19.2	20.2	18.4	17.0	21.0
33	Cape Town, SOUTH AFRICA	23.4	22.4	20.2	16.7	15.3	14.2	15.3	17.8	20.4	21.9	23.6	24.5	19.6
34	Tunis, TUNISIA	8.8	11.3	15.9	19.6	24.0	26.2	27.0	25.8	19.1	14.3	10.6	8.3	17.4
35	Odessa, RUSSIA	3.4	5.4	9.2	14.4	19.3	22.3	21.6	18.9	14.3	8.6	3.8	2.6	12.0

Ambient air temperature, in °C

No	CITY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
1	Habana, CUBA	22	22	23	24	26	27	28	28	27	26	24	22	25.0
2	San Juan, PUERTO RICO	24	24	25	25	26	27	27	27	27	27	26	25	25.8
3	Mexico City, MEXICO	12	14	16	17	17	17	16	16	16	15	13	12	15.1
4	Miami, USA	20	20	22	24	26	27	28	28	28	25	22	20	24.2
5	Los Angeles, USA	13	13	14	15	17	18	20	21	20	18	16	14	16.6
6	Honolulu, Hawaii, USA	22	22	23	24	25	26	27	27	27	26	25	23	24.8
7	DOMINICAN REPUBLIC	24	24	25	26	27	27	27	27	27	27	26	25	26.1
8	Barbados, WEST INDIES	26	26	26	27	28	28	28	28	28	28	27	26	27.1
9	Lamentin, MARTINIQUE	25	26	26	27	28	28	28	27	27	27	26	25	26.6
10	Buenos Aires, ARGENTINA	24	23	21	16	13	11	11	12	14	17	20	22	17.0
11	Santiago, CHILE	18	18	17	14	13	12	12	12	13	14	15	17	14.6
12	Quito, ECUADOR	13	14	14	14	14	13	13	14	14	13	13	14	13.6
13	Lima, PERU	12	12	12	12	11	10	10	11	12	12	13	13	11.7
14	Caracas, VENEZUELA	19	20	21	22	22	22	21	22	22	22	21	20	21.2
15	Tahiti, FRENCH POLYNESIA	27	27	27	27	26	25	25	25	25	26	26	27	26.1
16	Nandi, FIJI	27	27	27	26	25	24	23	24	24	25	26	27	25.4
17	Perth, AUSTRALIA	24	25	22	19	16	14	13	13	15	16	19	21	18.1
18	New Delhi, INDIA	15	18	23	29	33	35	31	30	30	26	20	16	25.5
19	Gillot, REUNION	24	25	27	29	30	29	28	28	28	29	27	26	27.5
20	Tokyo, JAPAN	-1	0	3	9	14	18	22	24	19	13	7	2	10.8
21	Beijing, CHINA	7	9	12	16	19	23	27	28	25	10	14	9	16.6
22	Kuala Lumpur, MALAYSIA	26	27	27	27	27	27	27	27	26	26	26	26	26.6
23	Colombo, SRI LANKA	26	28	29	30	30	29	28	28	28	28	27	25	28.0
24	Bangkok, THAILAND	26	28	29	30	30	29	28	28	28	28	27	25	28.0
25	Jakarta, INDONESIA	27	27	27	28	28	28	27	27	28	28	28	27	27.5
26	Manila, PHILLIPINES	25	26	27	29	29	29	28	27	27	27	26	25	27.1
27	Gaborone, BOTSWANA	27	26	24	21	18	14	14	17	21	24	25	26	21.3
28	Cairo, EGYPT	14	15	17	21	25	27	28	28	26	24	19	15	21.6
29	Nairobi, KENYA	18	18	19	19	18	16	15	16	17	19	18	18	17.6
30	Casablanca, MOROCCO	12	13	15	16	18	20	22	23	22	19	16	13	17.4
31	Benin City, NIGERIA	27	28	28	28	28	26	25	25	26	27	28	27	26.9
32	Dakar, SENEGAL	21	20	21	22	23	26	27	27	28	27	26	23	24.3
33	Cape Town, SOUTH AFRICA	21	21	20	17	13	10	10	13	16	20	20	21	16.8
34	Tunis, TUNISIA	11	12	13	16	19	23	26	27	25	20	16	12	18.3
35	Odessa, RUSSIA	-2	-2	2	8	15	20	22	22	17	11	5	0	9.8

Mean temperature of cold (mains) water, in °C

No	CITY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
1	Habana, CUBA	13.8	14.1	15.7	18.1	18.0	16.7	16.6	15.3	15.9	16.1	15.6	12.9	15.7
2	San Juan, PUERTO RICO	16.6	16.9	17.8	18.8	18.0	16.7	16.0	14.8	15.3	17.4	18.5	16.1	16.9
3	Mexico City, MEXICO	8.3	9.9	11.4	12.8	11.7	10.5	9.5	8.8	9.1	9.7	9.2	7.7	9.6
4	Miami, USA	13.8	14.1	15.7	18.1	18.0	16.7	16.6	15.3	15.9	16.1	15.6	12.9	15.7
5	Los Angeles, USA	13.8	14.1	15.7	18.1	18.0	16.7	16.6	15.3	15.9	16.1	15.6	12.9	15.7
6	Honolulu, Hawaii, USA	8.3	9.9	11.4	12.8	11.7	10.5	9.5	8.8	9.1	9.7	9.2	7.7	9.6
7	DOMINICAN REPUBLIC	16.6	16.9	17.8	18.8	18.0	16.7	16.0	14.8	15.3	17.4	18.5	16.1	16.9
8	Barbados, WEST INDIES	8.3	9.9	11.4	12.8	11.7	10.5	9.5	8.8	9.1	9.7	9.2	7.7	9.6
9	Lamentin, MARTINIQUE	16.6	16.9	17.8	18.8	18.0	16.7	16.0	14.8	15.3	17.4	18.5	16.1	16.9
10	Buenos Aires, ARGENTINA	16.6	16.2	15.0	12.0	9.0	6.8	6.5	6.6	7.9	11.0	14.2	14.1	11.3
11	Santiago, CHILE	12.4	12.7	12.1	10.5	9.0	7.4	7.1	6.6	7.4	9.0	10.6	10.9	9.6
12	Quito, ECUADOR	9.0	9.9	10.0	10.5	9.7	8.0	7.7	7.7	7.9	8.4	9.2	9.0	8.9
13	Lima, PERU	8.3	8.5	8.6	9.0	7.6	6.2	5.9	6.0	6.8	7.7	9.2	8.4	7.7
14	Caracas, VENEZUELA	13.1	14.1	15.0	16.6	15.2	13.6	12.4	12.0	12.5	14.2	14.9	12.9	13.9
15	Tahiti, FRENCH POLYNESIA	18.7	19.1	19.3	19.6	17.3	14.8	13.6	13.1	13.6	16.1	18.5	17.4	16.8
16	Nandi, FIJI	18.7	19.1	19.3	19.6	17.3	14.8	13.6	13.1	13.6	16.1	18.5	17.4	16.8
17	Perth, AUSTRALIA	16.6	17.6	15.7	14.3	11.1	8.7	7.7	7.1	8.5	10.3	13.5	13.5	12.1
18	New Delhi, INDIA	10.4	12.7	16.4	21.8	22.8	21.6	18.4	16.4	17.0	16.8	14.2	10.3	16.6
19	Gillot, REUNION	10.4	12.7	16.4	21.8	22.8	21.6	18.4	16.4	17.0	16.8	14.2	10.3	16.6
20	Tokyo, JAPAN	8.3	9.2	10.7	12.0	12.4	12.4	13.0	12.6	12.5	12.3	11.4	8.4	11.3
21	Beijing, CHINA	4.8	6.4	8.6	12.0	13.1	14.2	16.0	15.3	14.2	6.5	9.9	5.8	10.6
22	Kuala Lumpur, MALAYSIA	18.0	19.1	19.3	20.3	18.7	16.7	16.0	14.8	14.8	16.8	18.5	16.7	17.5
23	Colombo, SRI LANKA	18.0	19.8	20.7	22.6	20.7	17.9	16.6	15.3	15.9	18.1	19.2	16.1	18.4
24	Bangkok, THAILAND	18.0	19.8	20.7	22.6	20.7	17.9	16.6	15.3	15.9	18.1	19.2	16.1	18.4
25	Jakarta, INDONESIA	17.3	18.4	19.3	21.8	20.0	17.9	16.6	14.8	15.3	17.4	18.5	16.1	17.8
26	Manila, PHILLIPINES	17.3	18.4	19.3	21.8	20.0	17.9	16.6	14.8	15.3	17.4	18.5	16.1	17.8
27	Gaborone, BOTSWANA	15.2	15.5	15.7	16.6	15.2	13.0	12.4	11.5	11.9	14.2	15.6	14.1	14.2
28	Cairo, EGYPT	9.7	10.6	12.1	15.8	17.3	16.7	16.6	15.3	14.8	15.5	13.5	9.6	14.0
29	Nairobi, KENYA	12.4	12.7	13.6	14.3	12.4	9.9	8.9	8.8	9.6	12.3	12.8	11.6	11.6
30	Casablanca, MOROCCO	8.3	9.2	10.7	12.0	12.4	12.4	13.0	12.6	12.5	12.3	11.4	8.4	11.3
31	Benin City, NIGERIA	18.7	19.8	20.0	21.1	19.3	16.1	14.8	13.7	14.8	17.4	19.9	17.4	17.8
32	Dakar, SENEGAL	14.5	14.1	15.0	16.6	15.9	16.1	16.0	14.8	15.9	17.4	18.5	14.8	15.8
33	Cape Town, SOUTH AFRICA	14.5	14.8	14.3	12.8	9.0	6.2	5.9	7.1	9.1	12.9	14.2	13.5	11.2
34	Tunis, TUNISIA	7.6	8.5	9.3	12.0	13.1	14.2	15.4	14.8	14.2	12.9	11.4	7.7	11.8
35	Odessa, RUSSIA	8.3	9.2	10.7	12.0	12.4	12.4	13.0	12.6	12.5	12.3	11.4	8.4	11.3

Energy output of the collector in several cities of the world (in kWh/m²)

Base of results: Test of DEMOKRITOS

No	CITY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR 45°C	YEAR 45°C
1	Habana, CUBA	63	74	95	103	105	102	113	108	90	81	72	66	1072	1144
2	San Juan, PUERTO RICO	70	81	96	102	99	100	103	102	92	84	75	66	1021	1143
3	Mexico City, MEXICO	64	74	89	92	85	83	77	74	66	67	62	61	894	963
4	Miami, USA	53	66	83	99	100	94	99	91	81	70	58	51	945	1009
5	Los Angeles, USA	42	55	74	91	99	103	116	106	84	64	47	39	919	989
6	Honolulu, Hawaii, USA	61	72	85	95	105	109	111	109	100	84	68	59	1057	1129
7	DOMINICAN REPUBLIC	81	93	105	115	119	120	120	115	109	95	86	79	1238	1320
8	Barbados, WEST INDIES	88	96	100	104	110	98	110	107	101	91	89	83	1177	1254
9	Lamentin, MARTINIQUE	76	83	91	99	97	97	98	93	89	78	73	69	1043	1112
10	Buenos Aires, ARGENTINA	118	106	83	56	38	28	31	45	60	80	106	112	864	928
11	Santiago, CHILE	94	77	61	40	26	20	24	36	49	62	79	90	658	710
12	Quito, ECUADOR	60	60	59	54	60	58	60	65	65	59	60	61	720	778
13	Lima, PERU	104	94	92	92	85	85	86	93	101	105	111	103	1150	1246
14	Caracas, VENEZUELA	64	71	76	74	72	73	76	78	76	69	64	60	852	912
15	Tahiti, FRENCH POLYNESIA	126	114	109	118	97	102	100	109	122	132	132	127	1390	1482
16	Nandi, FIJI	95	94	84	76	67	61	63	75	84	93	101	103	997	1064
17	Perth, AUSTRALIA	117	114	89	61	44	36	40	53	73	90	102	116	935	1004
18	New Delhi, INDIA	46	59	74	99	111	101	92	85	91	75	55	44	933	995
19	Gillot, REUNION	108	100	101	84	76	71	72	84	94	105	113	109	1117	1191
20	Tokyo, JAPAN	14	23	38	55	69	73	79	76	57	39	19	13	555	599
21	Beijing, CHINA	30	37	50	59	66	68	83	88	66	47	38	31	662	712
22	Kuala Lumpur, MALAYSIA	85	93	95	91	86	82	83	85	82	88	74	80	1024	1092
23	Colombo, SRI LANKA	80	86	98	99	92	85	79	79	76	80	83	80	1016	1082
24	Bangkok, THAILAND	80	86	98	99	92	85	79	79	76	80	84	78	1016	1082
25	Jakarta, INDONESIA	87	95	93	96	91	88	91	85	89	86	80	80	1062	1132
26	Manila, PHILLIPINES	66	78	91	103	95	87	77	69	74	69	65	61	935	996
27	Gaborone, BOTSWANA	122	116	100	83	70	59	64	81	99	113	118	125	1150	1231
28	Cairo, EGYPT	48	64	82	104	125	136	134	124	105	83	58	46	1107	1185
29	Nairobi, KENYA	99	101	97	82	72	63	53	59	80	88	82	95	970	1043
30	Casablanca, MOROCCO	38	51	70	87	99	107	115	106	89	63	45	34	902	970
31	Benin City, NIGERIA	75	83	85	84	85	74	61	60	67	77	85	78	913	974
32	Dakar, SENEGAL	83	97	109	116	115	110	99	93	95	98	88	78	1180	1261
33	Cape Town, SOUTH AFRICA	105	100	89	70	61	53	58	71	85	97	104	110	1003	1078
34	Tunis, TUNISIA	34	44	63	81	104	121	130	116	90	63	44	32	923	990
35	Odessa, RUSSIA	10	16	30	53	79	98	98	86	60	33	13	8	585	631

Base of results: Test of DEMOKRITOS

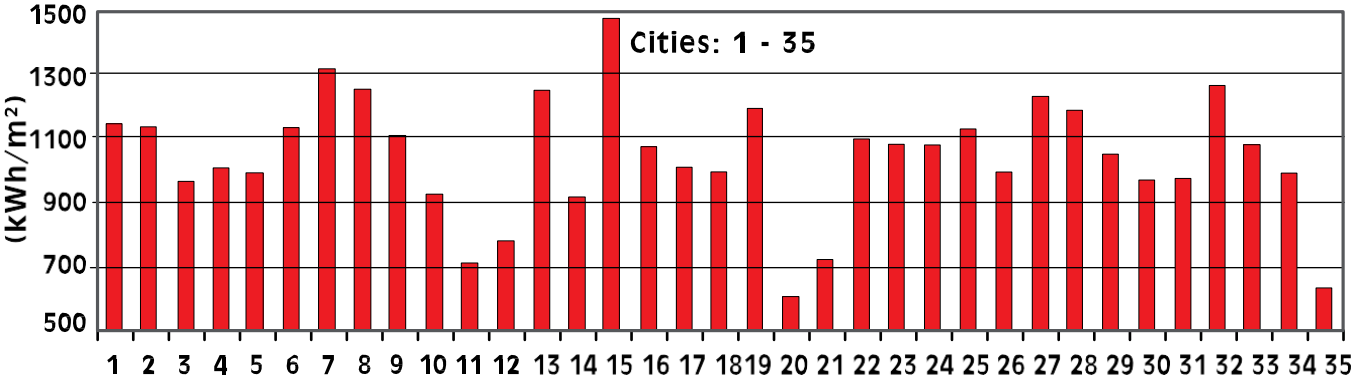
No	CITY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR 45°C	YEAR 45°C
1	Habana, CUBA	63	74	95	103	105	102	113	108	90	81	72	66	1072	1144
2	San Juan, PUERTO RICO	70	81	96	102	99	100	103	102	92	84	75	66	1021	1143
3	Mexico City, MEXICO	64	74	89	92	85	83	77	74	66	67	62	61	894	963
4	Miami, USA	53	66	83	99	100	94	99	91	81	70	58	51	945	1009
5	Los Angeles, USA	42	55	74	91	99	103	116	106	84	64	47	39	919	989
6	Honolulu, Hawaii, USA	61	72	85	95	105	109	111	109	100	84	68	59	1057	1129
7	DOMINICAN REPUBLIC	81	93	105	115	119	120	120	115	109	95	86	79	1238	1320
8	Barbados, WEST INDIES	88	96	100	104	110	98	110	107	101	91	89	83	1177	1254
9	Lamentin, MARTINIQUE	76	83	91	99	97	97	98	93	89	78	73	69	1043	1112
10	Buenos Aires, ARGENTINA	118	106	83	56	38	28	31	45	60	80	106	112	864	928
11	Santiago, CHILE	94	77	61	40	26	20	24	36	49	62	79	90	658	710
12	Quito, ECUADOR	60	60	59	54	60	58	60	65	65	59	60	61	720	778
13	Lima, PERU	104	94	92	92	85	85	86	93	101	105	111	103	1150	1246
14	Caracas, VENEZUELA	64	71	76	74	72	73	76	78	76	69	64	60	852	912
15	Tahiti, FRENCH POLYNESIA	126	114	109	118	97	102	100	109	122	132	132	127	1390	1482
16	Nandi, FIJI	95	94	84	76	67	61	63	75	84	93	101	103	997	1064
17	Perth, AUSTRALIA	117	114	89	61	44	36	40	53	73	90	102	116	935	1004
18	New Delhi, INDIA	46	59	74	99	111	101	92	85	91	75	55	44	933	995
19	Gillot, REUNION	108	100	101	84	76	71	72	84	94	105	113	109	1117	1191
20	Tokyo, JAPAN	14	23	38	55	69	73	79	76	57	39	19	13	555	599
21	Beijing, CHINA	30	37	50	59	66	68	83	88	66	47	38	31	662	712
22	Kuala Lumpur, MALAYSIA	85	93	95	91	86	82	83	85	82	88	74	80	1024	1092
23	Colombo, SRI LANKA	80	86	98	99	92	85	79	79	76	80	83	80	1016	1082
24	Bangkok, THAILAND	80	86	98	99	92	85	79	79	76	80	84	78	1016	1082
25	Jakarta, INDONESIA	87	95	93	96	91	88	91	85	89	86	80	80	1062	1132
26	Manila, PHILLIPINES	66	78	91	103	95	87	77	69	74	69	65	61	935	996
27	Gaborone, BOTSWANA	122	116	100	83	70	59	64	81	99	113	118	125	1150	1231
28	Cairo, EGYPT	48	64	82	104	125	136	134	124	105	83	58	46	1107	1185
29	Nairobi, KENYA	99	101	97	82	72	63	53	59	80	88	82	95	970	1043
30	Casablanca, MOROCCO	38	51	70	87	99	107	115	106	89	63	45	34	902	970
31	Benin City, NIGERIA	75	83	85	84	85	74	61	60	67	77	85	78	913	974
32	Dakar, SENEGAL	83	97	109	116	115	110	99	93	95	98	88	78	1180	1261
33	Cape Town, SOUTH AFRICA	105	100	89	70	61	53	58	71	85	97	104	110	1003	1078
34	Tunis, TUNISIA	34	44	63	81	104	121	130	116	90	63	44	32	923	990
35	Odessa, RUSSIA	10	16	30	53	79	98	98	86	60	33	13	8	585	631

Base of results: Test of TUV BAYERN

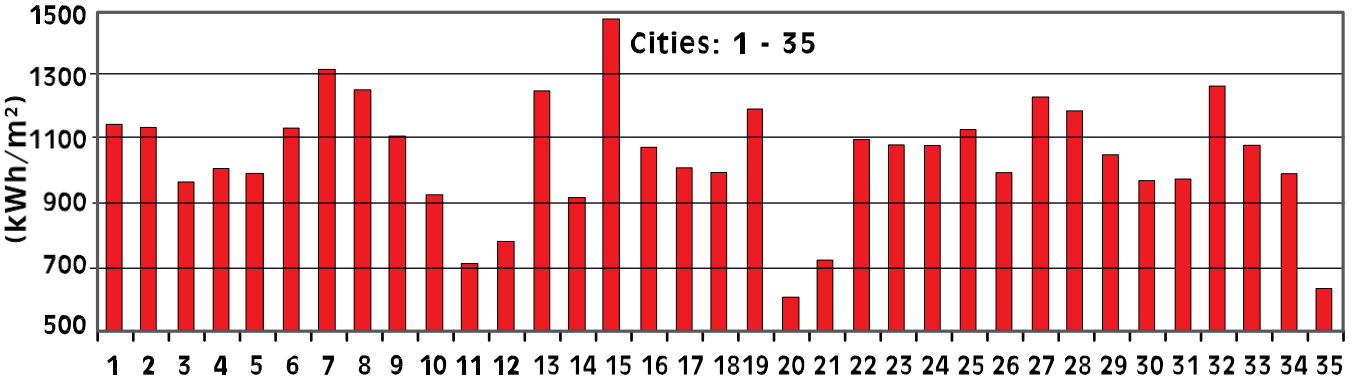
No	CITY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR 45°C	YEAR 45°C
1	Habana, CUBA	61	73	93	100	102	99	108	104	87	78	70	64	1038	1097
2	San Juan, PUERTO RICO	68	79	93	99	96	97	100	98	89	81	72	64	1036	1093
3	Mexico City, MEXICO	65	74	88	91	84	82	76	73	65	67	62	61	888	944
4	Miami, USA	52	65	81	96	97	91	95	88	78	68	56	50	917	969
5	Los Angeles, USA	42	55	74	90	98	102	113	103	83	63	47	39	908	965
6	Honolulu, Hawaii, USA	59	70	83	93	102	106	107	105	96	81	66	58	1025	1082
7	DOMINICAN REPUBLIC	79	90	102	111	115	116	116	111	105	92	83	77	1196	1263
8	Barbados, WEST INDIES	85	93	97	100	105	94	105	103	97	88	86	80	1135	1197
9	Lamentin, MARTINIQUE	74	80	88	96	94	94	94	89	86	76	70	67	1007	1063
10	Buenos Aires, ARGENTINA	114	103	81	55	38	29	32	45	60	79	104	110	850	902
11	Santiago, CHILE	93	76	60	40	26	20	24	36	49	62	79	89	654	695
12	Quito, ECUADOR	60	60	59	54	59	58	60	64	65	59	60	61	720	766
13	Lima, PERU	104	95	92	92	86	86	87	94	101	105	111	103	1156	1235
14	Caracas, VENEZUELA	63	70	74	72	71	71	74	76	75	67	62	58	833	882
15	Tahiti, FRENCH POLYNESIA	121	110	105	114	94	99	97	106	118	128	128	122	1343	1418
16	Nandi, FIJI	92	90	81	74	65	60	62	73	82	91	97	99	965	1019
17	Perth, AUSTRALIA	114	111	87	60	44	36	41	53	73	90	100	113	920	975
18	New Delhi, INDIA	46	58	72	95	106	95	88	82	87	72	54	43	901	950
19	Gillot, REUNION	105	97	98	81	73	68	69	81	90	101	109	106	1027	1136
20	Tokyo, JAPAN	15	24	39	55	69	72	77	74	56	39	20	13	554	589
21	Beijing, CHINA	31	38	50	59	65	66	80	85	64	47	38	31	653	693
22	Kuala Lumpur, MALAYSIA	82	90	91	88	83	79	80	82	80	85	72	78	989	1044
23	Colombo, SRI LANKA	77	83	94	95	88	81	76	76	74	77	80	77	978	1031
24	Bangkok, THAILAND	77	83	94	95	88	81	76	76	74	77	81	75	978	1031
25	Jakarta, INDONESIA	84	92	90	92	88	85	88	82	86	83	77	77	1024	1080
26	Manila, PHILLIPINES	64	76	88	99	91	84	74	66	72	68	63	59	901	951
27	Gaborone, BOTSWANA	117	112	97	81	70	59	64	80	97	110	114	121	1122	1187
28	Cairo, EGYPT	48	64	81	101	121	131	129	120	102	81	57	45	1029	1141
29	Nairobi, KENYA	98	100	95	81	71	62	53	58	79	86	81	93	958	1017
30	Casablanca, MOROCCO	38	51	69	86	97	105	110	104	87	62	45	34	889	943
31	Benin City, NIGERIA	72	80	82	81	81	72	59	58	65	74	82	75	881	930
32	Dakar, SENEGAL	81	95	107	113	112	107	95	89	91	95	85	76	1146	1211
33	Cape Town, SOUTH AFRICA	103	98	88	70	61	54	58	71	84	95	102	108	990	1051
34	Tunis, TUNISIA	34	44	63	81	103	117	125	112	88	62	44	32	905	959
35	Odessa, RUSSIA	11	17	31	54	79	97	96	84	60	33	13	9	583	620

GRAPHICAL REPRESENTATION OF ENERGY OUTPUT OF COLLECTORS IN SELECTED CITIES OF THE WORLD (in KWh/m²), in temperature 40°C

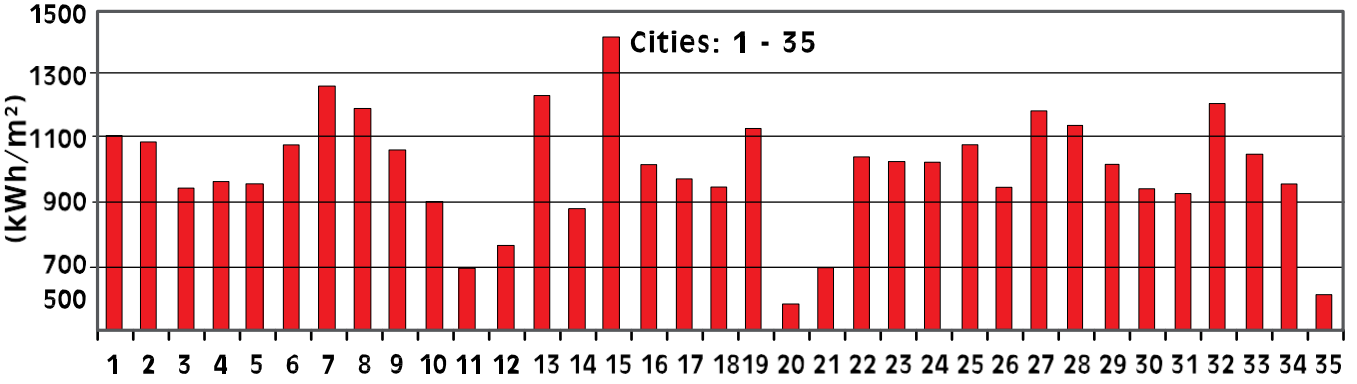
Collector: ST 2000 selective- Base of results: Test of DEMOKRITOS, GREECE



Collector: ST 2000 selective- Base of results: Test of DEMOKRITOS, GREECE

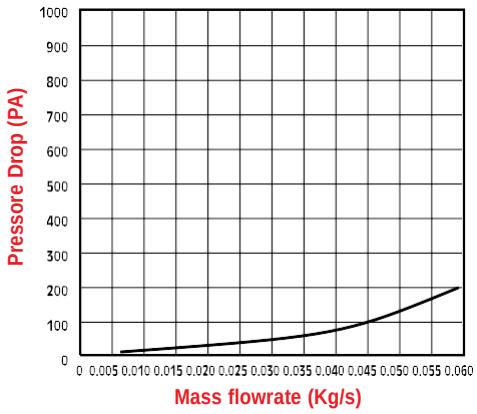


Collector: ST 2000 selective (SUN-POWER) - Base of results: Test of TÜV BAYERN, GERMANY

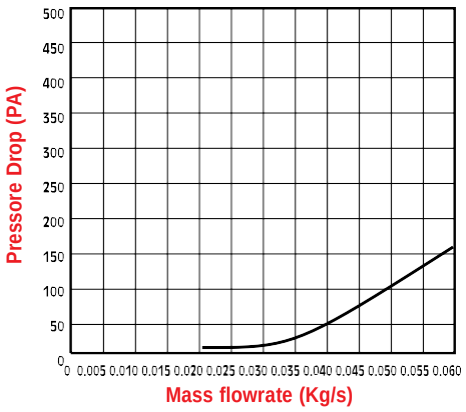


Pressure drop in collectors – Calculations of Demokritos Institute

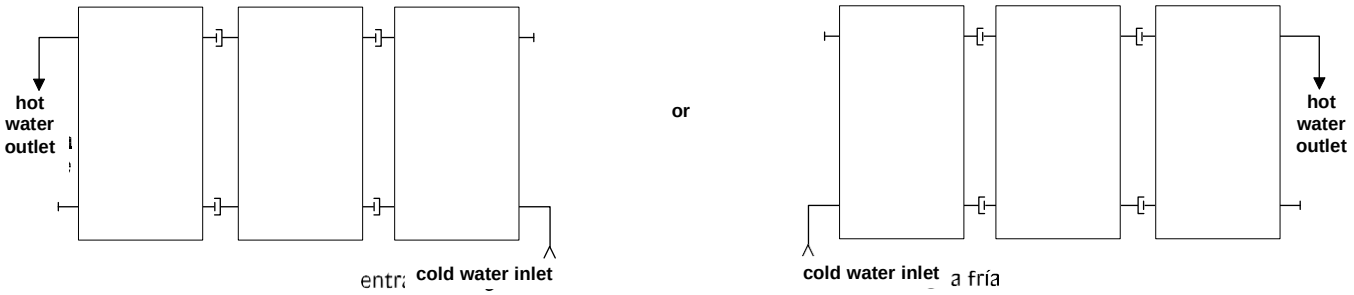
Collector: ST 2000 selective (2,10 m², 26 C)



Collector: ST 2500 selective (2,61 m², 24 C)



For the systems 150 – 500, BL1 or BL2, the parallel connection of the solar Collectors is recommended



In this case the pressure drop in one collector is about equal to the pressure drop in the whole row of collectors for the supply that is equivalent to the total of installed square meters.

The required flow of the pump for the forced circulation is approximately 40 - 80 liters / h for each installed square meter and depends on the design of each installation.

Example:

For one system 300 E/BL1 with 3 collectors ST-2000 in a parallel connection, total surface area 6,30m², we can choose a medium flow rate of 60lt/h per square meter of installed collectors. This means that the necessary flow rate of the pump must be 60lt/hm²x6,30m²=378lt/h approximately. When dividing by 3 (number of collectors), we obtain 126lt/h. When transforming to liters/second (by dividing by 3.600) we will have 0,035 liters/second. From the above graph of pressure drop of the collector St 2000, we estimate that the flow rate of 0,035 liters/second corresponds to a pressure drop of approximately 100 Pa.

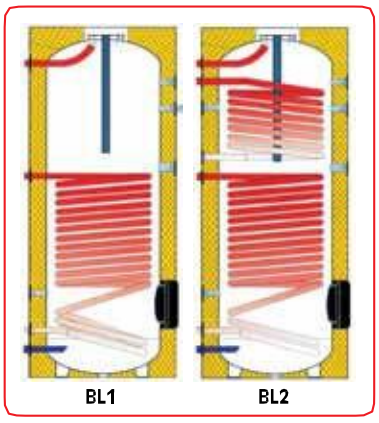
Boiler EVERHOT type BL1 and BL2 with one or two tube heat exchangers
Technical Characteristics

Description

The EVERHOT boilers are manufactured according to European and German standards in the new state of the art solar boilers manufacturing facility and offer absolute safety in operation, great savings and a long lifespan. These tanks are for indoor use.

- Manufactured from extra thick and high quality USD 37.2 steel plate.
- Double tested for water tightness.
- The internal cleaning of the cylinder is not done chemically but in the most modern sand blasting facility, resulting in the perfect addiction of the enameling on the steel surface.
- The enameling is made with double 'direct' enamel process and it is heated at a temperature of 850ºC.
- Supplied with a big magnesium rod DN 32mm for additional anti-Corrosive protection.
- Side flange DN 115 mm. for easy cleaning (except for models 150).
- Top flange DN 115 mm for easy replacement of the magnesium rod.
- Optional electric resistance (2 - 9 KW).
- Available with one or two tube heat exchangers, suitable for every Application
- Upon a special order, buffers can be delivered (150lt -1000lt models BL0) without a tube heat exchanger.

Models



Models Bl1 (With 1 tube heat exchanger)

model	Insulation exterior	Capacity (litres)
150BL1	Yes	150
200BL1	Yes	200
300BL1	Yes	300
420BL1	Yes	420
500BL1	Yes	500
800BL1	Yes	800
1000BL1	Yes	1000

Models Bl2 (With 2 tube heat exchangers)

model	Insulation exterior	Capacity (litres)
150BL2	Yes	150
200BL2	Yes	200
300BL2	Yes	300
420BL2	Yes	420
500BL2	Yes	500
800BL2	Yes	800
1000BL2	Yes	1000

Tank:

Material:	Steel plate USD37.2 quality
Welding:	Robotically welded in inert gas environment
Cleaning:	6 point metal blasting
Internal treatment:	Glass enameling heated at 850°C
Function Pmax:	6 bar
Testing Pmax:	15 bar for 5 minutes
Function Tmax:	+95° C

Outer Cover Material:

PVC in various colors

Heat Exchanger Type:

Coil heat exchanger made of heavy duty steel tube 33mm (tube)

Insulation:

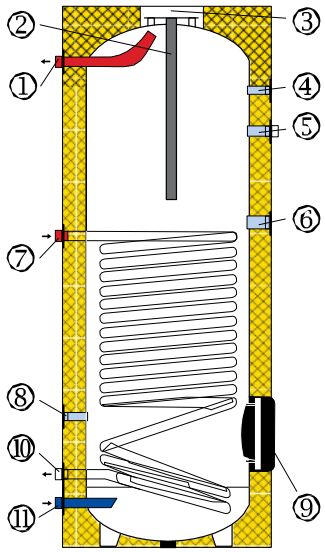
Material:	Polyurethane CFC & FCKW Free
Density:	40 kg/m3
Thickness:	65 mm

(For storage tanks BL800 – BL1000 for all the models, the insulation is made from flexible polyurethane 75 mm and is detachable for easier passage during installation)

Electrical Backup (upon request):

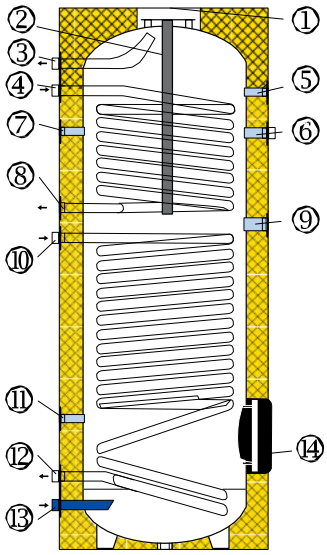
2 to 4 KW (230 V) with thermostat or 6KW or 9KW (400 V) without thermostat

DESCRIPTION OF STORAGE TANKS



BL1

1. Hot water outlet
2. Magnesium rod
3. Top flange Φ115
4. Sensor inlet
5. Recirculation connation
6. Electric back-up inlet
7. Collector inlet
8. Sensor inlet
9. Side flange Φ115
10. Collector outlet
11. Cold water inlet



BL2

1. Top lange Φ115
2. Magnesium rod
3. Hot water outlet
4. Back-up heat exchanger inlet
5. Sensor inlet
6. Recirculation connexion
7. Sensor inlet
8. Back-up heat exchanger outlet
9. Electric back-up inlet
10. Collector inlet
11. Sensor inlet
12. Collector outlet
13. Cold water inlet
14. Side lange Φ115

Outer Cover material:

Color PVC jacket

Storage tanks weight empty (kg) /External dimensions (mm):

litter/ model	Bl1	Bl2	DIamETER		HEIGHT	
150	64	69	603		1050	
200	85	93	603		1400	
300	108	128	603		1930	
420	146	156	730		1730	
500	165	182	730		1970	
800	176	210	805*	945	1735*	1800
1000	201	235	805*	945	1985*	2050

* DIMENSIONS WITHOUT INSULATION

Thermal Insulation:

Polyurethane Foam CFC & FCKW free
Density: 40 kg/m^3
Thickness: 65 mm.
Thermal Conductivity: 0,023 W/mk
Fire Class: B3, auto extinguishable.

Hydraulic Connections Bl:

Volume	150 l	200 l	300 l	420 l	500 l	800 l	1000 l
Sensor	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
Heat exchangers	1"	1"	1"	1 ¼"	1 ¼"	1 ¼"	1 ¼"
Hot-Cold inlets	1"	1"	1"	1 ¼"	1 ¼"	1 ¼"	1 ¼"
Electric Element	1 ½"	1½"	1½"	1½"	1½"	1½"	1½"
Recirculation	1"	1"	1"	1"	1"	1"	1"

Corrosion Protection

Inner cleaning of the tank with automated sand blasting (not chemically) resulting in a perfect adherence of the enamel.
Food grade enamel quality applied with a “double direct” method and baked at 850°C (BUFFER tanks are excluded).
Extra corrosion protection is offered by magnesium rods that must be checked and replaced if necessary every 2 to 5 years, depending on the quality of the water.

Backup Heating Source Using the Second, Upper Heat Exchanger

Coil type heat exchanger, from heavy duty steel (type Tube) integrated in the upper part of the tank, in order for the secondary heating source to heat only the upper part of the tank. Further technical data concerning the upper heat exchanger refer to the table concerning BL2 tanks.

ATTENTION: Tanks have a maximum service pressure of 6 bar. It is highly recommended to install a 6 bar TP Valve and an expansion vessel in the cold inlet.

Technical Specifications

model		BI 150								BI 200							
Heat Exchangers		Solar (lower) Heat Exchanger (BI1 models)				Back-up Heat Exchanger (BI2 models)				Solar (lower) Heat Exchanger (BI1 models)				Back-up Heat Exchanger (BI2 models)			
Heat Exchanger Capacity	lt	3.45				2.7				5.7				2.7			
Heat Exchanger surface area	m²	0.6				0.5				1				0.5			
lower Heat Exch. Flow Rate	m³/h	3				3				3				3			
Pressure drop	mbar	65				52				120				60			
Inlet temperature	° C	55	70	80	90	55	70	80	90	55	70	80	90	55	70	80	90
Heat Exchanger Power*	Kw	7.8	15.6	20.4	25.5	4.7	9.4	12.3	15.4	10	20.5	26.5	33.7	4.7	9.4	12.3	15.4
Hot water continuous supply	lt/h	190	385	500	625	115	232	303	380	250	500	650	830	115	232	303	380
Thermal losses **	Kwh/24H	1.2								1.65							

model		BI 300								BI 420							
Heat Exchangers		Solar (lower) Heat Exchanger (BI1 models)				Back-up Heat Exchanger (BI2 models)				Solar (lower) Heat Exchanger (BI1 models)				Back-up Heat Exchanger (BI2 models)			
Heat Exchanger Capacity	lt	7.4				5.7				7.6				6			
Heat Exchanger surface area	m²	1.4				1.2				1.5				1.3			
lower Heat Exch. Flow Rate	m³/h	3				3				3				3			
Pressure drop	mbar	150				130				155				140			
Inlet temperature	° C	55	70	80	90	55	70	80	90	55	70	80	90	55	70	80	90
Heat Exchanger Power*	Kw	12.3	25	32.6	41	11.8	23	30.5	38.3	14.2	27.5	36.6	46.4	12.8	23	34.5	37.5
Hot water continuous supply	lt/h	300	620	800	1000	290	565	750	940	350	675	900	1150	315	567	850	982
Thermal losses **	Kwh/24H	2.24								2.68							

model		BI 500								BI 800							
Heat Exchangers		Solar (lower) Heat Exchanger (BI1 models)				Back-up Heat Exchanger (BI2 models)				Solar (lower) Heat Exchanger (BI1 models)				Back-up Heat Exchanger (BI2 models)			
Heat Exchanger Capacity	lt	11.5				6				11.5				6.3			
Heat Exchanger surface area	m²	2.2				1.3				2.2				1.4			
lower Heat Exch. Flow Rate	m³/h	3				3				3				3			
Pressure drop	mbar	220				140				220				130			
Inlet temperature	° C	55	70	80	90	55	70	80	90	55	70	80	90	55	70	80	90
Heat Exchanger Power*	Kw	16.7	32.2	42.8	54.2	12.8	23	34.5	37.5	17	32	43	54	11.4	21	30.5	32.3
Hot water continuous supply	lt/h	410	790	1050	1330	315	567	850	925	440	820	1100	1390	560	660	950	1010
Thermal losses **	Kwh/24H	2.91								3.22							

model		BI 1000							
Heat Exchangers		Solar (lower) Heat Exchanger (BI1 models)				Back-up Heat Exchanger (BI2 models)			
Heat Exchanger Capacity	lt	13.3				7.5			
Heat Exchanger surface area	m²	2.5				1.4			
lower Heat Exch. Flow Rate	m³/h	3				3			
Pressure drop	mbar	250				145			
Inlet temperature	° C	55	70	80	90	55	70	80	90
Heat Exchanger Power*	Kw	20.5	40	53	65.5	12.3	25	32.6	41
Hot water continuous supply	lt/h	500	980	1300	1600	415	845	1100	1390
Thermal losses **	Kwh/24H	3.6							

***Cold water temperature 10°C. Hot water outlet temperature 45°C. Storage temperature 60°C.**
**** Water storage temperature 65°C – ambient temperature 20°C.**

ATTENTION: Tanks have a maximum service pressure of 6 bar. It is highly recommended to install a 6 bar TP Valve and an expansion vessel in the cold inlet.

Hydraulic kit

Application

As a pump, regulator and air venting valve in solar heating systems.
With the hydraulic kit, hydraulic balancing, flow measurement and venting can be performed directly in the station.
The built-in SETTER Inline UN allows the required quantity of fluid in the primary circuit to be exactly and simply set and checked. The continuous venting system meets the most demanding requirements and keeps the system free of air.

Systems which are correctly balanced hydraulically and air-free guarantee optimal energy extraction, and are thus more cost-effective in the sense of the energy-saving directives laid down by law.
Using the scale, which is pre-calibrated for glycol, the technician can set and check the exact flow-rate values on-site. Neither training courses nor expensive measuring devices are required. Installation and venting can be carried out by one person working unaided.

Installation position

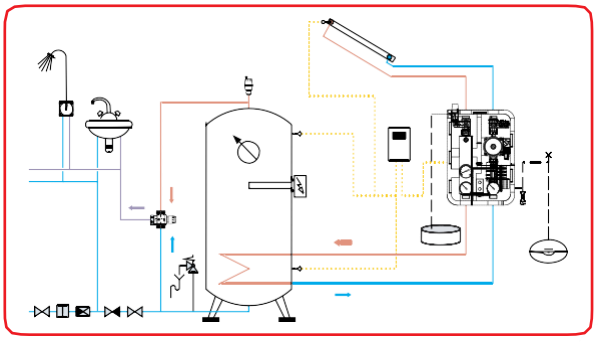
The solar station must be mounted vertically to ensure problem-free functioning of the venting unit.

Advantages

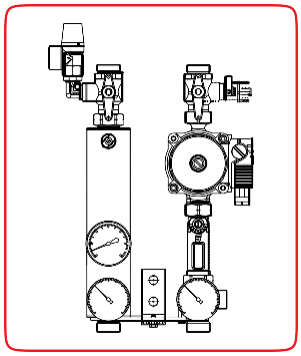
- Cost-effective installation and filling
- Multi-functional ball valve, which greatly simplifies the filling and draining of the system
- Collector and reservoir sections can be separated for installation work
- Straightforward pump replacement (suction and pressure side can be shut off)
- Precise and rapid regulation adjustments, requiring no diagrams, tables or expensive measuring devices
- Function checking using the direct flow rate indicator in the SETTER Inline UN
- Visual scale in l/min pre-calibrated for glycol mixes u=2.3 mm^2/s
- Constant air release while system is running
- Straightforward venting directly in the station
- Can be connected to any readily-available controller
- Reliable operation, and maintenance-free
- Rugged design

Operation

The flow-rate measurement is based on the proven principle of a baffle float.
The basis for the air venting are special flow technology measures which accumulate the air in the top of the venting space, from where it can be released from time to time. At the same time, acts as a check on whether air is building up in the system. There are no Mechanical parts, so the design ensures a long service life.



Hydraulic kit



HYDRAULIC KIT

1) Circulation pump
2) SETTER Inline UN balancing valve
3) Venting tank with bleeder valve
4) Bleeder valve
5) Pressure gage
6) Thermometer
7) Stop ball valve with Safety valve
8) Stop ball valve with fill and drain cock and integrated check valve
9) Safety valve
10) Connector ADG for the expansion vessel
11) Wall fixing
12) Packaging box

Flow circuit components (venting side)

Stop ball valve with safety valve (response pressure 6 bar)

The ball valve allows the flow circuit line to be divided between the collector and the heat accumulator. As required by safety regulations, the connection between the collector and safety valve is not interrupted in any of the ball valve positions.

The safety valve thus protects the system components against excessive over-pressure in all operating phases.

Holes are provided in the handle of the ball valve so that it can be sealed to protect against un intentional closing. This prevents unintentional disconnection of the connecting line between the collector and the expansion vessel at this point.

Venting tank with

The purpose of the venting tank is to remove air from the medium flowing through the tank.

The venting tank can hold up to approx. 2.5 dl of air and has a bleeder valve for releasing the air.

The bleeder valve is routed to the outside through the insulation which means that it can be accessed even when the insulating casing is on. The outlet has a suitable fitting for easy attachment of a hose.

The frequency and quantity of the collected air can be used to check the leak tightness of the system

Pressure gage

The pressure gage with a range from 0 to 10 bar indicates the system pressure.

Thermometer

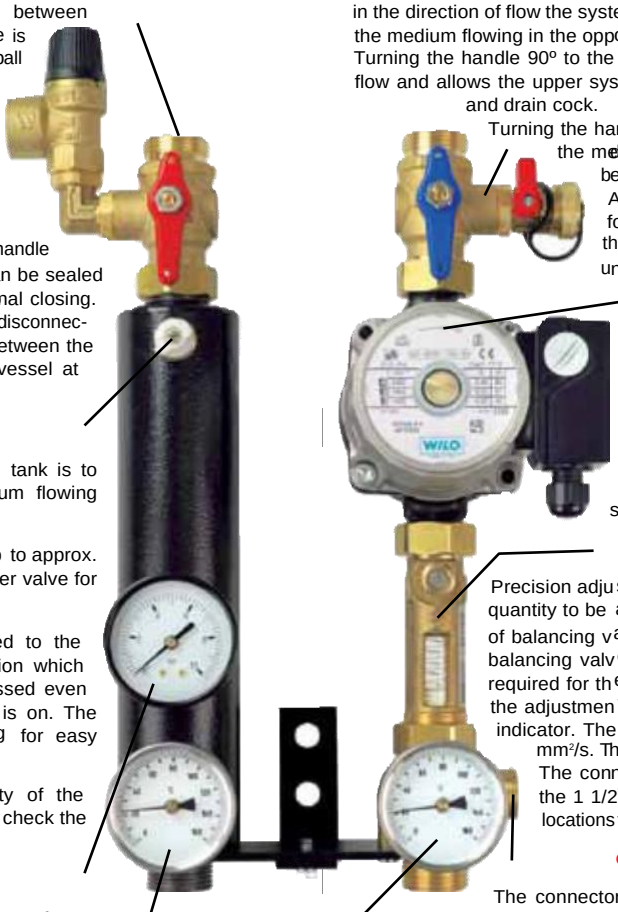
The thermometer with a range from 0 to 160ºC constantly indicates the medium temperature in the flow circuit. The temperature is recorded directly in the medium to minimize the reaction time.

The sensor is inserted in a protective pipe so that it can be exchanged without having to empty the system.

Return circuit components (pump side)

Stop ball valve with fill and drain cock and integrated check valve

The ball valve allows the return line to be split between the collector and the heat accumulator. The special ball cock design provides various functions. If the handle is pointing in the direction of flow the system medium can circulate. An integrated check valve stops the medium flowing in the opposite direction and also acts as a gravity brake.
Turning the handle 90º to the right closes the ball cock in the direction of the medium flow and allows the upper system part (collector) to be filled and emptied using the fill and drain cock.
Turning the handle 90º to the left closes the ball cock in the direction of the medium flow and allows the lower system part (reservoir) to be filled using the fill and drain cock.
A male thread G 3/4" is provided on the fill and drain cock for connecting a hose. Holes are provided in the handle of the ball valve so that it can be sealed to protect against unintentional closing.



WILO ST 25/6-3 circulation pump, solar version

This circulation pump, included as standard in the scope of delivery and integrated in the hydraulic kit, covers a large delivery range.
The required operating point can be preselected using one of the three levels.
A defective pump can be replaced without having to empty the system using the stop cocks on the suction side (Setter Inline UN) and the pressure side (ball valve).

SETTER Inline UN balancing valve

Precision adjustment at the balancing valve allows the required delivery quantity to be adapted to system requirements. The proven combination of balancing valve and flow indicator in one housing in the hydraulic kit balancing valves means that no additional measuring components are required for the SETTER Inline UN. Flow rate indication is constant, i.e. the adjustment can be immediately verified by means via the flow rate indicator. The indicator is pre-calibrated for a medium viscosity of 2.3 mm^2/s. This does away with the need for correction curves.
The connection flange on the outlet side is directly screwed onto the 1 1/2" pump connector fittings which means there are no seal locations for further adapter components.

ctor ADG

The connector fitting with G 3/4" connecting thread for the expansion vessel is connected in series with the circulation pump. This arrangement prevents negative working pressure conditions in even critical systems and avoids reductions in the working pressure, one of the main causes of early evaporation of the medium.

Thermometer

The thermometer with a range from 0 to 160ºC constantly indicates the medium temperature of the flow circuit. The temperature is recorded directly in the medium to minimize the reaction time.
The sensor is inserted in a protective pipe so that it can be exchanged without having to empty the system.

Hydraulic kit

Specification text

Is a ready-to-connect solar station for circulation and venting of solar circuit medium with mounting attachments.

With integrated SETTER Inline UN regulating and check valve with direct indication of the set flow rate in l/min.

Optimized for use in solar applications.

Measured values with medium viscous- ity u = 2.3 mm²/s can be read directly atthe sight glass during adjustment without the need for tables, diagrams or measuring devices.

Technical data

max. operating temperature:
- Flow circuit (venting side): TB 160ºC
- Return circuit (pump side): TB 110ºC

max. operating pressure: 8 bar.
- Safety valve response pressure: 6 bar

K_{vs} value and measurement range as per table «Type Program».
Vent pipe: Painted steel
Valve housing components: Brass
Internal components: Stainless steel, brass and plastic
Sight glass: Boric silicate
O-ring seals: EPDM
Flat seals with high temperature resist- ance suitable for use in solar applica- tions
Insulating material: EPP
Thread according to DIN 2999 / ISO 7 and ISO 228
Measuring accuracy ±10% (of the highest nominal value)

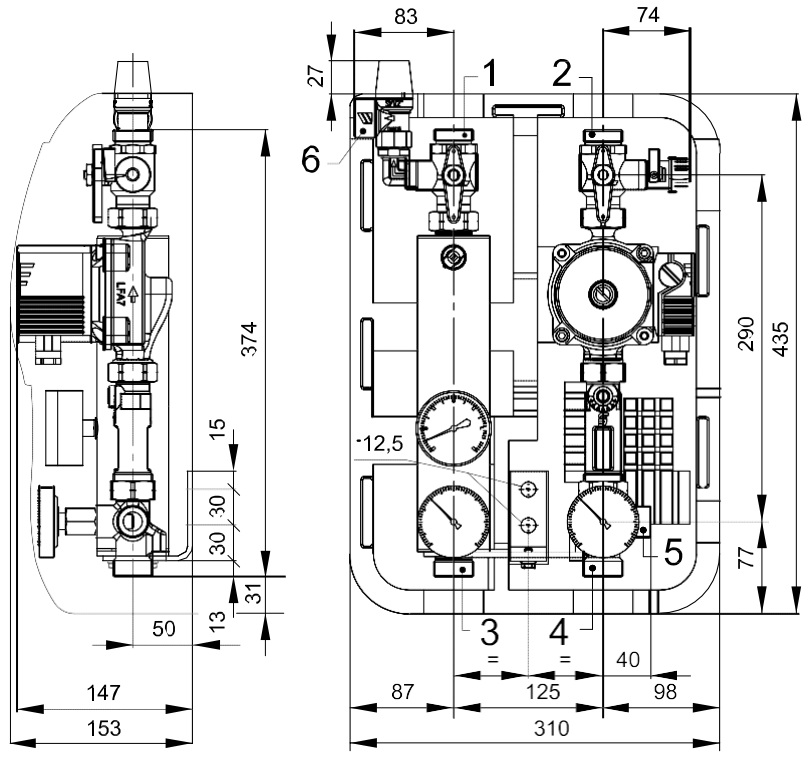
Fluids

- Water and proprietary additives used against corrosion and freezing (display scale for medium viscosity u=2.3mm²/s)
- Heating water and cooling water

Includes: flow phase (venting side) and return phase (pump side)			
Measurement range[3]	kVS[1]	kVS[2]	Circulation pump
4,0 -16,0 l/min	3,3	6,0	WILO ST 20/6-3

1) k_{vs} [m³/h] with U=1 mm²/s in the return phase (pump side)
2) k_{vs} [m³/h] with U=1 mm²/s in the flow phase (venting side)
3) Visual scale for water/glycol mix with U= 2,3 mm²/s

Dimensional drawing



1 Male thread ISO 228, G 1” (line from the collector)
2 Male thread ISO 228, G 1” (line to the collector)
3 Male thread ISO 228, G 1” (line to the reservoir)
4 Male thread ISO 228, G 1” (line from the reservoir)
5 Male thread ISO 228, G 3/4” (expansion vessel line)
6 Female thread DIN 2999 / ISO 7, Rp 3/4” (safety valve blow-off line)

Differential Thermostat
TCD1

Description

The programmable electronic thermostat secures the smooth transfer of thermal energy from solar collectors to the boilers via an electronic command to the circulator of the solar system.

Differential Temperature Controller for solar systems, type TDC-1 by SOREL-Germany. The controller is user friendly through its digital screen, the information given (sensor's temperature, operation status etc.) and could easily adapt to many different types of application. Auxiliary heating could also be controlled with an optional third sensor (not included in standard package), through the SPDT contact.

The Temperature Difference Controller TDC 1 facilitates efficient use and function control of your solar or heating system. The device is impressive most of all for its functionality and simple, almost self-explanatory operation. For each step in the input process the individual entry keys are assigned to appropriate functions and explained. The controller menu contains headwords for the measured values and settings, as well as helps texts or clearly- structured graphics. The TDC 1 can be used as a temperature difference controller for the various system variants.

Characteristics of the TDC 1:

- Depiction of graphics and texts in a lighted display
- Simple viewing of the current measurement values
- Analysis and monitoring of the system by means of statistical graphics ,etc.
- Extensive setting menus with explanations
- Menu block can be activated to prevent unintentional setting changes
- Resetting to factory settings

Function

The differential thermostat continuously checks the difference in temperature between the boiler and the solar collectors. In the case where the temperature of the collectors is up to 10ºC higher (recommended adjustment 4-6ºC) than the temperature of the boiler, the differential thermostat starts up the pump of the solar system.
This temperature along with the corresponding adjustment to the thermostat is named «starting differential temperature». The circulator will stop when the difference of temperature between the collectors and the boiler is below 2ºC (according to the suggested adjustment rate).
In case solar energy is not sufficient, the transferable contact SPDT of the differential thermostat for the start up of a back up source of energy (heat pumps, central heating system) can be used.

The annual consumption of hydraulic pump is 160 kWh, and differential thermostat is 4 kWh.

Basic Accessories (included in package)

Connection Accessories

All of the necessary connection accessories of each unit are located in an incorporated packaging which consists of the following:

- Screws, bolts, nuts, moly plugs, etc.
- Bronze cross
- Connection raccords of collectors and plugs
- Flexible tube for the expansion vessel
- Sensor-socket (boiler-collectors)
- Degasser of the collectors

Hydraulic kit

Description on
Page 19, 20, 21, 38 and 39

Differential thermostats TCD1 PLUS

Description on
Page 22

Expansion vessel

Expansion vessel of 18ltrs for the systems from 150 to 500 ltrs and 40lts for the systems 800 -1000 ltrs. If the total length of the closed circuit is over 100 m. with a 22mm pipe then it is recommended to use a bigger expansion vessel (the general rule for choosing an expansion vessel is 10% of the total volume of the closed circuit). The expansion vessel is connected to the hydraulic kit with the flexible tube included in the package.

Antifreeze Liquid

Dilution	
% v. in water	Freezing Point
20%	- 7°C
30%	- 13°C
40%	- 23°C
50%	- 34°C

Glycol is used to avoid the freezing of the thermal liquid of the solar collectors of the closed circuit. It is delivered in a plastic bottle of 10 liters. It must be mixed with water depending on
The weather conditions (minimal environmental temperature) in the area where the solar system is installed.
The table on the left shows the analogy of Water / Glycol to the environmental temperature.

Optional Accessories (not included in kit)

Electric Resistance

On all BL1 & BL2 boilers, an electric resistance can be installed which is delivered upon a special order. The electric resistance 2 or 4 kW / 1~230V is delivered with the thermostat and a plastic cover. The electric resistance 6 or 9 kW / 3~400 V is delivered without the thermostat (obligation of the installer).

The existence of a back up energy source secures the availability of hot water in the cases of low sunshine and /or in availability of other back up energy source (central heating system or heat pump).

Technical Characteristics of the electric resistance:

Material:	copper
Connection inlet:	N 40 (1 ½") M.
Power:	2 or 4 kW (1~230 V) with thermostat 6 or 9 kW (3~400 V) without thermostat

Thermostat

All of the single-phase electric resistances (up to 4 kW) are delivered with a thermostat with a uni-polar interruption function as well as a bi-polar interruption thermal safety button with manual reset.

Technical Characteristics of the thermostat:

Control:	incorporated
model of thermostat:	B2-10
Protection at IP:	00
Tmax - maximum environmental temperature:	105 ºC
Cycles start / pause :	10.000 times (cycles)
Fire resistance category:	B
Environmental function:	Clean Environment

Always follow the installation instructions as described in chapter 5, page 45.

Notes:
- When the electric resistance is installed, you must also fix a protective cover so that to ensure a complete water tightness and security.
- All the installations and connections must be done according to the rules and regulations (electrical, plumbing, urbanism and others) applicable in your area.

Forced Circulation Systems

Models

The systems are delivered with 1 tube heat exchanger on the boiler (BL1) for connection to solar collectors or with 2 tube heat exchangers on the boiler (BL2) for connection to solar col-lectors and central heating system. Every system can be delivered with an electric resistance 2kW or 4kW (upon request).

General

The forced circulation systems are used for the production of hot water.
Their basic characteristics are:

- High efficiency
- Easy installation
- Economic Function

Models BL1 (with 1 tube heat exchanger)

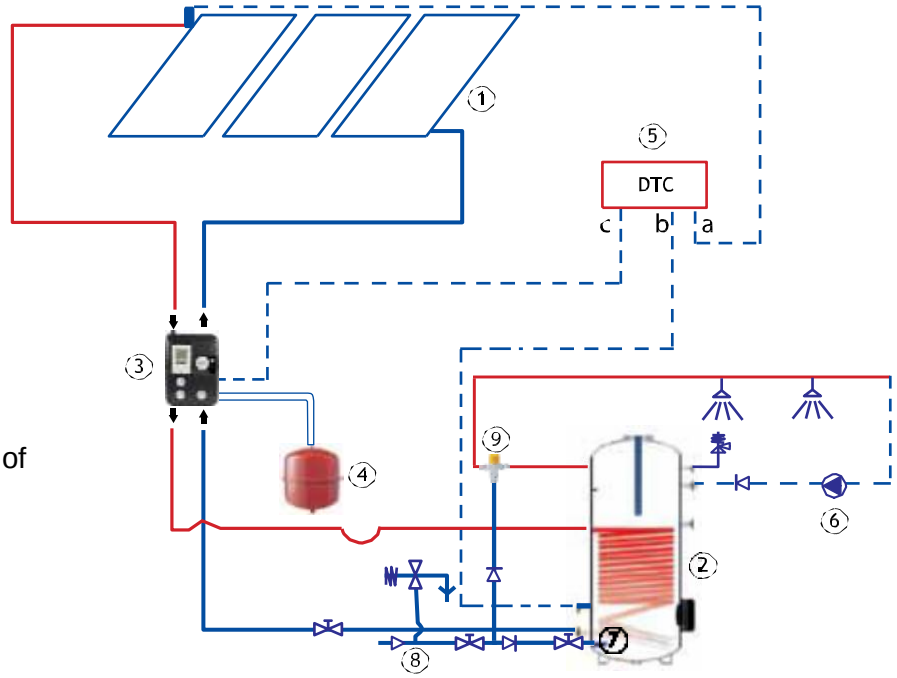
model	Capacity (litres)	Number of collectors	Total surface area of the collectors (m²)
150 / BL1	150	1	2,61
150 / BL1-M	150	1	2,10
200 / BL1	200	2	2 x 2,10
200 / BL1-M	200	1	2,61
300 / BL1	300	2	2 x 2,61
300E / BL1	300	3	3 x 2,10
300 / BL1-M	300	2	2 x 2,10
420 / BL1	420	3	3 x 2,10
420E / BL1	420	3	3 x 2,61
500 / BL1	500	3	3 x 2,10
500E / BL1	500	3	3 x 2,61
800 / BL1	800	6	6 x 2,10
800E / BL1	800	6	6 x 2,61
1000 / BL1	1000	8	8 x 2,10
1000E/ BL1	1000	8	8 x 2,61

Models BL2 (with 2 tube heat exchangers)

model	Capacity (litres)	Number of collectors	Total surface area of the collectors (m²)
150 / BL2	150	1	2,61
150 / BL2-M	150	1	2,10
200 / BL2	200	2	2 x 2,10
200 / BL2-M	200	1	2,61
300 / BL2	300	2	2 x 2,61
300E / BL2	300	3	3 x 2,10
300 / BL2-M	300	2	2 x 2,10
420 / BL2	420	3	3 x 2,10
420E / BL2	420	3	3 x 2,61
500 / BL2	500	3	3 x 2,10
500E / BL2	500	3	3 x 2,61
800 /BL2	800	6	6 x 2,10
800 /EBL2	800	6	6 x 2,61
1000 /BL2	1000	8	8 x 2,10
1000E/BL2	1000	8	8 x 2,61

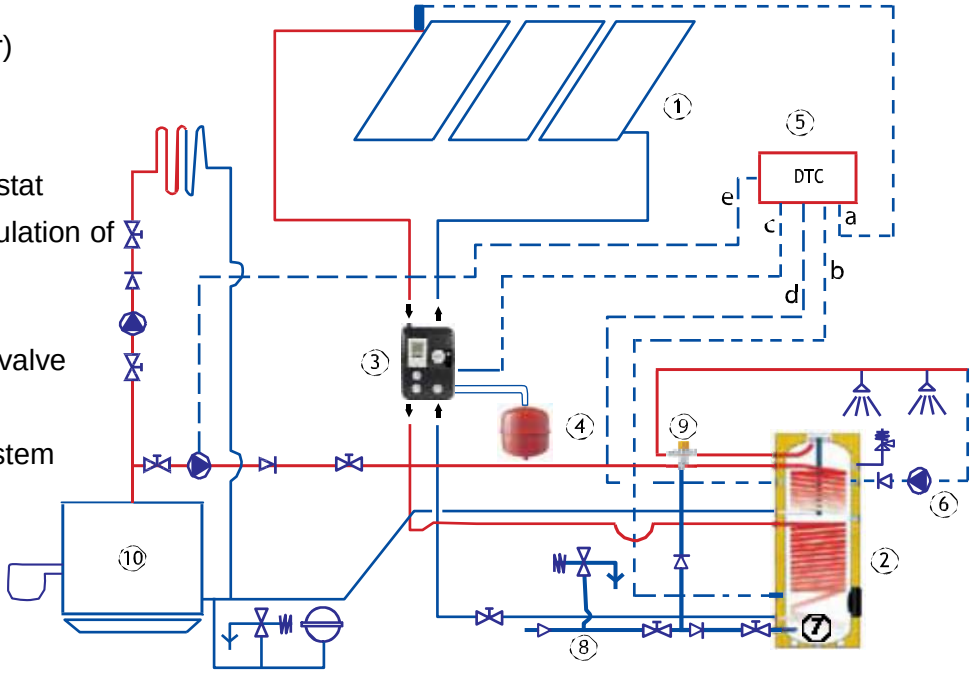
Forced circulation solar systems Model BL 1
(without a helping source of energy - central heating boiler)

1. Solar collectors
2. Storage tank (boiler)
3. Hydraulic kit
4. Expansion vessel
5. Differential Thermostat
6. Circulator for recirculation of hot water (optional)
7. Cold water inlet
8. Non return / safety valve
9. Mixing valve



Forced circulation solar systems Model BL 2
(with a helping source of energy - central heating boiler)

1. Solar collectors
2. Storage tank (boiler)
3. Hydraulic kit
4. Expansion vessel
5. Differential Thermostat
6. Circulator for recirculation of hot water (optional)
7. Cold water inlet
8. Non return / safety valve
9. Mixing valve
10. Central heating system

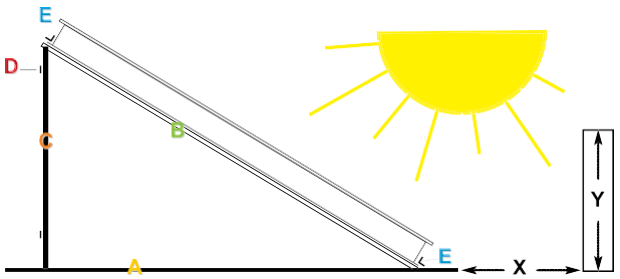


Attention: A safety pressure releaf valve is mandatory in the cold inlet of a tank.

NOTE: The above drawings are typical drawings of basic principles. You must always consult a specialized engineer for your own installation

Installation Instructions

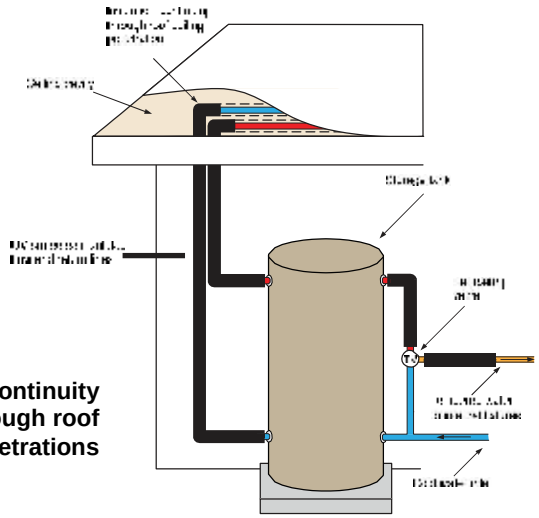
1. Before you start installing the solar water heater, please read carefully all the installation instructions stated and illustrated in this manual.
2. Before the installation of the solar water heater, it is very important that the customer and the installer agree on all the details concerning the correct and safe installation of the appliance, (such as location, placement point, static resistance and control of the surface on which the appliance will be placed, piping and wiring run etc).
3. The installation should be done according to the local electric and plumbing regulations.
4. The location you will choose for the installation of the solar collector(s) should not be shaded by any obstacles (trees, buildings...etc.) all around the year. (see obstacle table here below).
5. For optimum performance of the solar system, the collector(s) must face South, for countries located in the Northern hemisphere and North for countries located in the Southern hemisphere. In case that it is not totally possible for the solar collector(s) to face the equator, you must turn it (them) towards East up to 30º if major hot water draw is before 14:00 p.m., or towards West up to 30º if major hot water draw is after 14:00 p.m. The ideal inclination of the solar collector(s) should be equal to the latitude in which the installation is done.
6. The support base of the collector(s) is the same for both flat and inclined roofs. It is diversified only in the way of it's assembly (see installation instructions on the following pages.)
7. If the surface on which the solar collector(s) will be installed (inclined or flat) is not compatible with the standard equipment supplied with each appliance, then alternate equipment must be used. The installer has to choose, propose and install this alternate equipment, always under the concurrent opinion of the customer.
8. For installation on an inclined roof, the «D» plates must be screwed with the appropriate screws and nuts on the roof timber, in order to secure the right and safe installation of the collector(s).
9. In regions subject to heavy snowfalls, rainfall, storms, strong winds, cyclones, tornadoes it is very important to ensure that the supports of the standard equipment are sufficient to withstand the weight of the expected snow or the intensity of the weather conditions. In these cases the collector(s) must be placed in a stable way on the roof and must be tightened with additional metal straps.



latitude	Distance between collector and obstacle
0º- 25º	X = 1,0 x Y
25º- 35º	X = 1,5 x Y
35º- 45º	X = 2,0 x Y
45º- 50º	X = 2,5 x Y
50º +	X = 3,0 x Y

Insulation considerations

Continuity in pipe work insulation must be maintained, although, sometimes, many lengths may need to be joined to cover the full length of pipe work. In those instances, the join should be taped and UV-resistant tape used where the join is made on external pipe work.
Where pipe work penetrates the roof material, the insulation should go through the penetration with the pipe work, as shown in figure on the right.

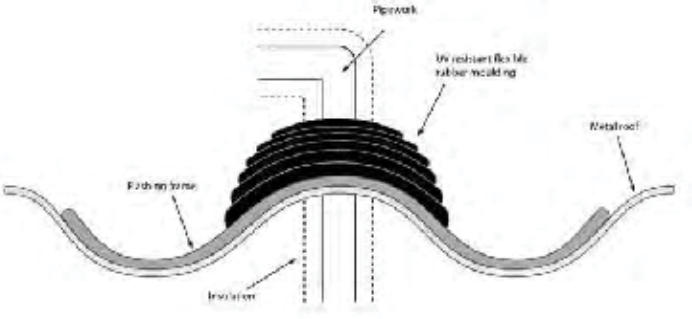


Insulation continuity through roof penetrations

Roof flashings

Roof penetrations for pipe work, electrical conduits or support frames should be sealed with roof lashings to prevent water leaking into the roof cavity. These lashings are usually made of EPDM or silicon rubber, with an aluminum frame that can be mounded to the shape of the roof, as shown in figure below. **Where possible, penetration should be done on the high part of the roof profile to avoid the possibility that water will pool around a penetration that is located in the valley of the profile.**
Lead lashing should not be used on a roof that is collecting rainwater for drinking and it must be compatible with other roof cladding material.

Roof penetration (cross-section)



Installation Instructions

ASSEMBLY INSTRUCTIONS

The same support base is used for both flat and inclined surfaces for the collector models ST-2000 and ST-2500.

INSTALLATION ON FLAT SURFACES

Connect the plates A, B, C, and D by screwing them tight to each other as shown on the illustrations on the following pages. Loosely screw the bottom plate E onto the plates B.
Attention: The top plate E is adjusted after the placement of the collector(s). Level the support base on the flat surface. Place the collector(s) on the support base and then screw it with the moly plugs and the bolts onto the concrete, according to your country's regulations.

INSTALLATION ON AN INCLINED SURFACE

Connect the plates (A) and (E) so that to form a rectangular frame, on the support bases with one and three collectors while
the plates (A) and (C) on the support base with two collectors (as shown on the following pages).
Bend the 4 plates (D) as shown in the illustrations. Remove the tiles, and place the bent plates (D) on the wooden timbers or on the concrete of the roof. Screw tightly the rectangular frame (A)+(C) or (E) onto the plates (D). Level the support base and screw the plates (D) onto the wooden timbers of the roof as shown in the illustrations. For the safe installation of the support base you must always use the additional metal straps.
Lift the tiles and pass the metal straps under the horizontal wooden timbers of the roof. Tighten them onto the plates (C) for the support base with two collectors or to plates (E) for the support bases with one or three collectors, so that the support base cannot move in any direction.

Screw the plates (B) onto the rectangular frame (A) + (C) or (E). Ensure that the plates (B) are tightly screwed on the holes of the plate (A). Loosely screw the **bottom** plate (E) or (C) onto the plates (B).
attention: the top plate E or C is adjusted after the placement of the collector(s).
Place the collector(s) on the support base and secure them with the plates (E) or (C) and tightly screw them onto the plates (B).

TECHNICAL CHARACTERISTICS OF THE SUPPORT BASE

Material: heat dipped galvanized metal plates
Thickness: 2,5mm - 3,0mm
Form: Angle of 90º, 35mm x 35mm

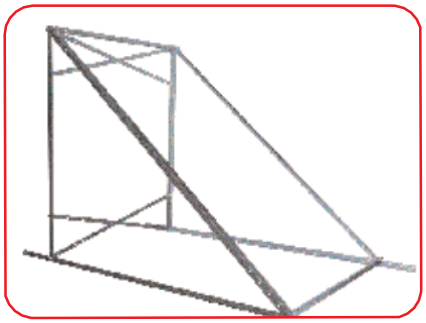
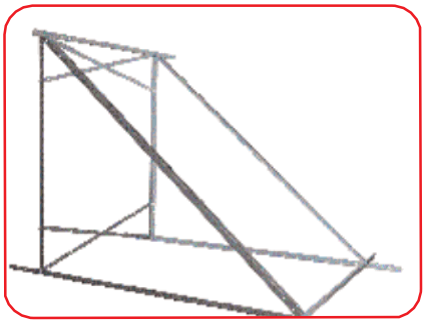
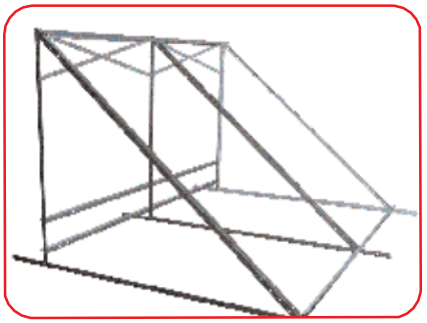
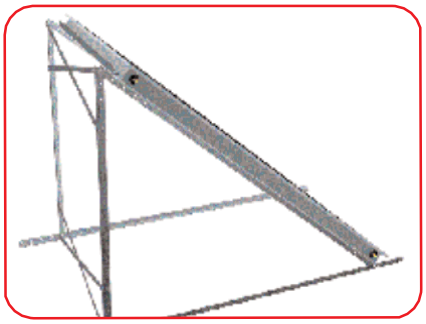
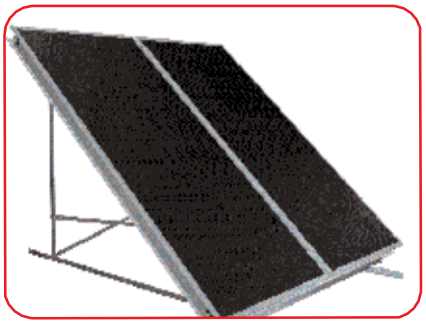
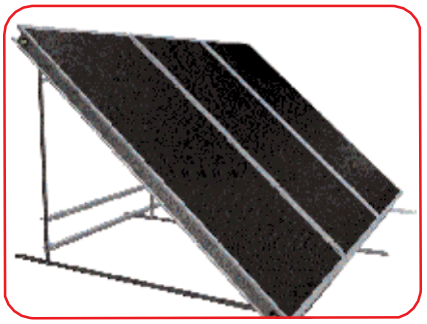
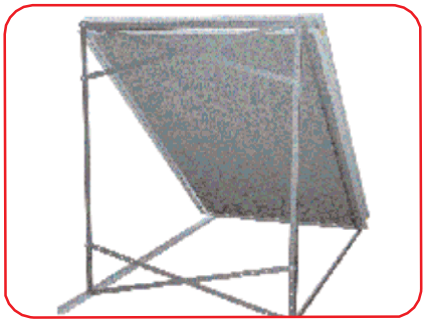
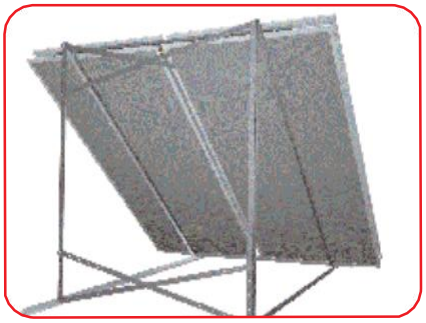
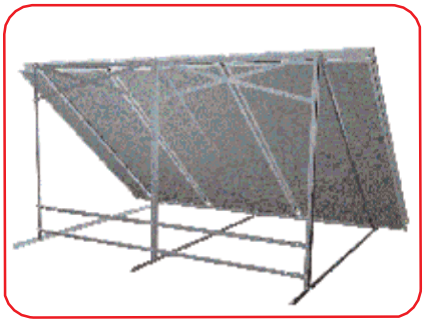
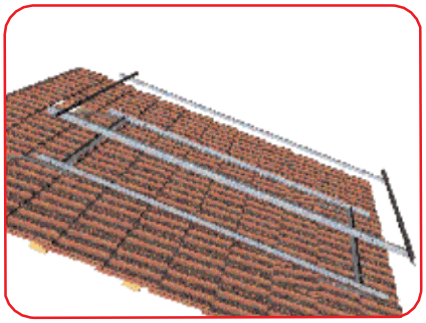
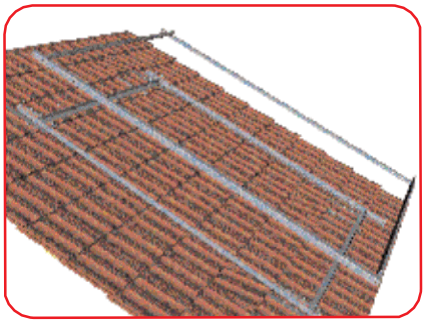
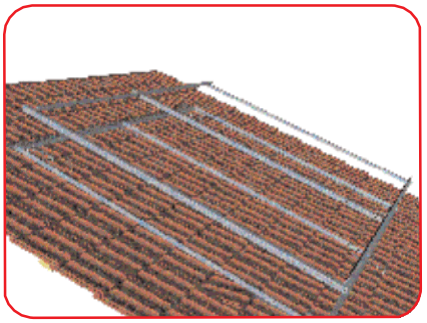
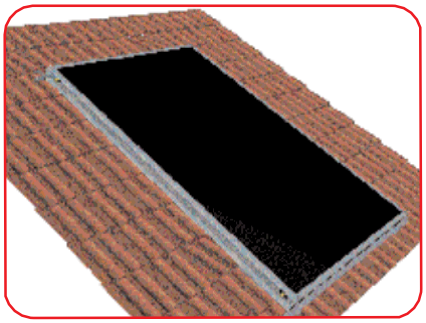
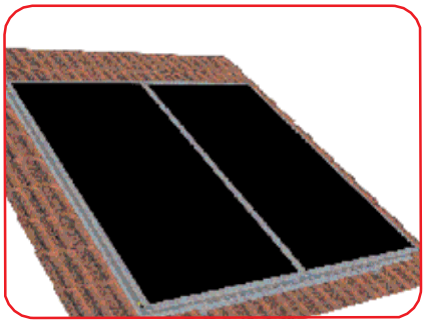
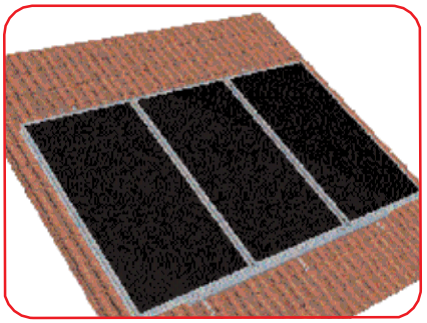
DIMENSIONS OF THE PLATES OF THE SUPPORT BASE

a = 2150 mm B = 2150 mm C = 1430 mm	**same for all of the support bases**
D = 1180 mm	**For support bases with 1 & 2 collectors**
D = 1220 mm	**For support bases with 3 collectors**
E = 1150 mm	**For support base with 1 collector**
E = 1430 mm	**For support base with 2 collectors**
E = 2355 mm	**For support base with 3 collectors**

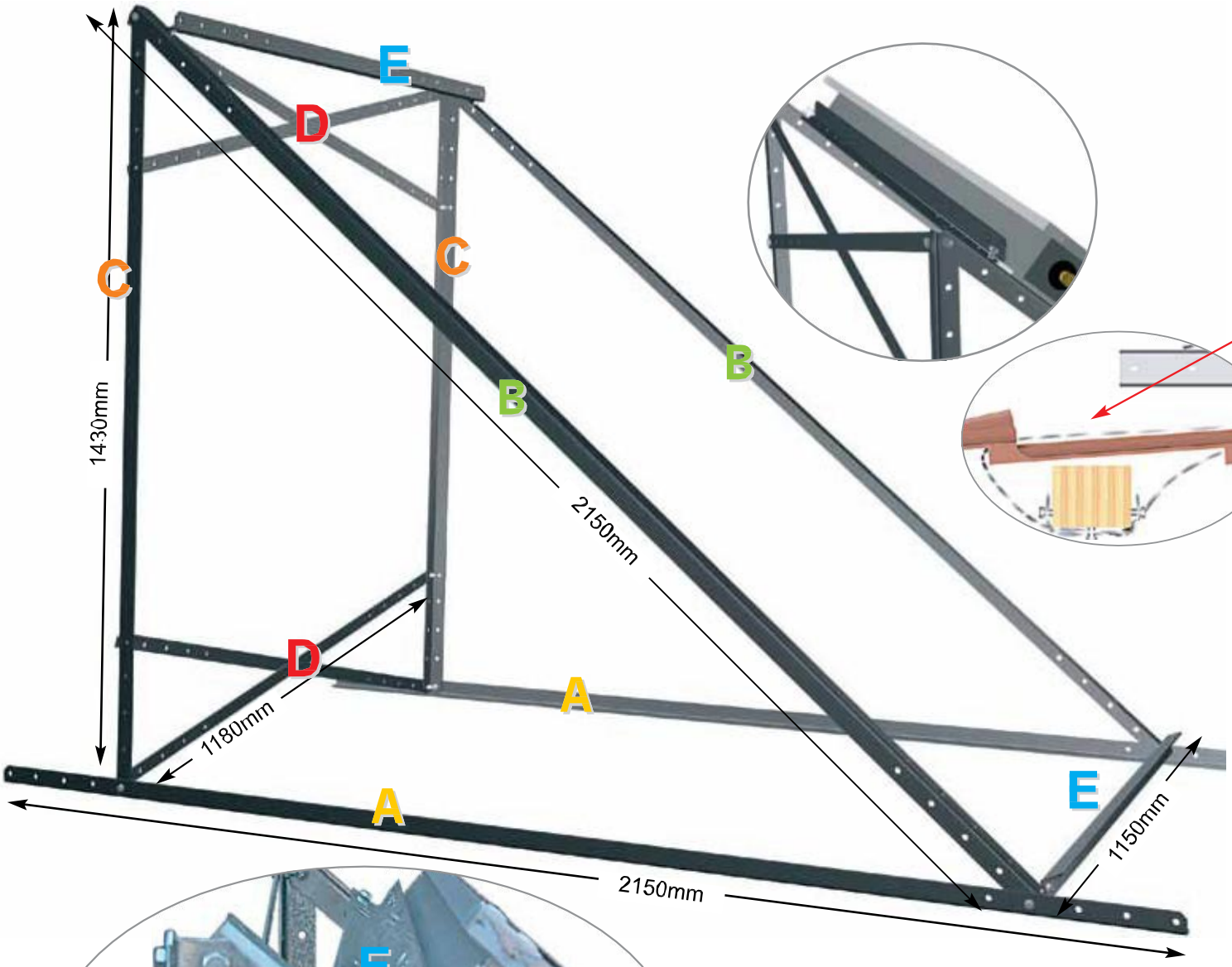
Note:
The specifications of the products, their accessories (e.g. electric resistances, thermostats, valves, liquid….etc) and their materials are in accordance with the Greek standards . You must be informed and check if the specifications of the products and their accessories are in accordance with the local and national standards and regulations that apply in your country. The importer/distributor is responsible for the importation, commercialization and installation of the products.

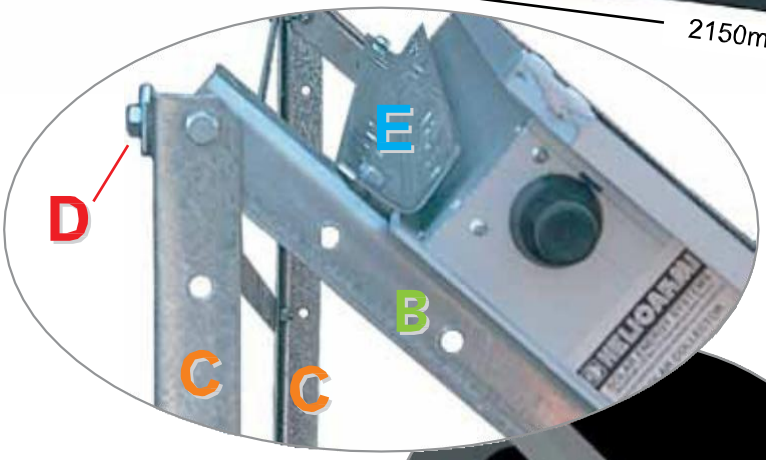
HELIOAKMI S.A. in no case is liable for any damages caused to third parties for any reason, such as wrong installation of the appliances and their accessories, from the non-observation of the regulations and lows (electrical, urban planning, plumbing, sanitary…etc) applying in your country/area. In case of a defective product apply the terms and conditions of the warranty.

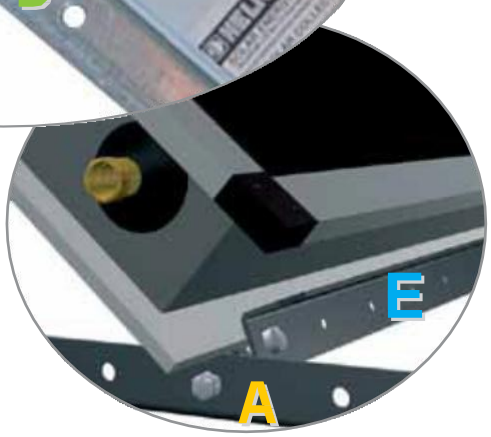
Installation Instructions

Support base for 1 collector ST 2000 or ST 2500 (p. 30-31)	Support base for 2 collectors ST 2000 or ST 2500 (p. 32-33)	Support base for 3 collectors ST 2000 or ST 2500 (p. 34-35)
		
		
		
		
		

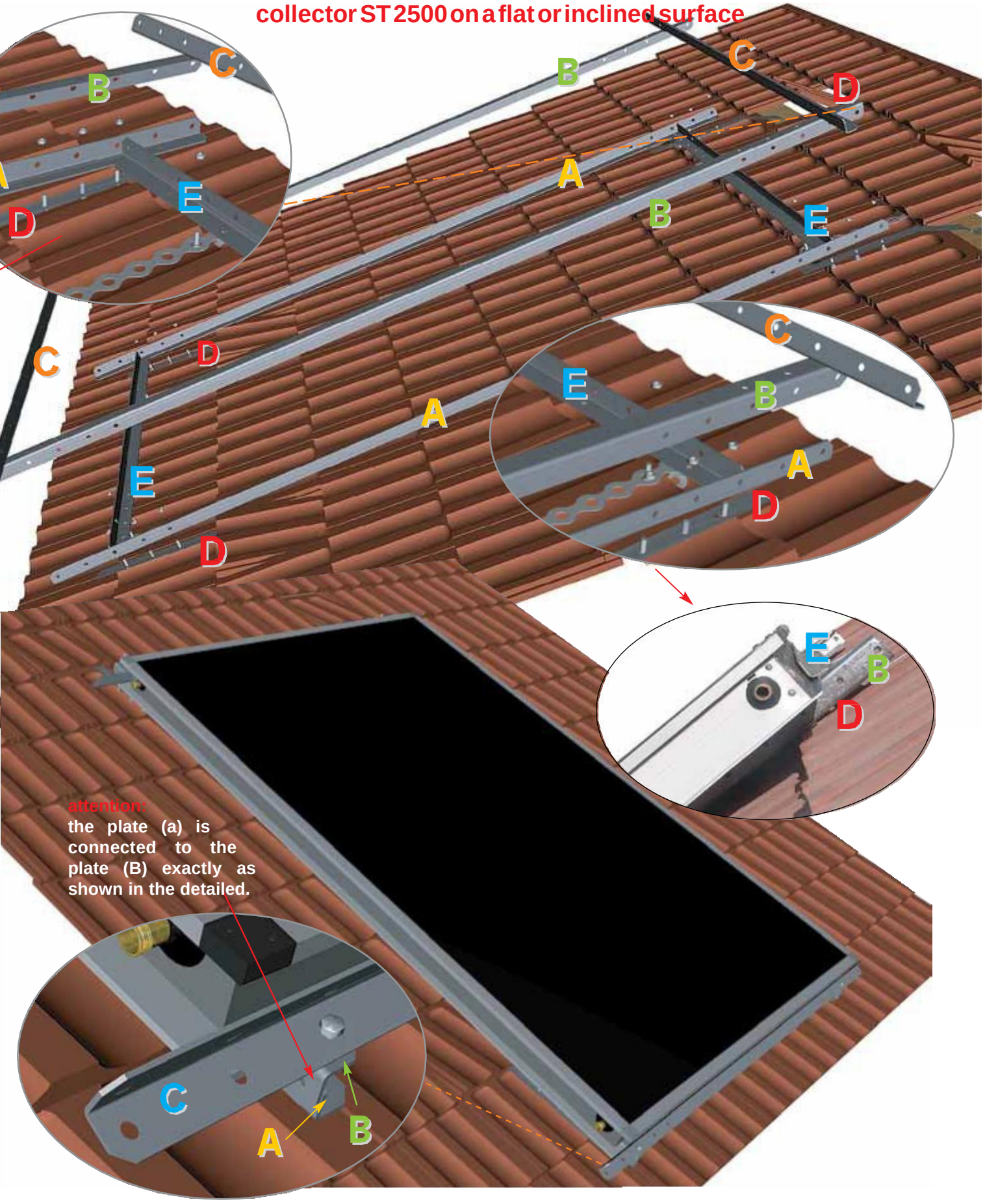
Assembly diagram of the support base for one





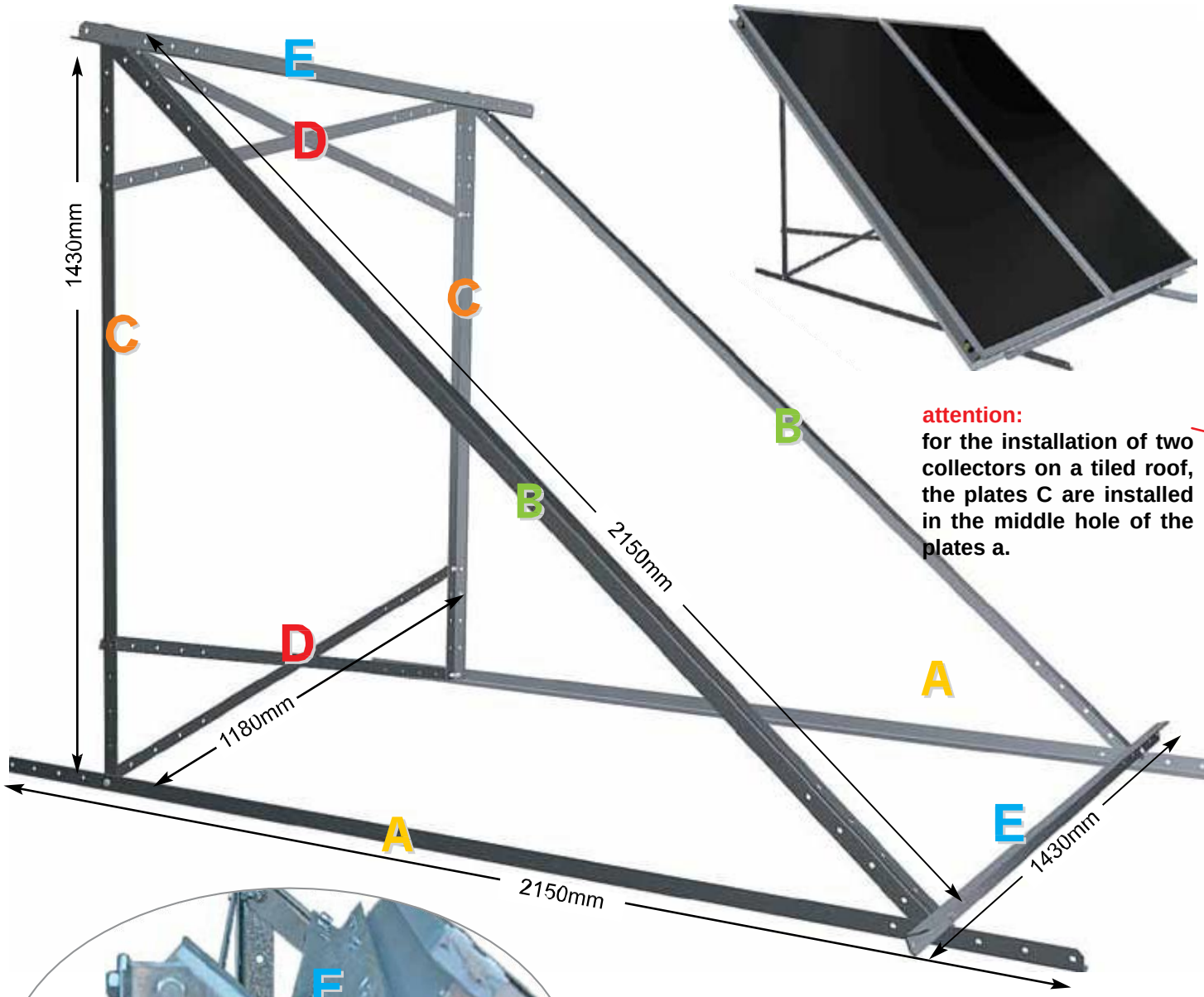


collector ST 2500 on a flat or inclined surface

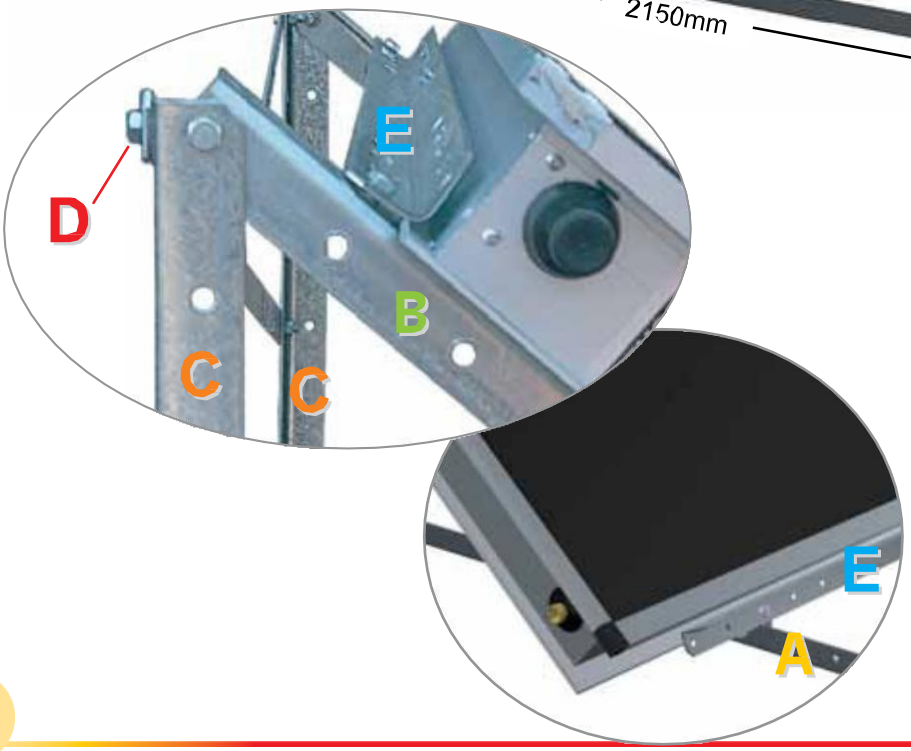


attention:
the plate (a) is connected to the plate (B) exactly as shown in the detailed.

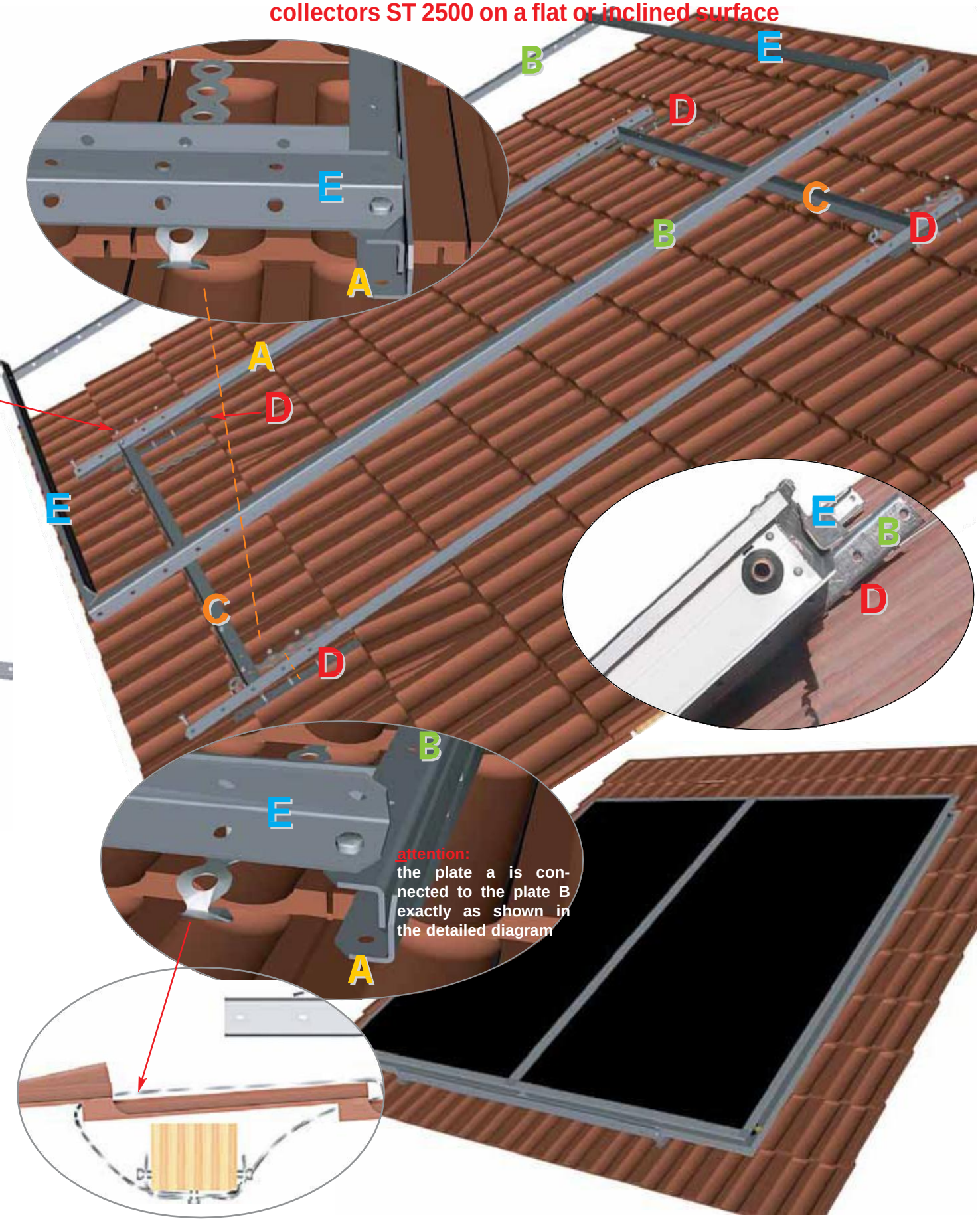
Assemply diagram of the support base for two



attention:
for the installation of two collectors on a tiled roof, the plates C are installed in the middle hole of the plates a.

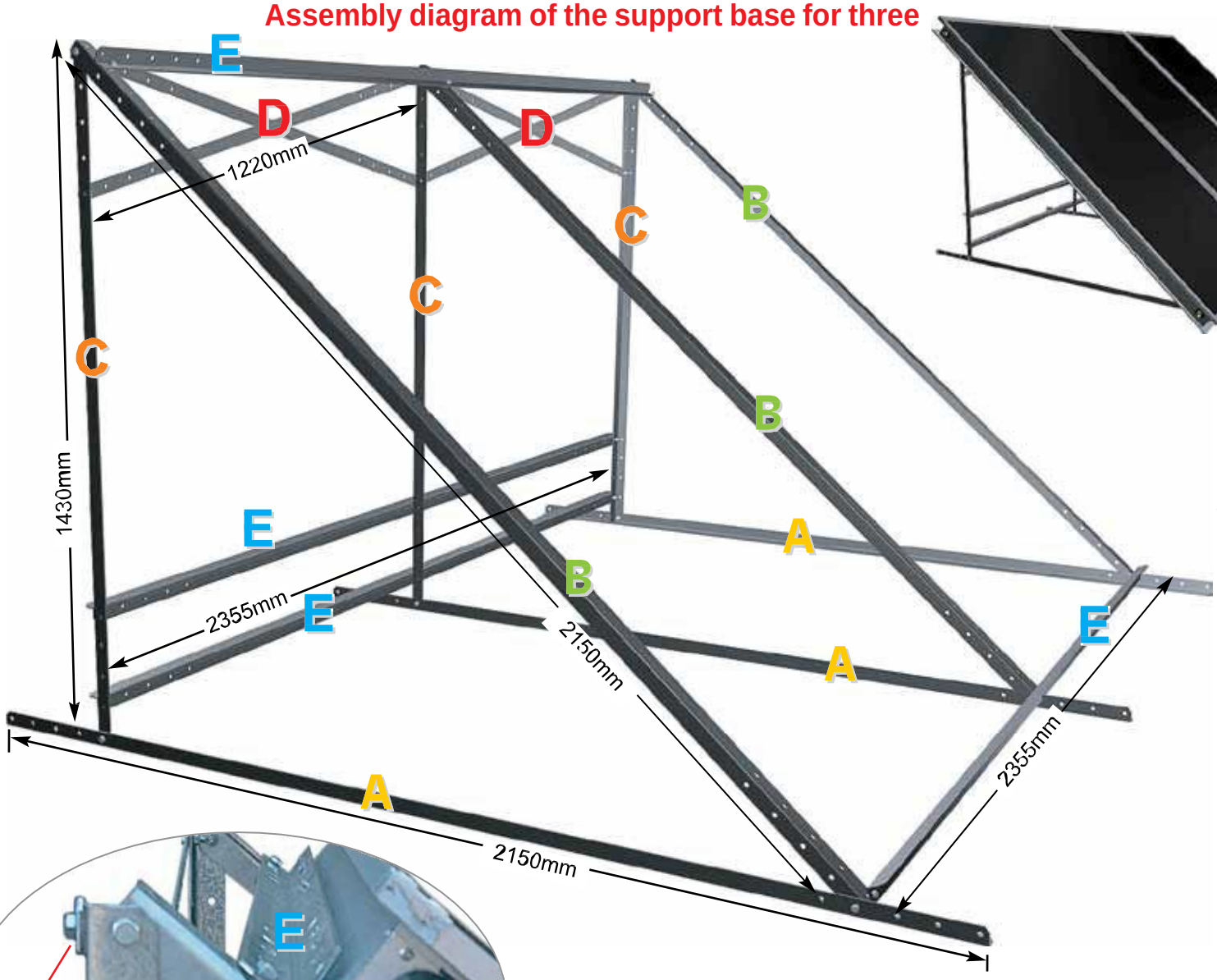


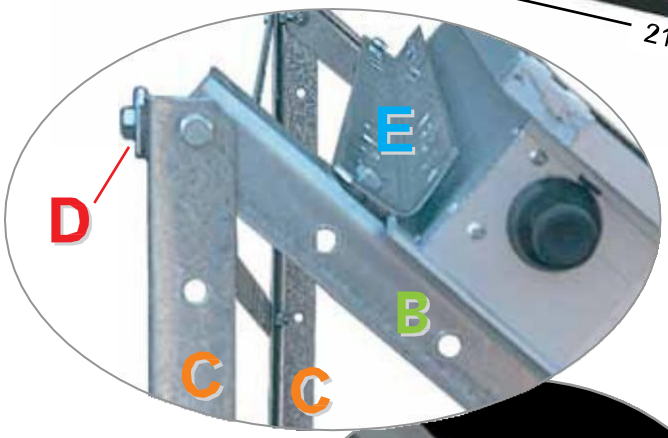
collectors ST 2500 on a flat or inclined surface

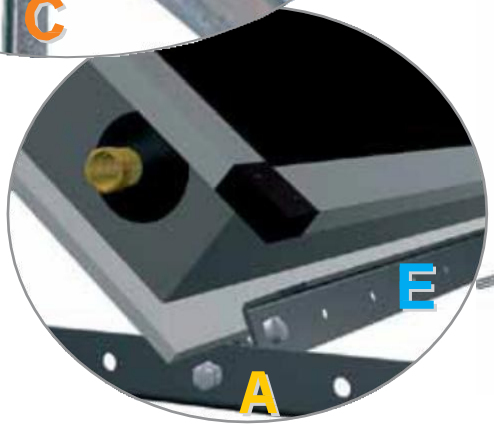


attention:
the plate a is connected to the plate B exactly as shown in the detailed diagram

Assembly diagram of the support base for three

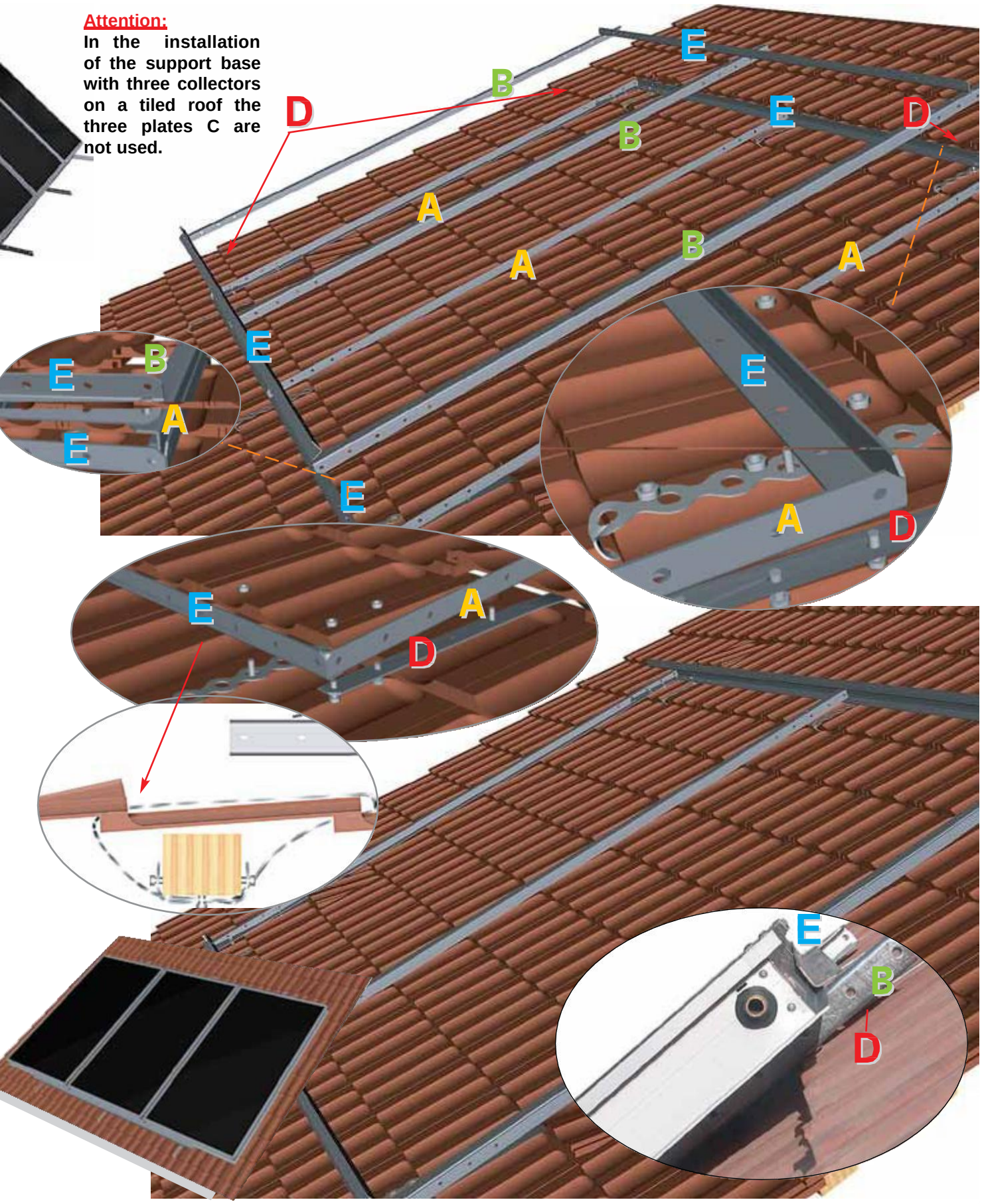






Collectors ST 2500 on a flat or inclined surface

Attention:
In the installation of the support base with three collectors on a tiled roof the three plates C are not used.



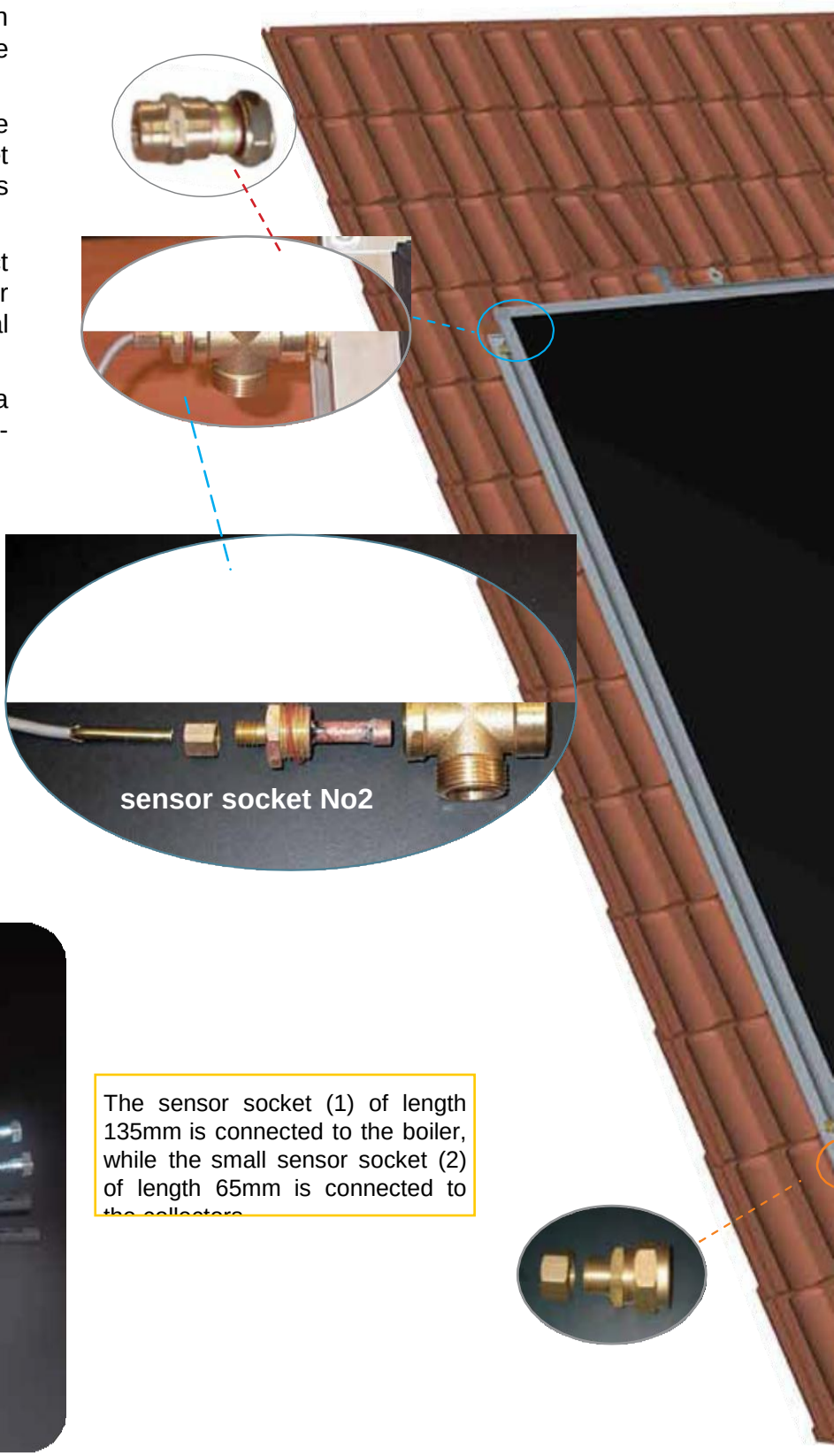
Connection of collectors and accessories

For the connection of two and three collectors to each other you must use the bronze connecting records as shown in diagrams. The bronze plugs $^{1}/_{2}$" are connected diagonally on the collector(s).

The bronze cross, the degasser and the sensor socket are connected to the outlet on the highest point of the collector(s) as shown in the photo.

In order to achieve the best contact between the the sensor and the sensor socket, use thermal conductive material before connecting.

The above accessories are found in a plastic bag which is included in the accessories box.



The sensor socket (1) of length 135mm is connected to the boiler, while the small sensor socket (2) of length 65mm is connected to the collectors.

Connection of collectors and accessories

Hydraulic KIT

- For the connection of the hydraulic kit with the closed circuit (collectors, tube heat exchanger which is located at the bottom part of the boiler) refer to the hydraulic diagram of the solar system on page 19.
- The connection of the expansion vessel with the safety valve of the hydraulic kit must have greatest length of 2 meters, without any corners and without any high air gathering area. The diameter is 3/4".
- After the plumbing installation, the closed circuit must be cleaned. The cleaning of the system is achieved with water for 15 minutes by isolating the circulator from it's two valves which are located before and after it and by opening the two inlets / outlets of the system. The inlets / outlets have records (male) for connection to a plastic pipe.
- Before the filling of the closed circuit, we must check the water tightness of all of the connections. We can, for instance, during the cleaning, turn-off one of the emptying-filling valves and use a pressure pump or the pressure of the water supply so that we can raise the pressure to 5 bars for 15 minutes.

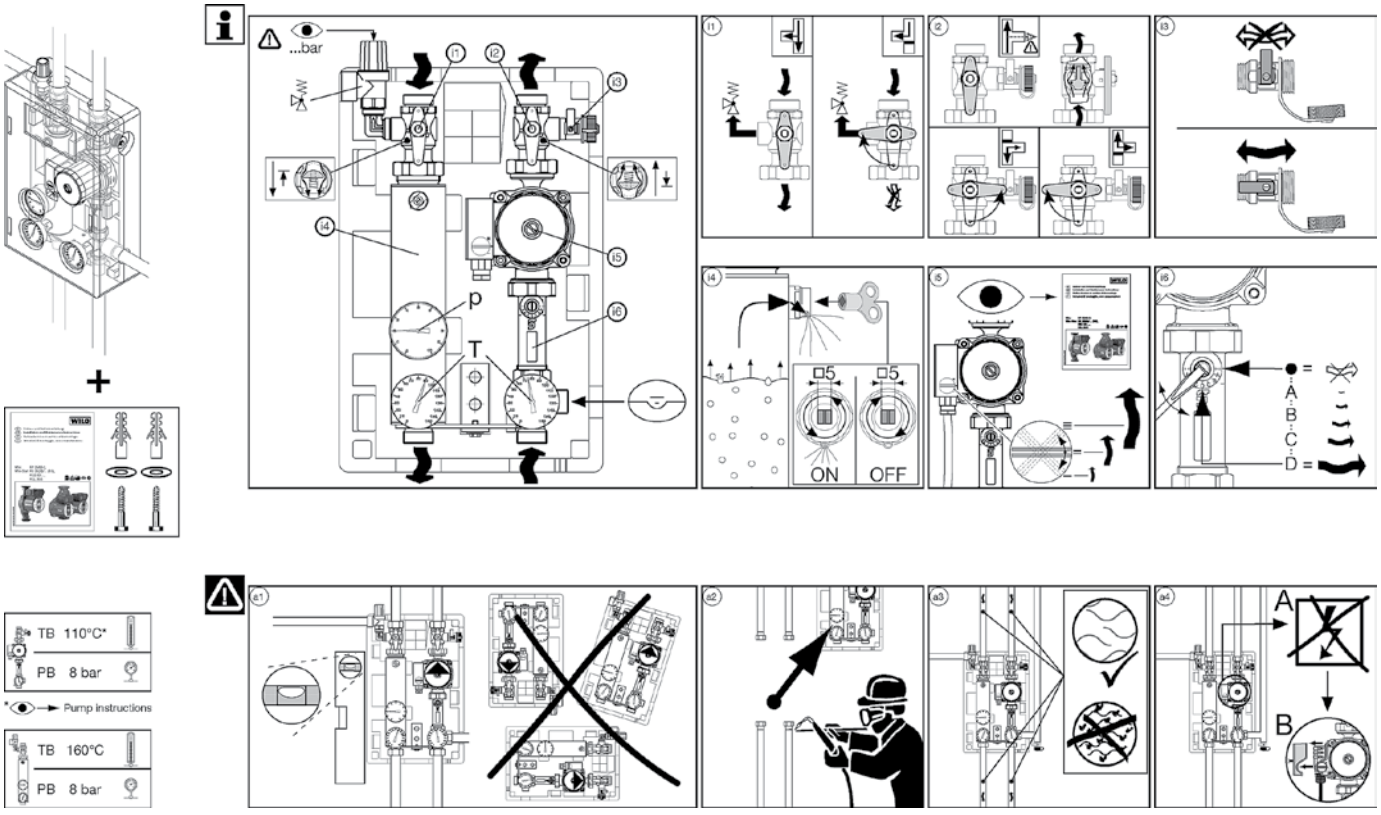
Attention: the expansion vessel must be isolated so as to minimize the overload of the maximum functioning pressure.

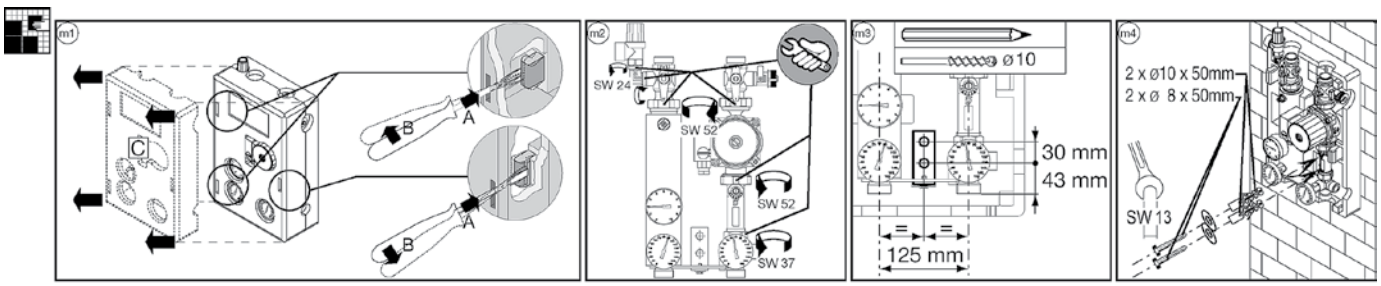
- The mixing of the antifreeze liquid must be done before the filling and in accordance to the lowest environmental temperature (see table on page 23).
- The filling of the system can be done either from the top part of the collector, by the gravity or with a pump from the hydraulic kit. The functioning pressure, between 1,5 and 3 bar, can be achieved with the pressure pump or the pressure of the water supply. We constantly check all of the points of degassing, while filling simultaneously with liquid.
- All of the installations and connections of the system must be done according to the electric, plumbing, and construction etc… regulations applicable in your country.
- It is recommended that a pail is placed under the hydraulic kit in which water or liquid will be accumulated from the dripping of the safety valve. This is really useful during the filling and degassing or the hydraulic testing since the valve opens at 6 bar.

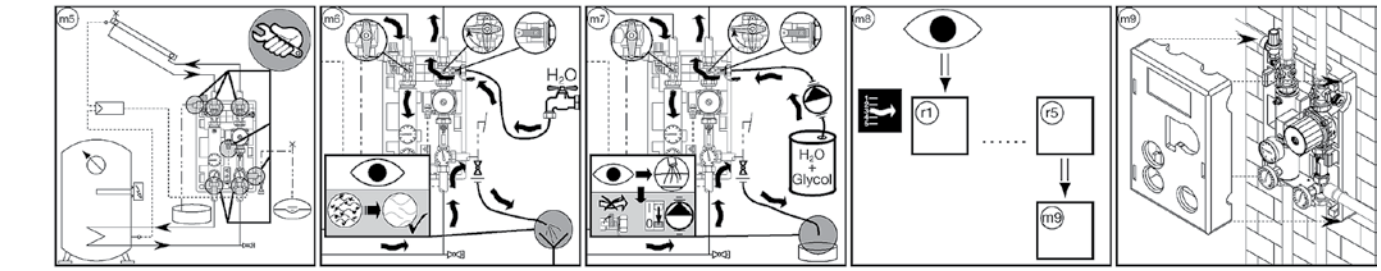
Piping of the closed circuit

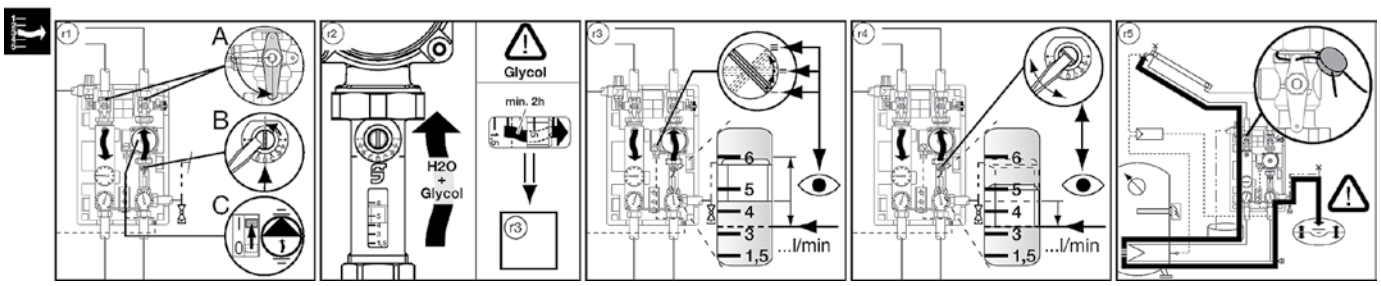
- All of the piping that leave and return from and to the collectors have to be properly insulated so that they can withstand temperatures from -30ºC up to +120ºC. It is also necessary to use an anti-UV (solar radiation) for the insulation.
- The insulation must have suitable thickness in Accordance to the local climatic conditions.
- The distance between the collectors and the tube heat exchanger of the boiler must be the least possible so as to minimize the thermal losses.
- Air trapping areas must be avoided. If this is not possible, an automatic degasser must be installed at that point.
- The diameter of the pipes must be from Δ18mm - 22mm for distance up to 20m and Δ15mm for distance down to 12m.
- All of the connection records which will be used must withstand pressure of 6 bar and temperatures between –30ºC and + 200ºC.
- After the guarantee has expired, it is recommended that a yearly check is made on the installation and the connections.

HYDRAULIC KIT







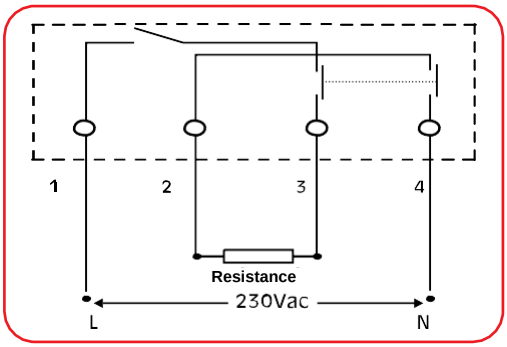


ELECTRIC CONNECTIONS

- For the installation of the differential thermostat, refer the producer's manual which is included in the package.
- All of the units function with 230V / 50Hz.
- In the case where an electric resistance is installed, the voltage must be checked. The electric resistances up to 4kW are 1~230 V with thermostat, while for the electric resistances 6kW - 9kW the voltage is 3~400V and the installation of a thermostat is the installer's obligation.
- The thermostat once installed and adjusted functions automatically on the boiler. According to the needs of the client, the temperature of the water can be adjusted by the installer to lower or higher levels from the original adjustment and between 30ºC - 80ºC. In the case that for some reason the temperature exceeds the tolerated safety level, the safety unit is activated. This is adjusted to be activated when the temperature of the thermostat reaches 100ºC (±10). In the case that this happens, you must determine its cause. After the water cools down, we can reactivate it manually by pressing the red button.
- During the transport of the thermostats and during the process of installation avoid the hitting / banging, dropping of the thermostats, because they can cause serious damage to the thermostat with very dangerous consequences to its operation. The electric installation should be made by a licensed electrician. A faulty electric connection can cause an explosion of the boiler.
- In the case where the hot water consumption needs are during periods of the day with little or no sunlight, for instance after 17:00 or before 10:00 a.m., the use of a timer is recommended. This will automatically activate the electric resistance and as long as there is a need for hot water.
- All the connections must conform with the regulations (electrical, plumbing, urbanism and others) that apply in your area.

after completing the installation of the system, clean the area where you have worked , fill out the guarantee and send it by registered post to Helioakmi S.a.

ELECTRIC CONNECTIONS OF THE ELECTRIC RESISTANCE AND THERMOSTAT*



ELECTRIC RESISTANCE

* For all countries except South Africa

HELIOAKMI S.A. is not responsible for damages to the products or third parties, which arise from the faulty installation of the unit.

The technical characteristics can change without prior notification.

Overheating

If your Solar Collector will be stagnant in the sun for an extended period of time, you should cover the collector to protect against overheating and damaging the collector and Your Solar Hot Water System. A heat dissipation device may be needed to protect against overheating

Snow and Wind loads

Snow and wind loads are a significant factor for structural planning. European norms were established, albeit without specifically taking solar installations into account. Wind and snow loads affect the collectors and the installation system. Depending on the conditions and height of the installation site as well as the collector inclination, the mechanical loads on the system can vary considerably. Also see guidelines for the planning of structural frameworks and standards EUROCODE 1, (European guidelines for structural planning). With combined snow and wind loads the maximum strain for the solar collector is 1,000 N/m². Note that wind suction spikes may occur on roof Edges.

It is mandatory to follow best practice rules for static planning, especially related to snow and wind loads. Different codes and regulations apply in different countries and regions. In case of doubt and/or in absence of exact static calculations (not recommended) always allow for additional fixtures, weight, anchors, and screws, especially in regions with known weather extremes.

Lightning protection

This type of installation, do not increase the risk of attracting lightning and there are no records of ever happened such incident. However we suggest that you check for a lightning rod in your area and also check if it gives protection to the place of your system. If it exists, and if it is not enough, we suggest that you provide a lightning rod according to your country rules and to EN 61024-1. We suggest that you connect the visible metallic parts (solar collectors, piping and support devices) to the lightning rod installation with copper cable never less 50 mm² cross section.

Note: the lightning protection must be done by qualified professionals.

The solar system can operate at extremely high temperatures. Please do not attempt to decommission the system yourself, as there is a risk of serious injury.

There is also a risk of electrocution from 240VaC electricity.

1. Always wear appropriate Personal Protective Equipment such as gloves and eye protection.
2. Even if the pipework near the cylinder seems cool, the panels can be at high temperature. Decommissioning should therefore only be attempted when there is no solar input, or the panels should be covered with light proof covers and left for at least 5 hours.
3. Turn off the switched fused spur and remove the fuse. Leave the fuse holder open and use a padlock or similar to lock it open. Leave a conspicuous sign stating the power should not be reconnected.
4. Connect a short length of hose to the drain point situated at the lowest point of the system and place in a suitably sized container – do not drain into the public sewerage system. Antifreeze liquid must be disposed of correctly.
5. Open the check valve.
6. Slowly open the drain tap. When the initial low created by pressure has stopped, open the air-vent at the top of the solar panels.
7. When the luid has inished draining, disconnect the pipework starting at the upper part of the system. Caution – there may still be luid in the pipework.
8. Dispose of any materials correctly.
9. Panels should only be removed by qualiied professionals using appropriate access and safety equipment.

The law requires employers to appoint one or more competent persons to assist them in identifying and implementing the preventive and protective measures required.

Maintenance schedule

TO BE SIGNED ON Completion OF Commissioning

Date of site visits for bacterial, water Quality and access risk assessments.	.....
Commissioned by.	.....
Competent persons scheme unique identification number.	.....
On behalf of.	.....
Date system commissioned and Handed over.	.....
Signature of commissioning engineer.	.....
Signature of user to confirm receipt and understanding	.....

Maintenance log

Date:	Name of engineer/company:
Date:	Name of engineer/company:
Date:	Name of engineer/company:

Instructions to the end user and installer

INSTRUCTIONS TO THE END USER aND Installer

- The solar systems do not require the intervention of the user. It is recommended though, that after the first 15 days of functioning, to check the pressure of the closed circuit (collector - boiler) and that the temperatures are at normal levels in relation with the time of the inspection, the sunlight and the «Installation Sheet».
- After two years of functioning, it is recommended that a program of annual service is begun. The maintenance program is to replace the fluid loop circuit and maintain the proportions of propylene glycol, replacing the magnesium anode and check the operation of all existing valves
- If there is a breakage of collector's glass, it must be replaced immediately so that the absorber will not be damaged.
- In dusty conditions or small rainfall, it is recommended to clean the glass with a damp cloth, if the collectors are dirty. It is also recommended that the glass of the collectors is washed at least twice a year with water, except if it often rains.
- After the installation is complete, the installer will have to inform the client about the functioning of the system.
- In the case of any malfunction of the system, we recommend the client to contact the installer as he knows all of the various parameters and the possible particular characteristics of the installation.
- The valves must be periodically checked to assure their correct functioning .
- The installer who will make the disassembly must be a specialized and certified installer in accordance with the national regulations that apply in your country. When the installation is completed he must leave the place in the same conditions as before the installation.
- The mixing valve (when installed by the installer) must not be regulated in a temperature above 60°C. There is only one thermostat and should not be set up above 60 °C.
- Before putting the system in operation, the installer must check all the valves and fittings, including also the loop circuit as well as the main water tank.
- The safety valves must be checked periodically to Assure their proper functioning
- If there is a danger of frost, please check the loop circuit to confirm if the s antifreeze liquid conforms with the rules. In case of overheating check the overheating valve to assure that the circuit is working properly.
- Do not start the system operation if the weather conditions are around 0°C. Check the loop circuit and the quantity of the antifreeze liquid. Consult the standards of the builder.
- The thermal efficiency and the solar quantity of the system is according to paragraph 5.9 of EN 12976-2, for loads defined on the proposed load.
- NOTE: during high radiation do not close the supply of water and do not empty the system
- NOTE: The water consumption of the system can be withdrawn during high radiations to prevent the overheating of the system.
- The heat transfer liquid is propylene glycol
- During periods of prolonged absence it is recommended the collectors to be covered with an opaque covering so that to avoid working unnecessarily. Do not use plastic material or glass Material for their cover.
- The system does not use any electrical device for freeze protection, because it works with propylon glycol.
- The overheating protection of this system it is not electrical dependent, however it should not be disconnected from the electricity or water supply network.

Installation INSTRUCTIONS

- The piping system used on the system is Resistant to rain and moisture.
- The hot water piping system is thermal insulated.
- Sk maximum (snow load) is 2kN/m² according to ENV 01/03/1991, and Vm (mean wind speed) is 180 km/h.

  Disclaimer: This equipment can be installed in areas with snow load values under 2kN / m² and the wind speed average under 180 km/h.
- Our equipments can be only installed with safety valve on the inlet cold water to prevent over pressure. An safety valve to is also needed in cases where there is overheating circuit which uses metal pipes (copper, stainless steel or steel) to hot water extraction. This pipe system is connested to the extraction system of the equipment. This system should not cause any problems to any other building material.
- The system should be used with mixing valve to draw-off temperature limit of 60 °C.
- The installation of the system should be performed only by authorized installer. Collectors should be covered during installation, for example with the same cover used for transportation. The collectors will be filled with propylene glycol + water, without air. After that, the collectors cover can be removed. To start using the collectors, open the water. After that, you can use the installation. To re-check, please perform the same procedure.
- The operation of the system can start since everything was checked and is correct.

  The end user should also confirm that everything is correct and uses the invoice has warranty.
- Declaration: the sizing of the system depends on the climatic conditions of the area where the systems is installed.
- Check the gaskets, valves, fittings and thermal insulation (replacing it if necessary). Furthermore, it should check the general state of metallic structure as well, screws and nuts, in order to detect any type of wear or damage. This is especially important in marine environments. The charges from these repairs will be the responsibility of the owner.
- If the water pressure exceeds 6 bar, you must install a pressure reducing valve.
- The system should be installed as close as possible to the place of consumption of hot water. It is very important to inform end user, of technical aspects of installation, to agree with him all the details in this way, a secure installation and aesthetics possible, respecting the appearance of the building where it will be performed.
- The system can be installed on the roof, terrace or garden, on a firm surface and sturdy, which does not receive shade of nearby obstacles in any season.
- Comply with current regulations on water and electricity installations. Keep in mind the local conditions of wind, especially during assembly. The damage resulting from faulty installation are not covered under warranty.
- The tank must be full of water before filling the primary circuit or filled with the heat transfer fluid before connecting the electrical resistance backup.
- After finished the system installation, make sure that all leftover materials used on the installation, are collected, since they may cause injury or damage to third parties.
- The reading of this instruction manual is very important, since it's not checked, may void the warranty.
- The piping system used in this system is waterproof and moisture.
- All pipes for conducting hot water are thermally Isolated.
- a hose must be used for hot water draining to the nearest gutter, to avoid damage in materials or people.

Warning: THE Installation Should NOT Compromise THE Structural Integrity OF THE Building ON which IS Installed.

IN THE Case OF malfunction (Instructions to the installer)

Ensure that:

- The climate conditions permit the functioning of the solar system.
- There is no shading of the collectors by any Obstacles and that they are clean from dust.
- That there is no leakage in the closed circuit and that all of the connections, raccords, and pipes are tightly screwed and water-tight.
- That the function of the circulator is correctly programmed.
- The mixing valve for hot / cold water in the outlet of the boiler is correctly adjusted and is functioning.
- The pressure of the closed circuit (indication of the manometer on the hydraulic kit) is the same, with the one described on the «setup sheet» (around 1.5 – 2.5 bar). To start immediately the system fill the closed circuit with a mixture or water and antifreeze liquid or adjust the automatic filling tap, until reaching the indicated pressure in the "installation sheet".
- There is enough liquid in the closed circuit of collectors - tank. During days with high radiation and normal operation of the pump, the pipes in their highest points (outlet of collectors) should be warm (be careful with the high heating due to solar radiation).
- The circulator is functioning if the weather conditions allow for it's function. By touching the circulator we can feel the vibrations of the system. Check the electric current on the electric board and
- There is no air in the expansion vessel and the safety valve was not opened.

Note: All the connections and the installations must be done according to the regulations (electrical, plumbing, urbanism and others) that apply in your area. Instructions to the customer and installer In the case of the malfunction of the sys- tem and before contacting the installer, distributor or agent, please have at hand the information on the next page.

The product warranty terms and condition apply.

INSTALLATION SHEET

(Filled out by installer, kept by client)

Full name of client . . . . . .
Address / Telephone . . . . . .
Model . . . . . .
Date of Installation . . . . . .
Installation of the collectors (tiled roof, flat roof, other) . . . . . .
Collectors facing: South . . . . . East . . . . . West . . . . . .
Inclination of the collectors . . . . . (in ºC)

Characteristics of plumbing

- Test pressure of the closed circuit. . . . . (bar)
- Test pressure of the expansion vessel (nitrogen) . . . . . (bar)
- Relation of glycol . . . . . (%) water . . . . . .(%) glycol
- Existence of automatic filling . . . . . YES / NO
- Initial filling with pump . . . . . YES / NO

Electric characteristics / adjustment of differential thermostat

- Model of Differential Thermostat .....
- Adjustment of maximum temperature for the protection of the boiler . . . . . (ºC)
- Adjustment of starting differential temperature . . . . . (ºC)
- Adjustment of the hysteresis temperature . . . . . (ºC)
- Adjustment of antifreeze protection . . . . . (ºC)
- Description of the electric connection of the circulator (for example: direct in the differential thermostat or use of electric board with safety switch especially for the circulator).

. . . . . .
. . . . . .
. . . . . .

General comments:

. . . . . .
. . . . . .
. . . . . .

Personal data of the installer:
Full name . . . . . .
Address . . . . . .
Telephone . . . . . .

Personal data of the distributor or agent:
Full name . . . . . .
Address . . . . . .
Telephone . . . . . .

INSTRUCTIONS FOR THE INSTALLER

(Filled out by installer, sent to manufacturer)

After the installation is complete, the installer with the help of the check list below has to check all of the points which are noted and mark in the relevant column if it has been correctly done with YES or NO.

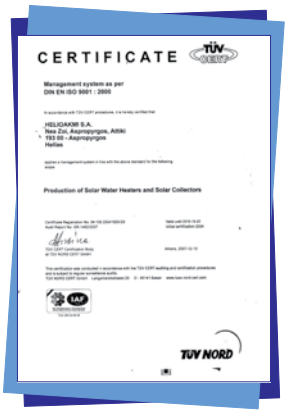
IIST	yES	NO
COLLECTORS AND EXTERNAL PIPING		
Is the installation and the fixing of the support base according to the instructions and local regulations ?		
Is there an ideal location and facing of the collectors ?		
Is there humidity inside the collectors ?		
Is water allowed to flow under the collectors?		
Are the hydraulic connections of the collectors correct ?		
Has the function and installment of the sensor on the collectors been done correctly?		
Has there been good UV protection on the thermal insulation ?		
Has there been good insulation of all the piping?		
Has the installment on the roof been done according to the local regulations?		
PRIMARY CIRCUIT (SOLAR)		
Does the inclination of the pipes allow the degassing from the highest point?		
Does the closed circuit have the right pressure?		
Are there any leaks in the closed circuit, the connections, or in the tube heat exchanger ?		
Is there a manometer in the closed circuit of the collectors ?		
Is the loading valve installed properly?		
Was a non-return valve installed?		
Was a discharge valve installed in the lowest points?		
Does a receptacle exist for the leaking of liquid or thermal fluid / water?		
Is there a safety valve connected?		
Is there an indication of the make and type of thermal liquid on a label installed in a viewable area ?		
DIFFERENTIAL THERMOSTAT – ELECTRIC CONNECTIONS		
Is the differential thermostat programmed for the right temperatures?		
Does the differential thermostat function properly?		
Is the maximum temperature of the boiler adjusted properly? (if a mixing valve has not been installed for hot / cold water at the outlet of the boiler)		
Have the sensors of the boiler and collectors been properly connected?		
Do the sensors of the boiler and collectors function properly?		
Are the electric cables properly fixed?		
Has the electric connection been done according to the local regulations? (insulation, grounding, etc…)		
BOILER AND HOT WATER CIRCUIT		
Is the electric resistance connected properly. (if it exists) Does a mixing valve of hot / cold water exist?		
Is the insulation of the boiler in good condition?		
Is the safety valve connected to the sewer?		
GENERAL		
Was the guarantee properly filled and given to the client?		
Were the instructions of use given to the client?		
Was the proper selection of the model made according to the needs of the client?		
Was the client informed with the other choices that exist for the production of hot water ?		

This check list must be sent along with the guarantee to the manufacturer
HELIOAKMI S.A., Nea Zoi, Aspropyrgos Attiki, 19300 Greece

Personal data of the installer:
Full name . . . . . .
Address . . . . . .
Telephone. . . . . .

Personal data of the distributor or agent:
Full name . . . . . .
Address . . . . . .
Telephone. . . . . .
Signature of installer: . . . . . .

WORLD WIDE RECOGNITION



From the extensive research & the design… … to the final product

The MEGASUN products are manufactured under the strictest International specifications and their production is inspected at each productin stage. Each MEGASUN product has a SPECIAL QUALITY & INSPECTION IDENTIFICATION BADGE that certifies:
• IT'S QUALITY • IT'S PERFORMANCE • IT'S DESIGN

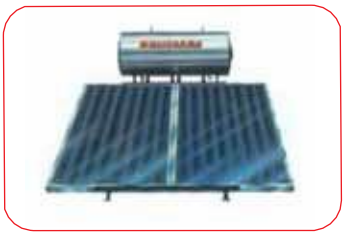
1. Conference room **2.** Design of products & moulds **3.** Automatic welding machine of the storage tank **4.** Automatic welding machine of the storage tank side covers **5.** Six - Stage automatic sand-blasting unit **6.** Drying & polymerization furnace for the internal protection of the storage tank **7.** Boilers before assembly **8.** Assembly of the storage tanks **9.** Packaging

World leader in Solar Water Heaters, 35 years before the others discovered the power of the sun

1970 *design of vertical storage tank with open circut system*

1978 *vertical storage tank with both open and closed circuit system*

1980 *Horizontal storage tank with closed circuit system*



1983 *Horizontal storage tank (made from stainless Steel) with closed circut system*

1985 *Horizontal storage tank with closed circut system (with "Sandwich" type solar collectors)*

Thirty five years of manufacturing Solar water Heaters means thirty years of innovating in the field, and introducing new technologies.

Three decades of continuous development, combined with vast experience and extensive research have established mEGaSUN products as leaders in most world markets.

Thousands of mEGaSUN Solar water Heaters are successfully in use in most countries of the world - from athens to america and from africa to australia, to all of asia and the Far East, covering all continents - Providing continuous and abundant hot water even in the most difficult climatic conditions.

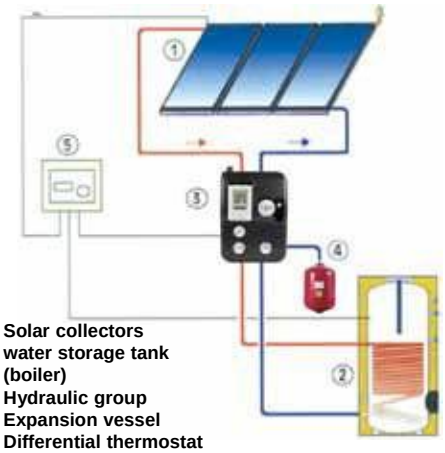
Today, HEllOaKml not only represents highly specialized technology and the experience of 35 years, but high quality Systems which meet the highest demands.

Over 20 million litres of hot water are supplied daily by Helioakmi's installed solar water systems throughout the world, contributing to the ecological protection of the environment on a daily basis.

Some of the countries where mEGaSUN is successfully exported

Germany, Italy, France, Spain, Canary Islands, Portugal, Holland, Austria, Belgium, Sweden, Bulgaria, Slovenia, Albania, Cyprus, Australia, N.Zealand, Oman, Bahrain, U.A.E., India, Thailand, Malaysia, Indonesia, Philippines, Korea, Argentina, Brazil, Chile, Bolivia, Venezuela, Aruba, Grianada, Martinique, Nevis, St. Lucia, Dominican Rep., El Salvador, Costa Rica, Nicaragua, Panama, Malta, Morocco, Tunisia, Egypt, Libya, Algeria, Senegal, Ghana, S. Africa, Kenya, Botswana, Namibia, Zimbabwe, Tanzania, Zambia, St. Mauritius, Reunion, Madagascar... and others

And we continue…

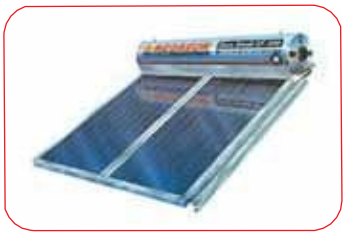


1. Solar collectors
2. water storage tank (boiler)
3. Hydraulic group
4. Expansion vessel
5. Differential thermostat

1988 *Integrated solar water heater Compact with open circut system*

1990 *Horizontal storage tank with closed circuit system*

1994 *Horizontal storage tank with closed circuit system*



2000 *Horizontal polygonal storage tank with closed circuit system (120, 160, 200, 260 & 300 lt)*

2000 *Floor standing boilers (capacity 150, 200, 300, 420, 500, 800, 1000 lt)*