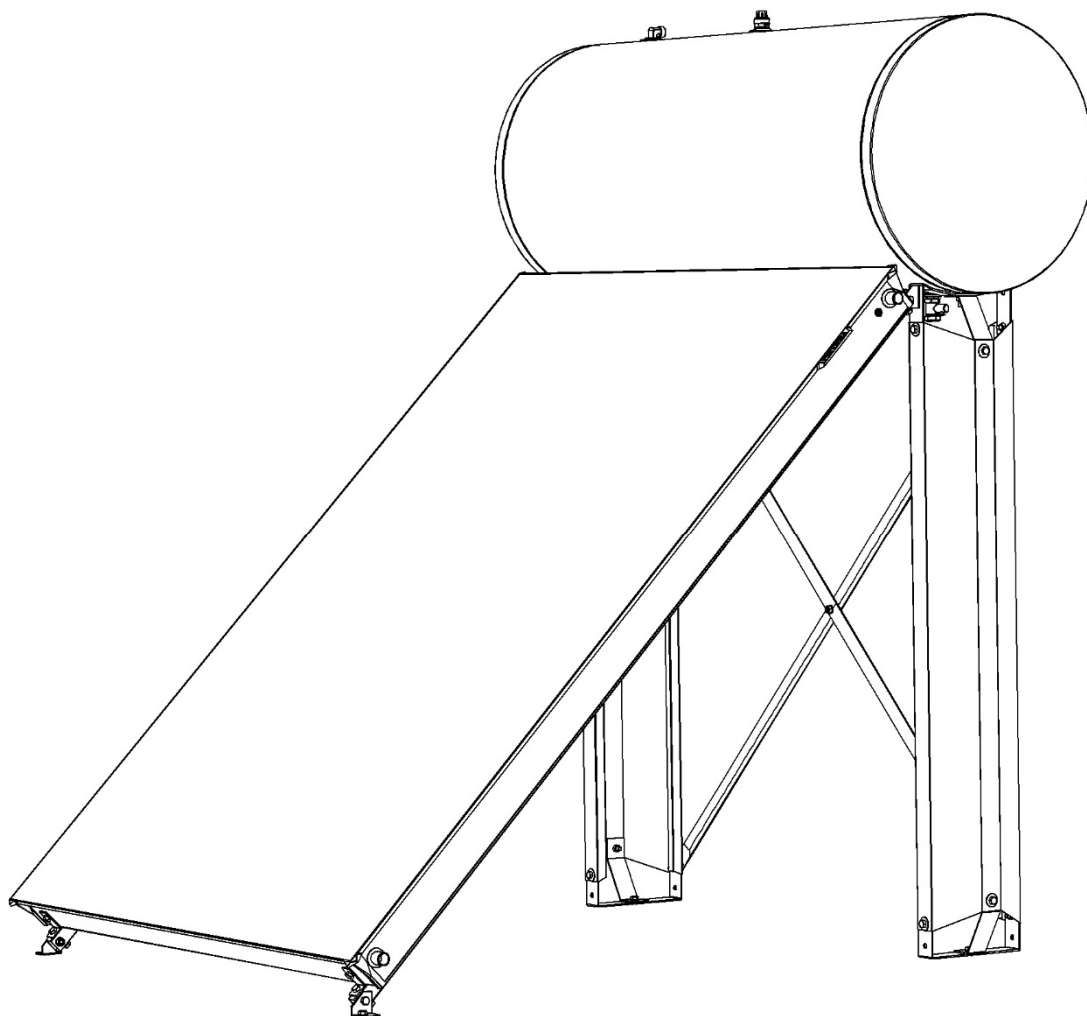


PRISMA



TECHNICAL DOCUMENTATION

THERMOSIPHONIC SOLAR WATER HEATERS

Thank you for placing your trust in our products. Our solar systems have been designed and manufactured according to the strictest quality standards so that they may offer many years of top of the range performance. For any clarifications regarding our products or this manual you may contact one of our dealers, visit our website www.calpak.gr or contact us directly.

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I. INTRODUCTION

SAFETY MEASURES

- Always use certified installation tools and full protection devices.
- In case you need to work near electrical wires, turn the electricity off.
- Always wear protective goggles, protective boots, gloves and masks in compliance with the respective safety regulations.

TRANSPORT & HANDLING

The tanks and the collectors come packed in expanded polystyrene frames and stretch films, where they must remain during all transportation and storage. The collectors must be transported in vertical position, in order to avoid any damage. During installation keep the collector covered until the closed circuit is filled with thermal fluid.

LIGHTING PROTECTION

Connect the metal part of the collector with the lighting protection system, if available or otherwise connect them to an earth rod. For further information consult a specialist.

Thermal effects due to lightning currents are considered negligible (Annex E, paragraph E 5.10 standard EN 12976-2).

The mechanical loads on the components of the solar system due to lightning charges are too low and the effect on durability and stability is considered negligible (Annex E, paragraph E 5.11 standard EN 12976-2).

The solar thermal system can be connected to the existing lightning protection at the roof of a building, in order to be protected against any form of damage due to lightning. Additionally, please note that the solar system is a natural circulation system and its electrical resistance is fed from the main building switchboard, provided that there is always possibility of connecting the electrical resistance of the storage tank to the building's central earth. The electrical resistance is tested according to standards EN 60335-1 and EN 60335-2-21.

THERMAL FLUID

It is a propylene glycol based thermal fluid, non-toxic to the skin. It must be used diluted in water in order to provide anti-freezing and anti-corrosive properties. The advisable percentage is 33% of water volume. In case of very low environmental temperatures, increase the volume percentage according to the following table:

Temperature (°C)	-10	-15	-20	-25	-30	-35
Percentage in water solution (%)	23	31	37	43	48	53

PERMISSIBLE SNOW LOAD AND MEAN WIND VELOCITY

The collectors are tested according to the standards EN 12975-2. Through these tests, it is admitted that they can resist without any failure to a mechanical load up to 2400 Pa.

SYSTEM COMPONENTS

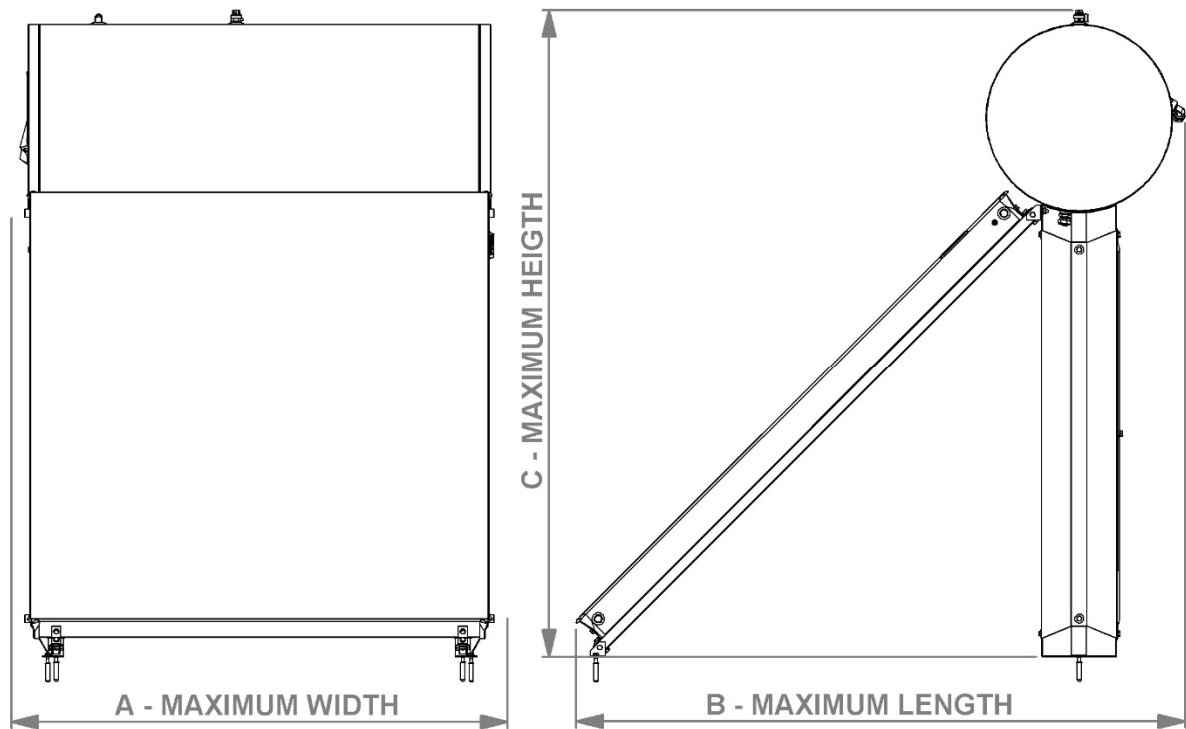
1. Collector
2. Tank
3. Support Base System
4. Thermal fluid (propylene glycol)
5. 1 pressure relief valve for the closed circuit
6. 1 safety valve for the domestic cold water line
7. Insulated connecting pipes
8. Pipe fittings

SYSTEM IDENTIFICATION

The tank and the collector/s which form a solar system are appropriately marked with metalized item plates. These plates include the technical characteristics of the system and the unit serial number according to paragraph 4.7 of EN 12976-1 and are placed on each part of the system (tank and collector/s)

II) TECHNICAL CHARACTERISTICS

Technical data	PRISMA flat plate selective collectors	
Type	Prisma 2.0	Prisma 2.5
Gross area (m ²)	2.00 m ²	2.50 m ²
Absorber area (m ²)	1.90 m ²	2.37 m ²
Aperture area (m ²)	1.91 m ²	2.39 m ²
W x L x H (mm)	1235x1625x85	1235x2020x85
Weight (kg)	29.15	35,4
Absorber capacity (l)	1,38	1,55
Housing	Pre-painted and galvanized steel	
Absorber	Selective aluminum	
Absorption	95±1	
Emission (%)	5	
Number of tubes	8	
Absorber tube Dia.	8 mm	
Glass	3.2 mm low iron mistlite tempered glass	
Transmittance of glass (%)	>0,91	
Insulation	30 mm glasswool	
Stagnation temp at 1000 W/m ² and 30°C	180 °C	
Max. operating pressure (bar)	10	



Collector

- Aluminum **flat plate** selective absorber
- Ultrasonic welded on copper harp
- Rock wool insulation
- Single piece pre-painted zinc coated alloy-steel (ArcelorMittal) casing
- Colofast[®] by BASF[®] reinforced collector body corners
- Low iron tempered glass

Tank

- Enameled tank according to DIN 4753/3
- Insulation with expanded polyurethane, 50mm thick
- Magnesium anode cathodic protection according to DIN 4753/6
- Electrical resistance 3,5 KW
- Heat exchanger to connect to a boiler (model TRIEN)

Base

- Heavy duty galvanized steel
- Optimized construction
- CNC production for superior accuracy and quality
- Unified system for all systems for ease of installation
- Superior anchoring to roof

Model		160/2	160/2.5	200/2.5	200/ 4	300/ 4	300/ 5
Dimensions [45 degree inclination]	Width (mm) A	1314	1314	1680	2594	2594	2594
	Length (mm) B	1624	1903	1903	1624	1624	1903
	Height (mm) C	1731	2010	2010	1731	1731	2010
System weight empty (kg)		87.15	93.4	108.4	131.3	154.3	166.8
System weight full (kg)		239.5	245.9	299.9	324.1	433.1	445.9
Optional electrical resistance (kW)		3,5	3,5	3,5	3,5	3,5	3,5
Tanks	Tank volume (l)	151	151	190	190	276	276
	Tank weight empty (kg)	58	58	73	73	96	96
	Tank weight full (kg)	209	209	263	263	372	372
	Length (mm)	1230	1230	1520	1520	1980	1980
	Diameter (mm)	Ø 500					
Collectors	Dimensions of collector (mm)	1235x1625 x85	1235x2020 x85	1235x2020 x85	1235x1625x 85	1235x1625x 85	1235x2020 x85
	Number of collectors	1	1	1	2	2	2
	Gross area per collector (m ²)	2.00	2.50	2.50	2.00	2.00	2.50
	Weight per collector empty (kg)	29.15	35.4	35.4	29.15	29.15	35.4
	Max. working temp.	180°C					
	Thermal liquid per absorber (l)	1.38	1.55	1.55	1.38	1.38	1.55
	Max. collector circuit working pressure	2bar					

III) POSITIONING OF THE SYSTEM

The installation area of the solar water heater must fulfill the following requirements:

1.1 The solar water heater **must face the SOUTH (or NORTH in case the installation takes place in the South hemisphere)**, and it is strongly recommended to use a compass to ensure this. Deviations of up to 10-15° does not affect substantially the system's efficiency, but larger deviations may seriously affect the performance.

1.2 In countries situated in latitude of 40°, the collectors must be installed at an angle of 45° against the horizontal level. The collectors must be generally placed at an angle of 5° over the latitude of the installation area. Any decrease in this angle entails considerable decrease of the solar heater's annual performance.

1.3 In no case are the solar heaters to be placed in the shade, especially during winter time, when the sun is lower in the sky. The minimum distance between the solar heater and any obstacle that causes shadow should be no less than twice the height of the obstacle.

IV) INSTALLATION OF SYSTEM ON A FLAT ROOF [All single collector models]

The Prisma base system has been pre-assembled so as to maximise ease of use and safety. Check that the subassemblies are as shown in the figures below and make sure that you use the correct subassembly for each step.

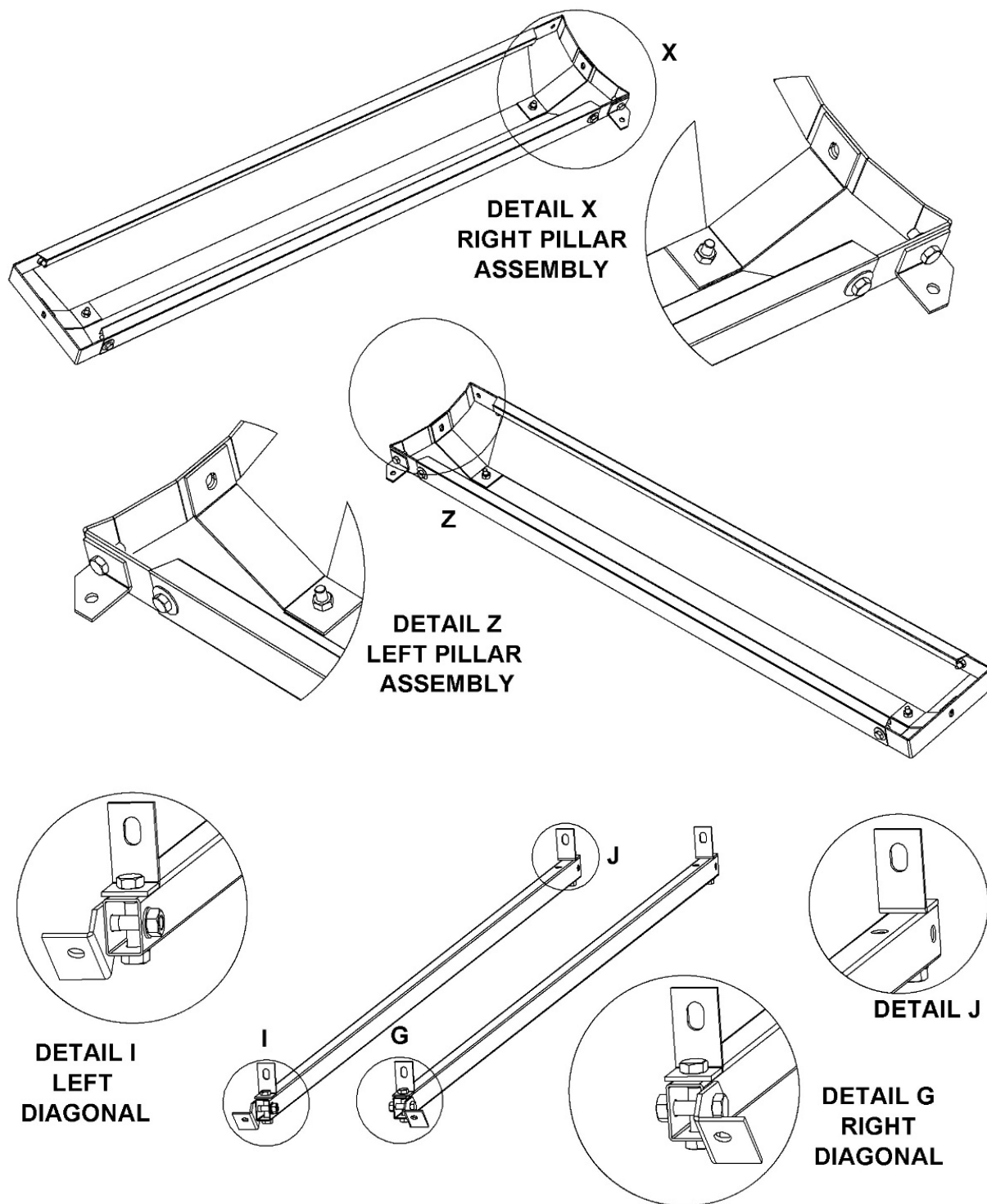
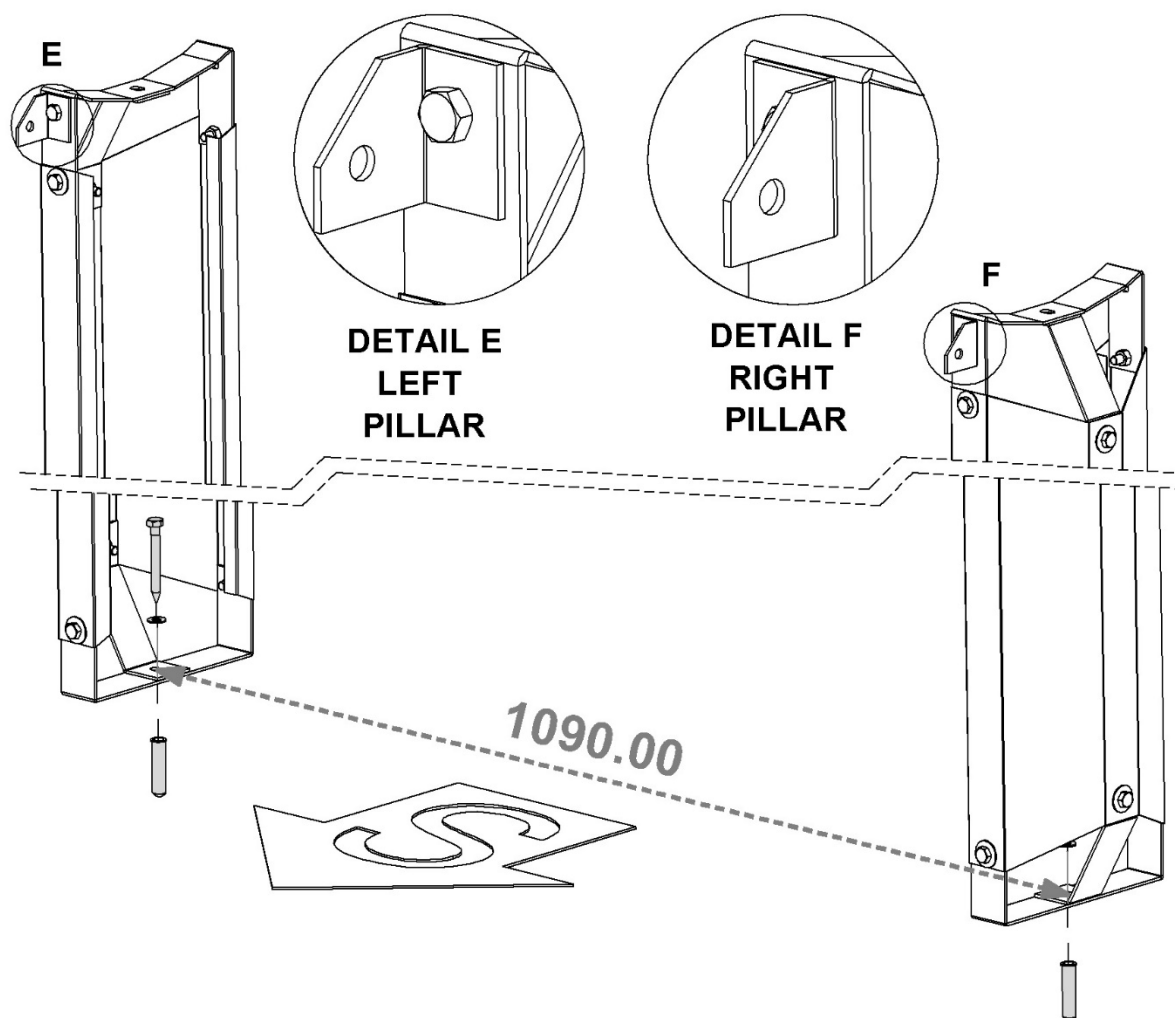


Figure 2: Prisma system preassembled components, from top to bottom: Pillar assemblies, collector diagonals. Note the differences between right and left variants.



STEP 1

Identify the area where the system will be installed according to the guidelines in page 7.

Identify South and install the two pillars as shown above. In the southern hemisphere point to the North.

The distance between the two holes should be 1090 mm.

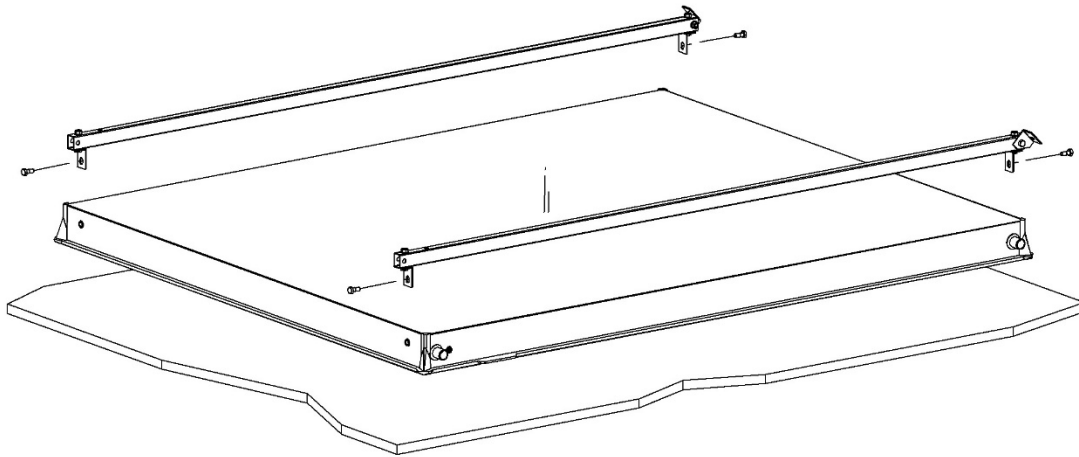
Make sure that the two pillars are parallel and aligned.

Note position of right and left pillar.

Fixing hardware [shown in gray] is not provided with the system, the installer must ensure that the hardware is appropriate for given roof material. Diameter of bolts should be 8mm, length and type according to roof.

ATTENTION: Failure to fix the pillars to the roof material will eventually result in support structure failure under extreme loading conditions.

In order to avoid humidity problems or water penetration (rain/snow) in the roof, the pipes which are entering the roof must be very well sealed. Local building engineer should provide you with precise guidelines depending on the kind of roof construction and/or local legislation. The same applies to the system anchoring points, regardless of the devices used for the installation.



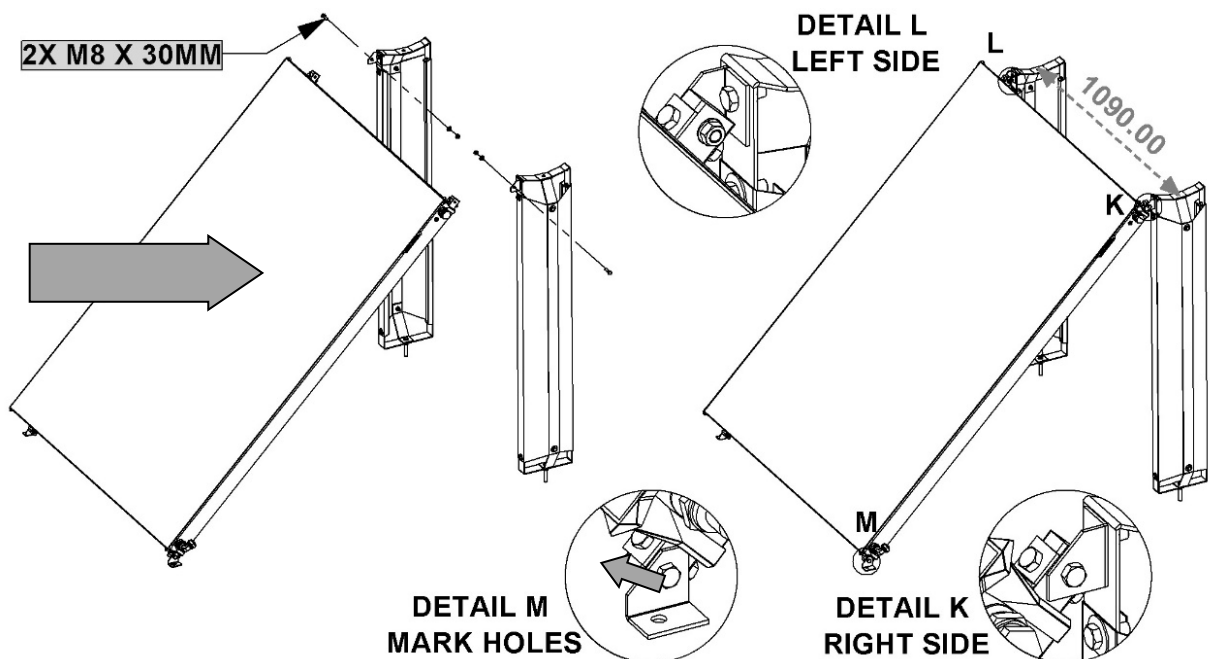
STEP 2

Carefully place the collector glass-down on a soft, flat surface such as packaging cardboard.

Install the diagonals on the collector noting the orientation.

Ensure that the rails are parallel and tighten the 4 collector bolts ensuring that you do not strip the threaded rivets from the collector shell.

DO NOT REMOVE THE COLLECTOR COVER!



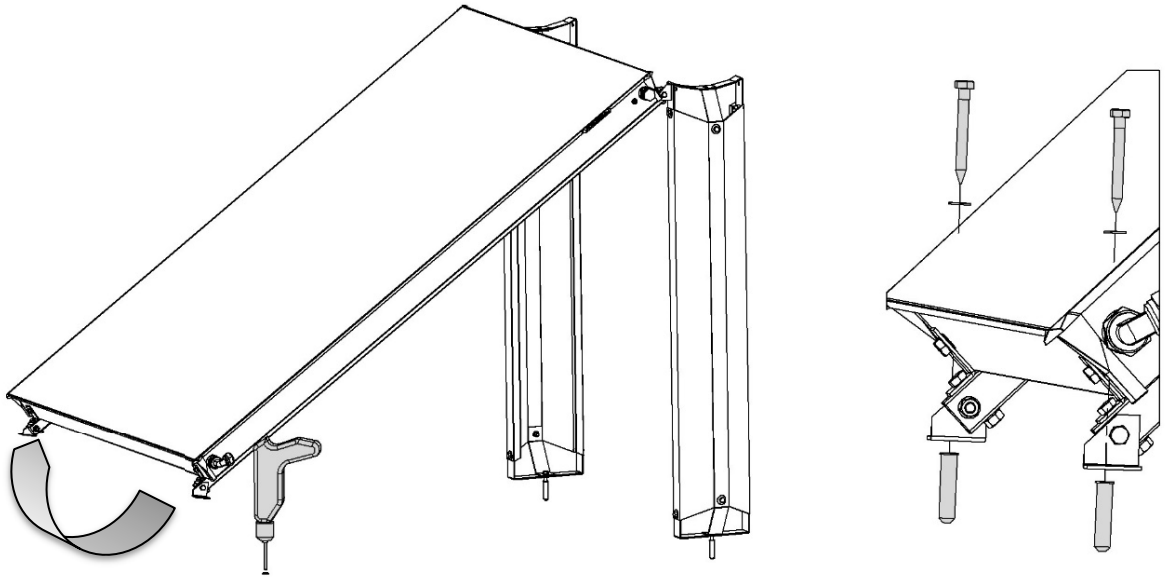
STEP 3

Carefully position the collector at an angle of 45 degrees and slide towards the pillars.

Connect the diagonals with the pillar assemblies.

Ensure the pillars are vertical and that the diagonals aligned. Check that the distance between the tank support holes is 1090 mm.

Mark on the roof the position of the holes at the feet of the diagonals.

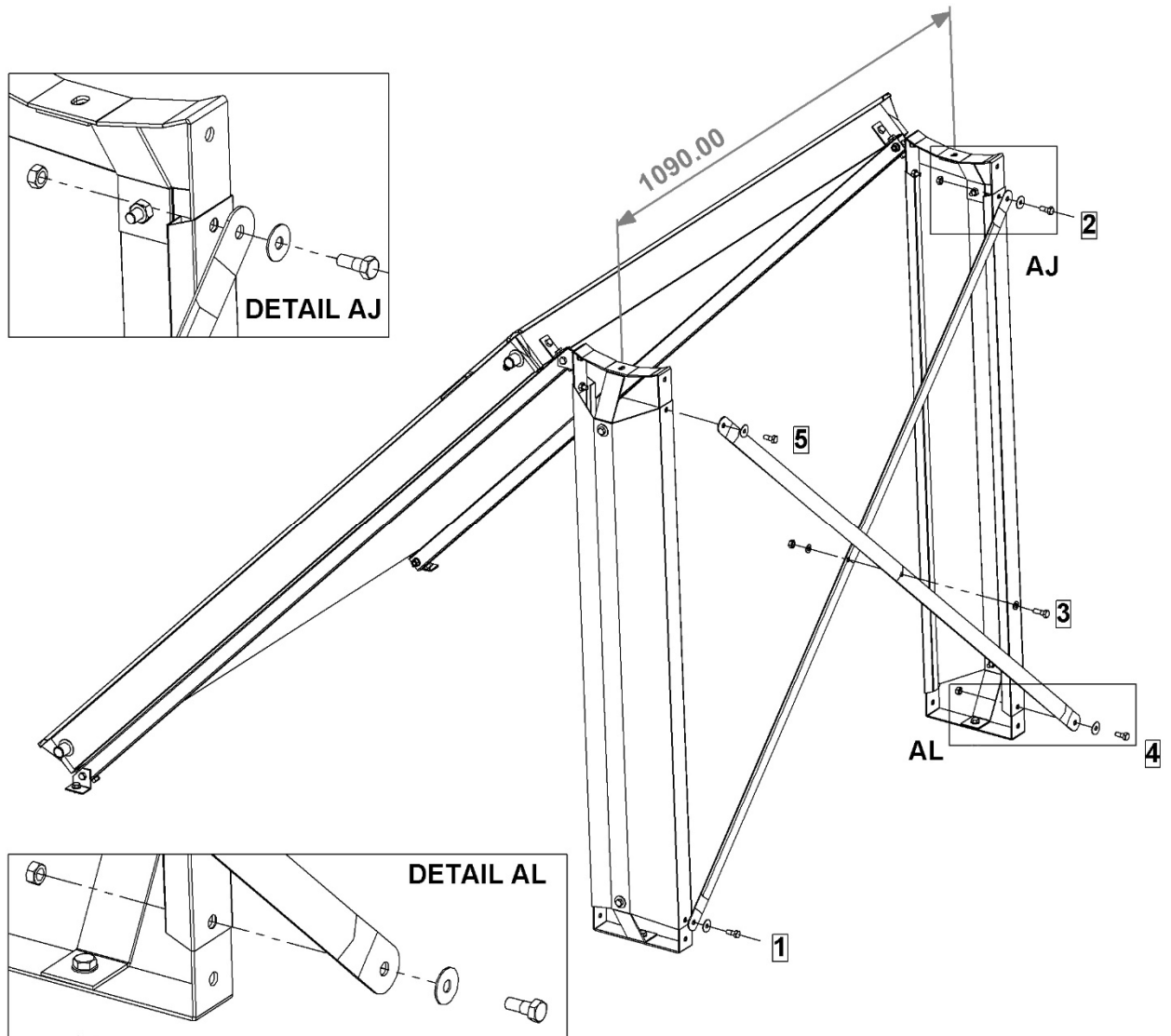


STEP 4

Lift the collector and drill holes on the roof surface.

Install the appropriate anchors [not included, shown in gray].

Seal the floor so that moisture does not enter the roof material.



STEP 4

Install the X-system at the back of the pillars in the following sequence:

Remove bolt [1] and connect the lower end of the X brace beam as shown.

Make sure of the orientation of the beam: the **convex side** should face the **front** of the system.

Replace bolt [1] but do not fully tighten it.

Remove bolt [2] and connect the upper end of the X brace beam.

Replace bolt [2] but do not fully tighten it.

Connect the second X beam at the center with bolt [3]. Do not fully tighten the bolt. Make sure of the orientation of the beam: The **convex side** should face the **back** of the system.

Remove bolt [4] and connect the lower end of the X brace beam.

Replace bolt [4] but do not fully tighten it.

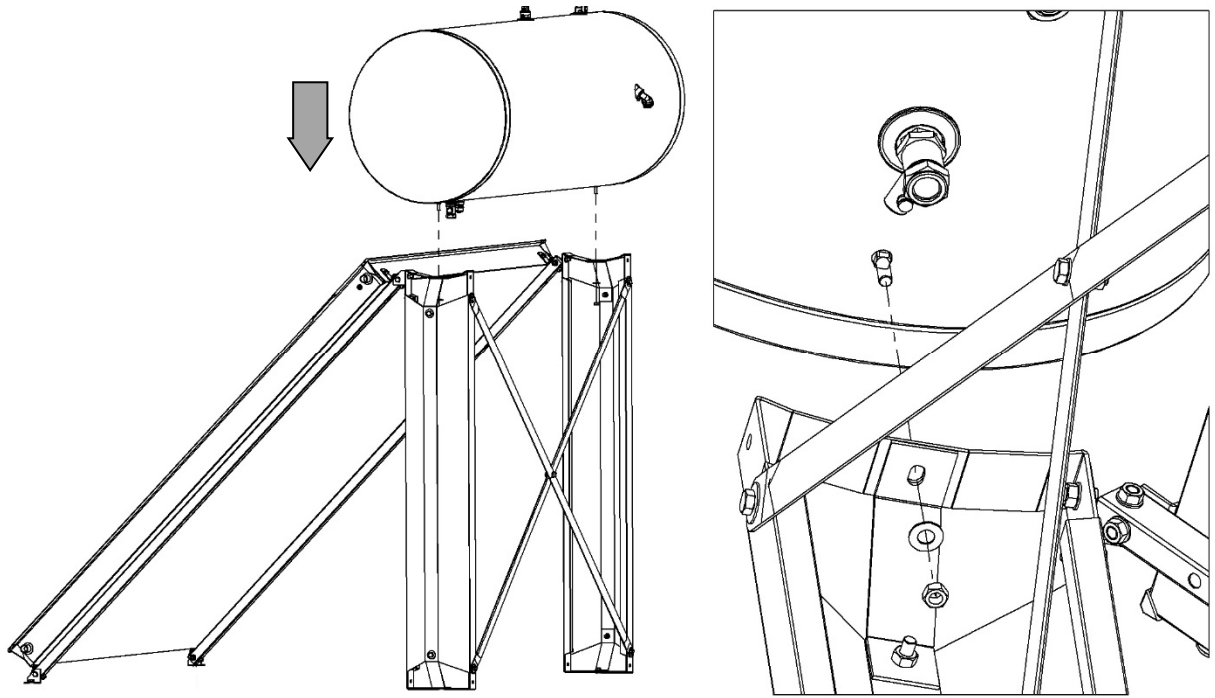
Remove bolt [5] and connect the lower end of the X brace beam.

Replace bolt [5] but do not fully tighten it.

Check the distance between the tank support holes.

If it is not 1090mm make minor adjustments.

Ensure both pillars are vertical and tighten bolts 1-5 in the sequence 1-2-4-5-3.



STEP 5

Remove tank securing bolts and washers and lower the tank in a controlled manner onto the pillars.

Ensure that the coach bolts are properly seated into the slots.

Install washers and tank securing nuts.

Ensure that the pillars are vertical and that the tank is properly seated and tighten both tank securing nuts.

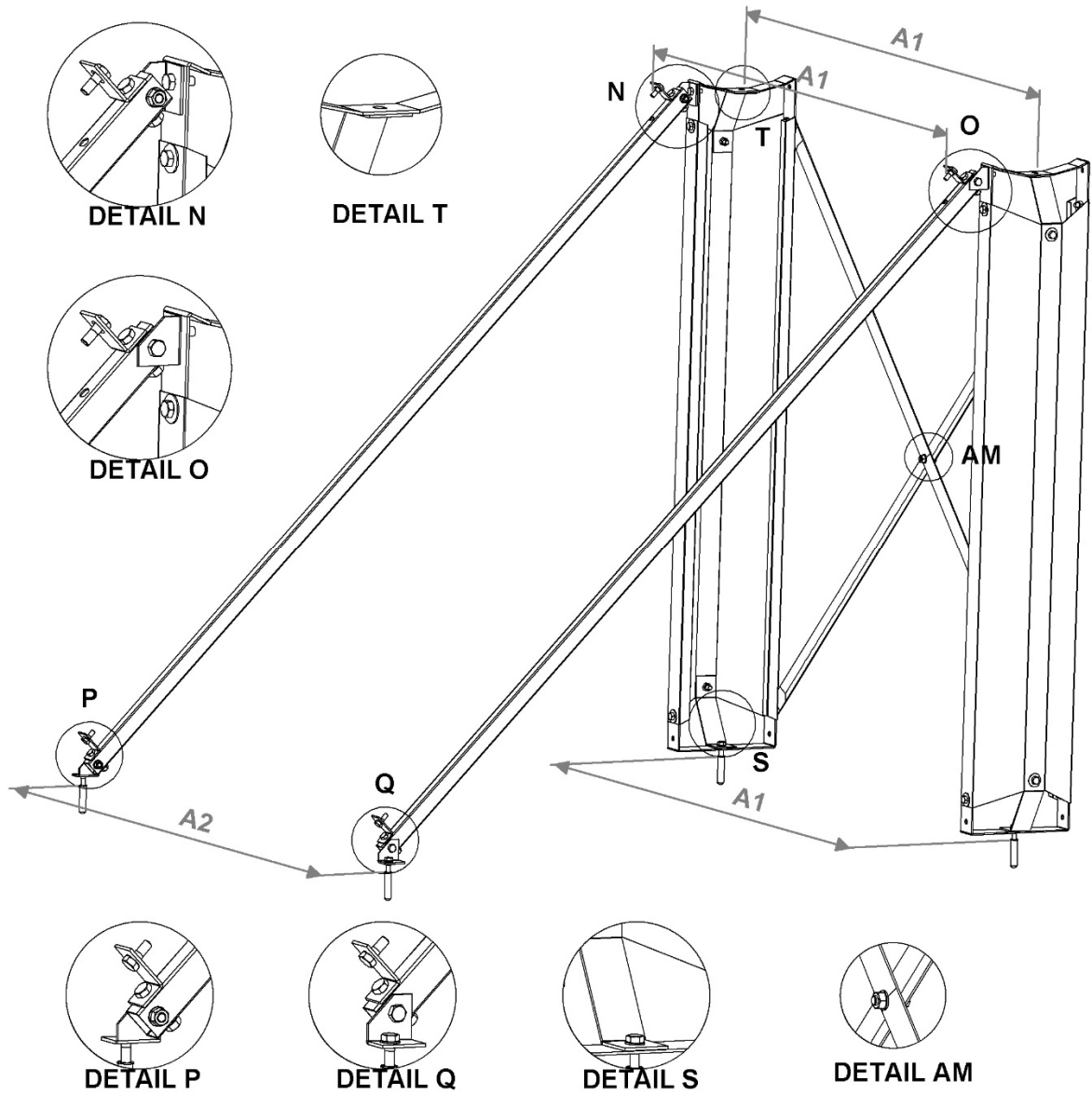


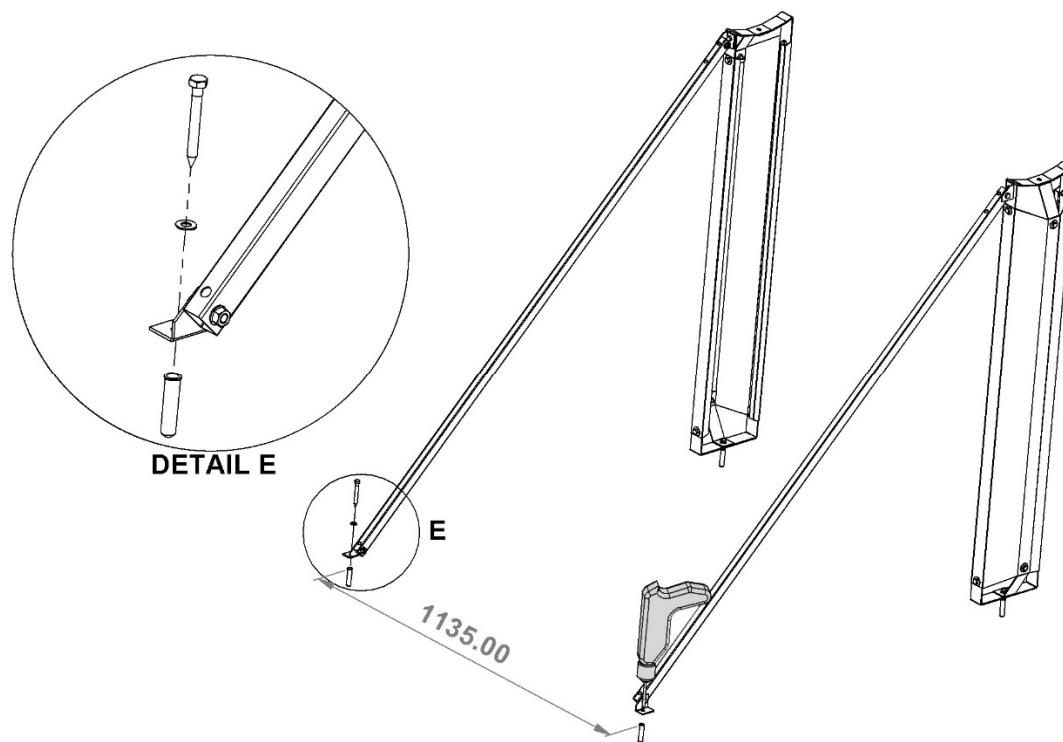
TABLE 1

INSTALLATION DIMENSIONS

DIMENSION	160/2	160/2.5	200/2.5	200/4	300/4	300/5
A1	1090	1090	1090	1090	1090	1090
A2	1135	1135	1135	1135	1135	1135
B	1296	1575	1575	1296	1296	1575

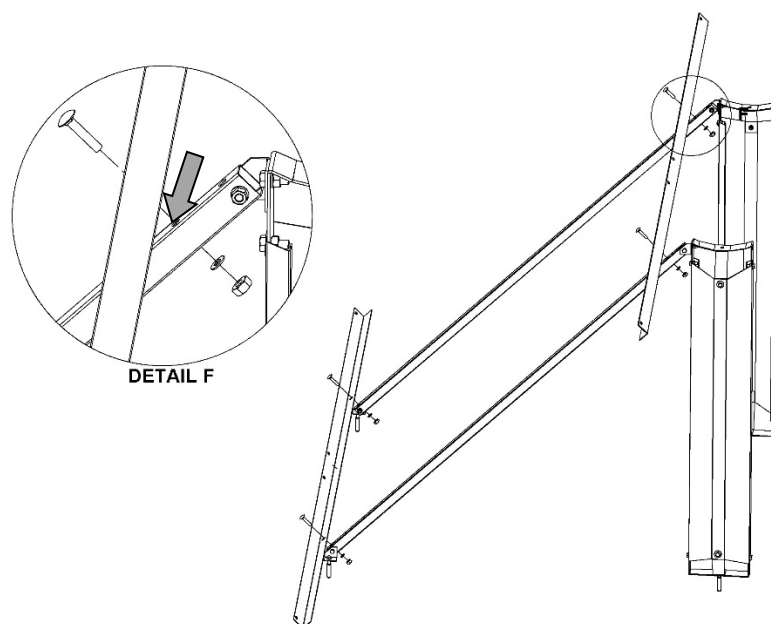
V) INSTALLATION OF SYSTEM ON A FLAT ROOF [TWIN COLLECTOR MODELS]

Follow step 1[p. 9] to install the two pillar assemblies.



STEP 2

Assemble the diagonals on the pillars. Ensure diagonals are parallel and in line with the pillars. Ensure that the hole to hole distance is 1135 mm, install appropriate anchors and seal.

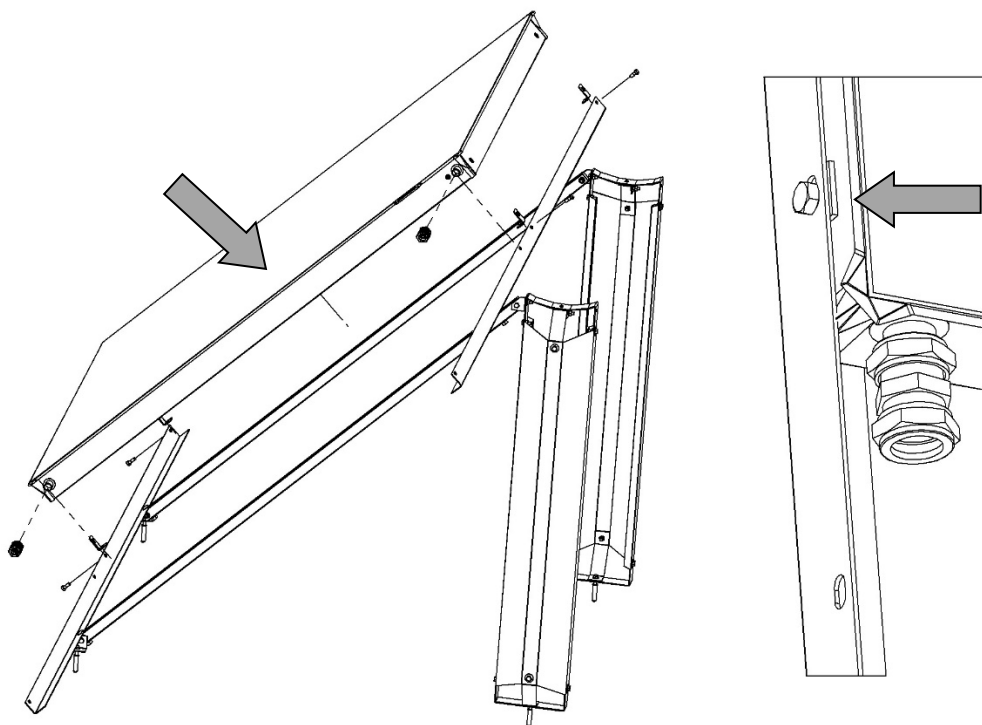


STEP 3

Install the two collector rails as shown above by means of the coach bolts.

Note that the top rail is assembled in the **lower hole** at the top.[DETAIL F]

Make sure that the coach bolts are properly seated, that the rails are perpendicular to the diagonals and that the base is aligned and tighten the nuts.

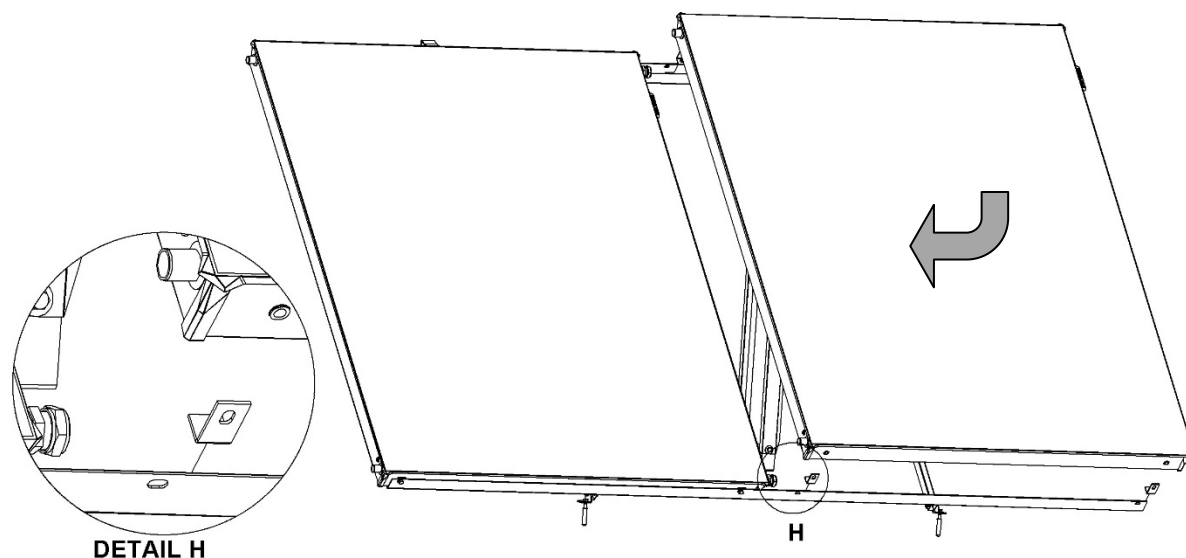


STEP 4

Install the first collector on the rails.

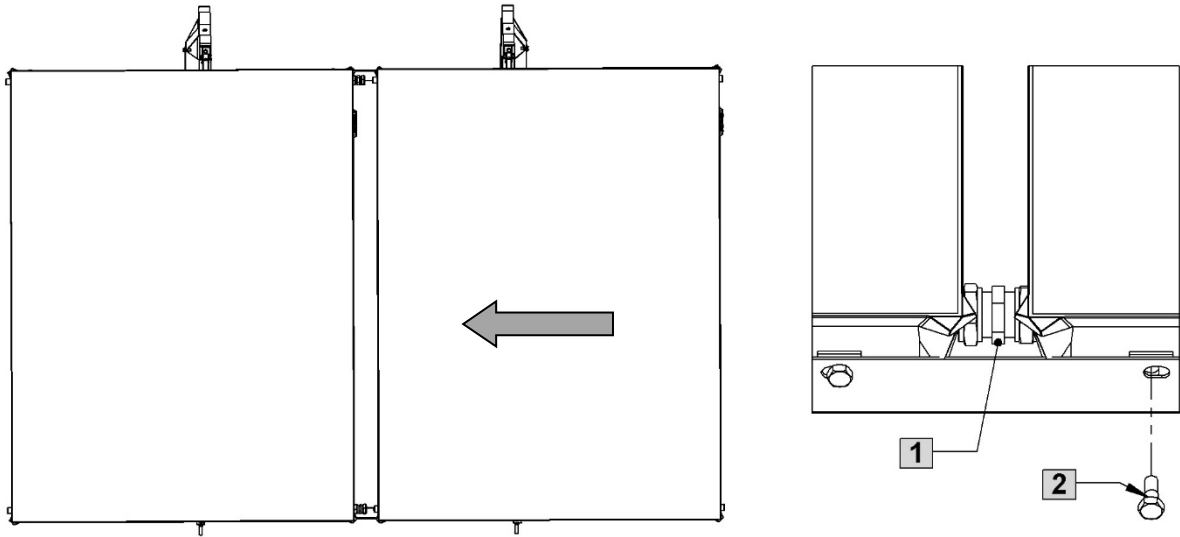
Use 4 collector spacers between the collector and the rail and install the hydraulic fittings.

Center the fitting with respect to the rail and tighten the bolts taking care not to strip the thread.



STEP 5

Lower the second collector onto the rails. Use the spacers provided.



STEP 6

Slide the second collector towards the first so that the tubes are inserted into the connection fitting.

[1] Tighten the fitting.

[2] Install and tighten the second collector securing bolts.

Assemble the X-system according to STEP 4 in page 12.

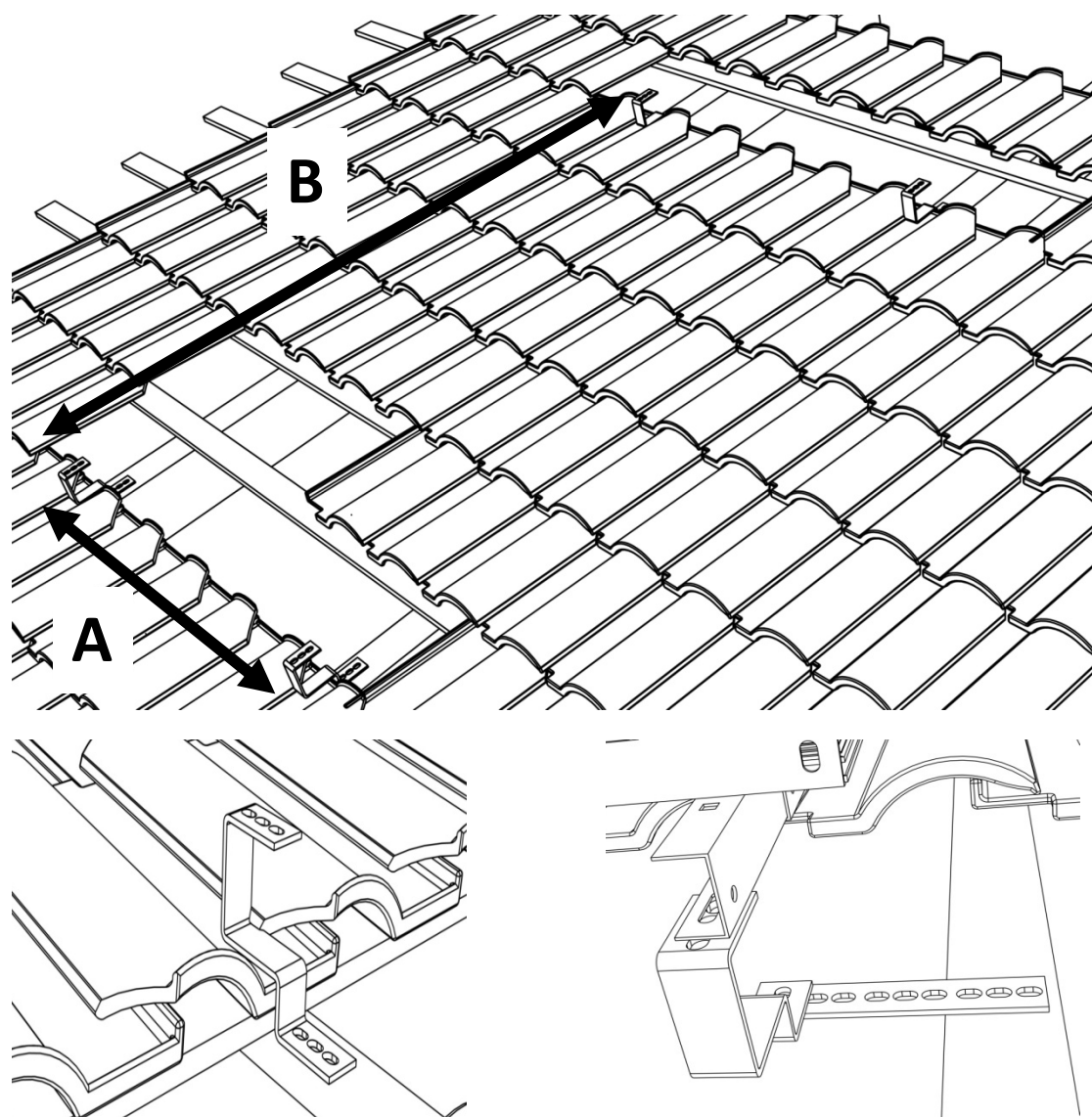
Install the tank according to STEP 5 in page 13.

NOTES

1. The anchoring of the system to the flat roof floor should be implemented with devices that are appropriate to the floor material.
2. In order to avoid humidity problems or water penetration (rain/snow) in the roof, the pipes which are entering the roof must be very well sealed. Local building engineer should provide you with precise guidelines depending on the kind of roof construction and/or local legislation. The same applies to the system anchoring points, regardless of the devices used for the installation.

VI) INSTALLATION OF SYSTEM ON INCLINED ROOF [All systems]

CAUTION: Check the capacity of the roof structure to bear the solar heater load in operation with the constructor of the building or contact the local authorities.

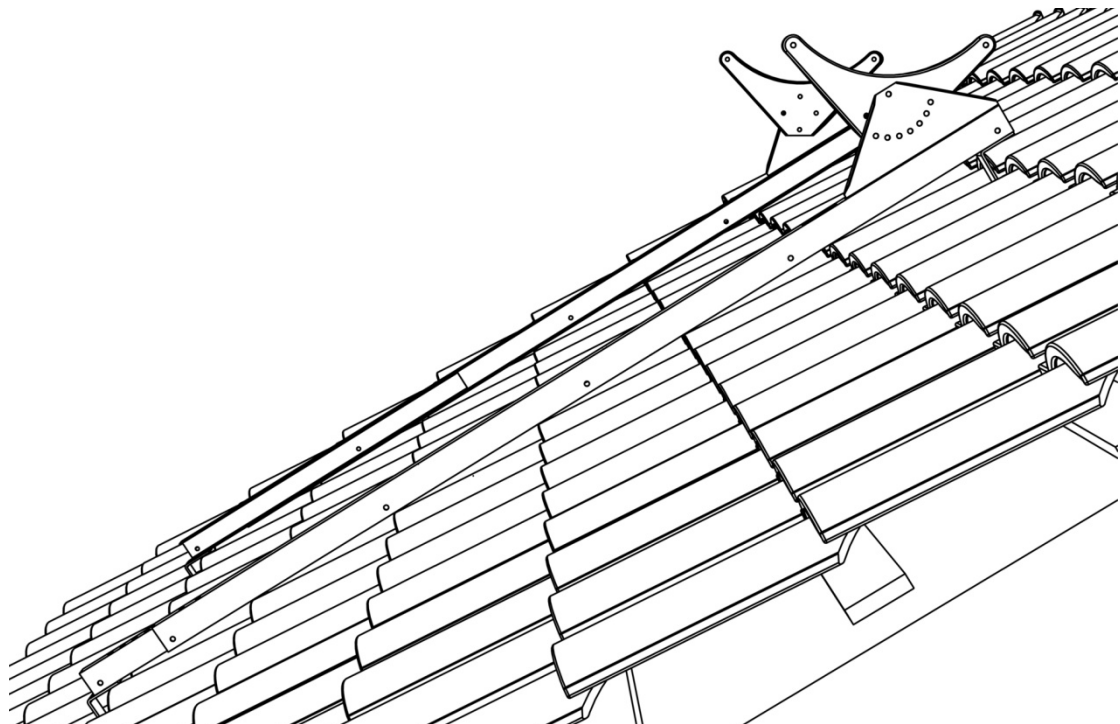
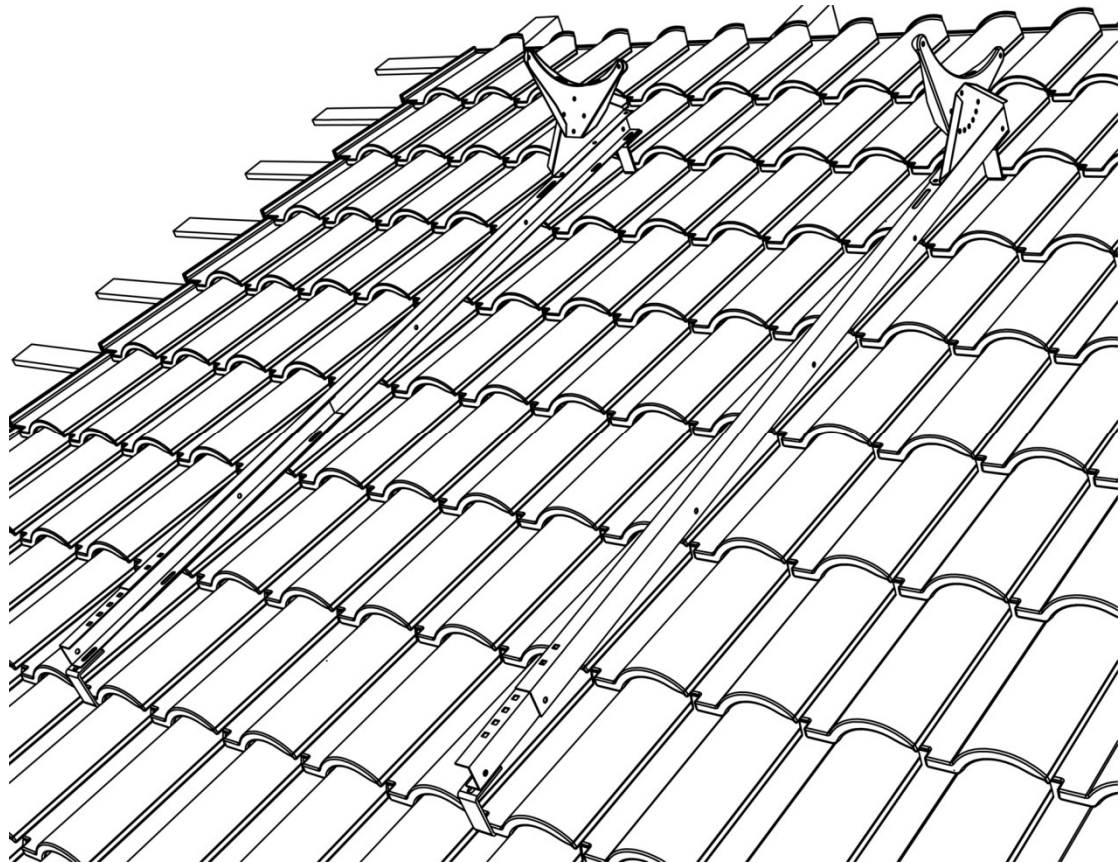


STEP 1

Uncover the roof tiles at the lowest and the highest part of the area where the thermosiphonic system will be installed. Install the 4 AGG brackets (or the AT – triangular type or the AR – special screw, if needed) on the vertical, load bearing beams with appropriate screws, as shown on the drawing above. Make sure that the distances A and B between any of the top holes on each bracket are set according to Table 2. You may take advantage of the fact that there are 3 holes on the top of each bracket to accommodate for different tile sizes. In case the AGG brackets do not coincide with the roof beams, use the additional 20 cm extension piece for AGG brackets [right drawing].

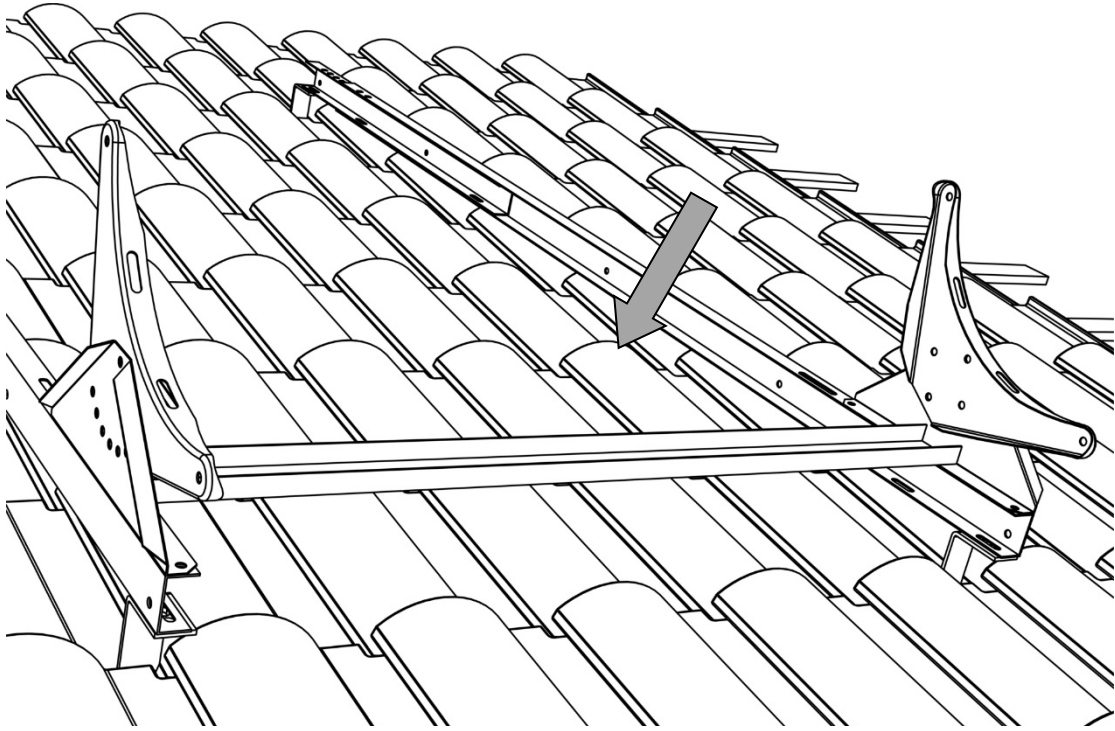
TABLE 2

DIMENSION	160/2	160/2.5	200/2.5	200/4	300/4	300/5
A	2000	2400	2400	2000	2000	2400
B	1600	1994	1994	1600	1600	1994



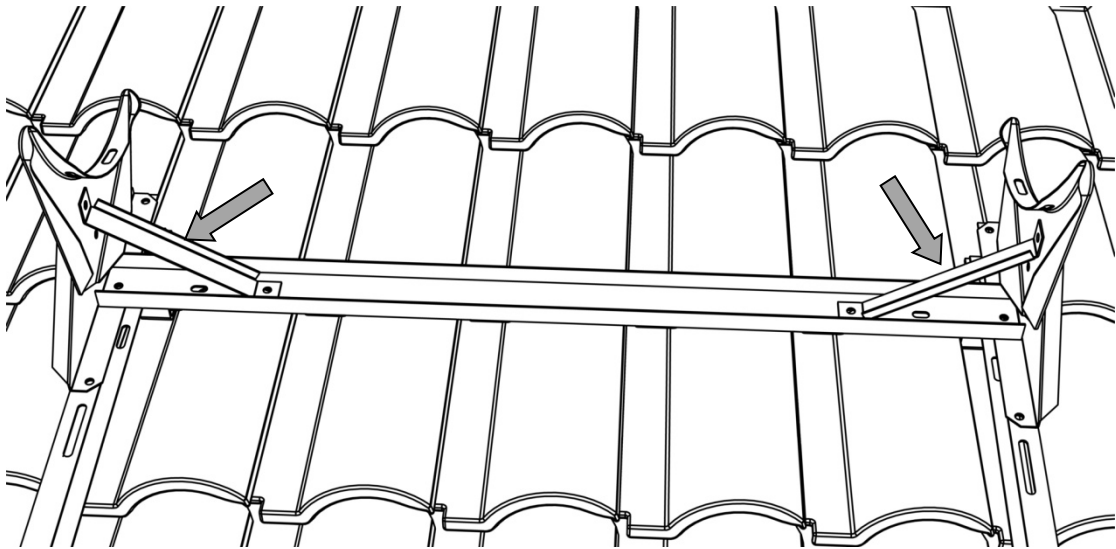
STEP 2

Replace the roof tiles and install the two longitudinal base sections onto the AGG brackets. Make use of the telescopic feature of the sections to adjust them to the appropriate length.



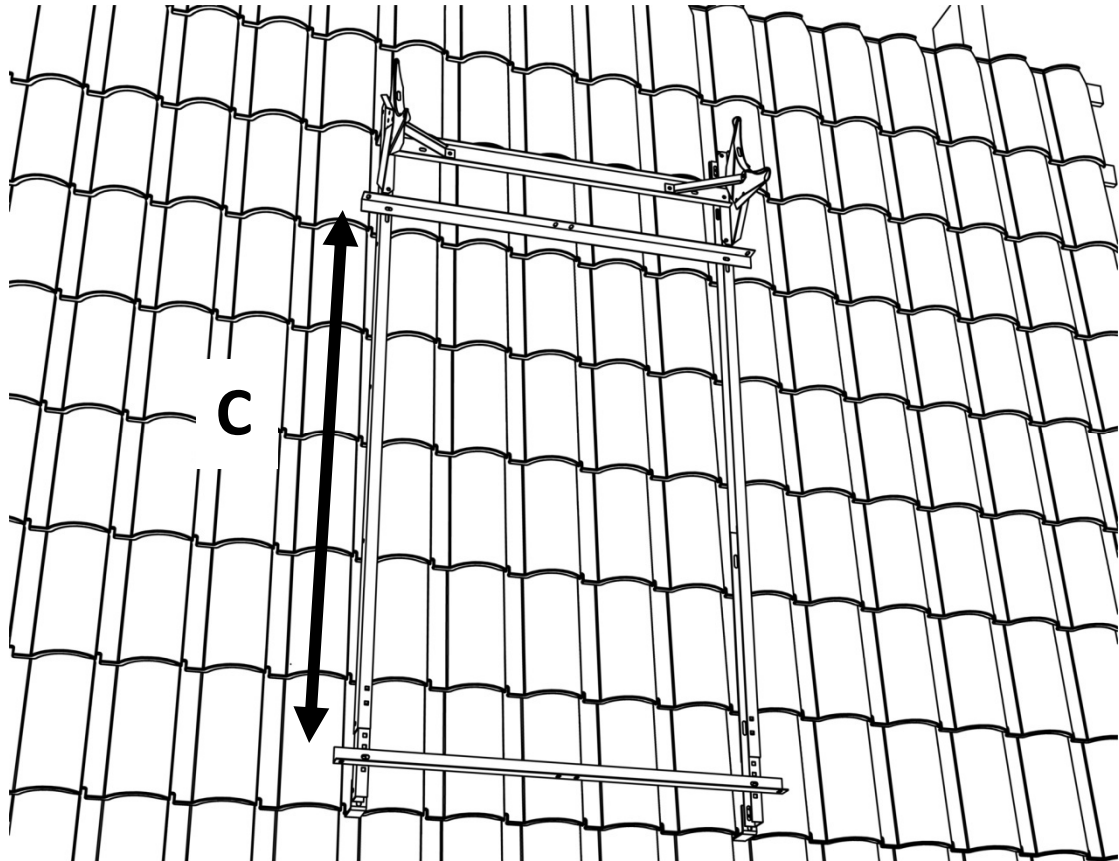
STEP 3

Install the transverse beam joining the two longitudinal sections.



STEP 4

Install the two support struts joining the transverse beam with the two longitudinal sections.

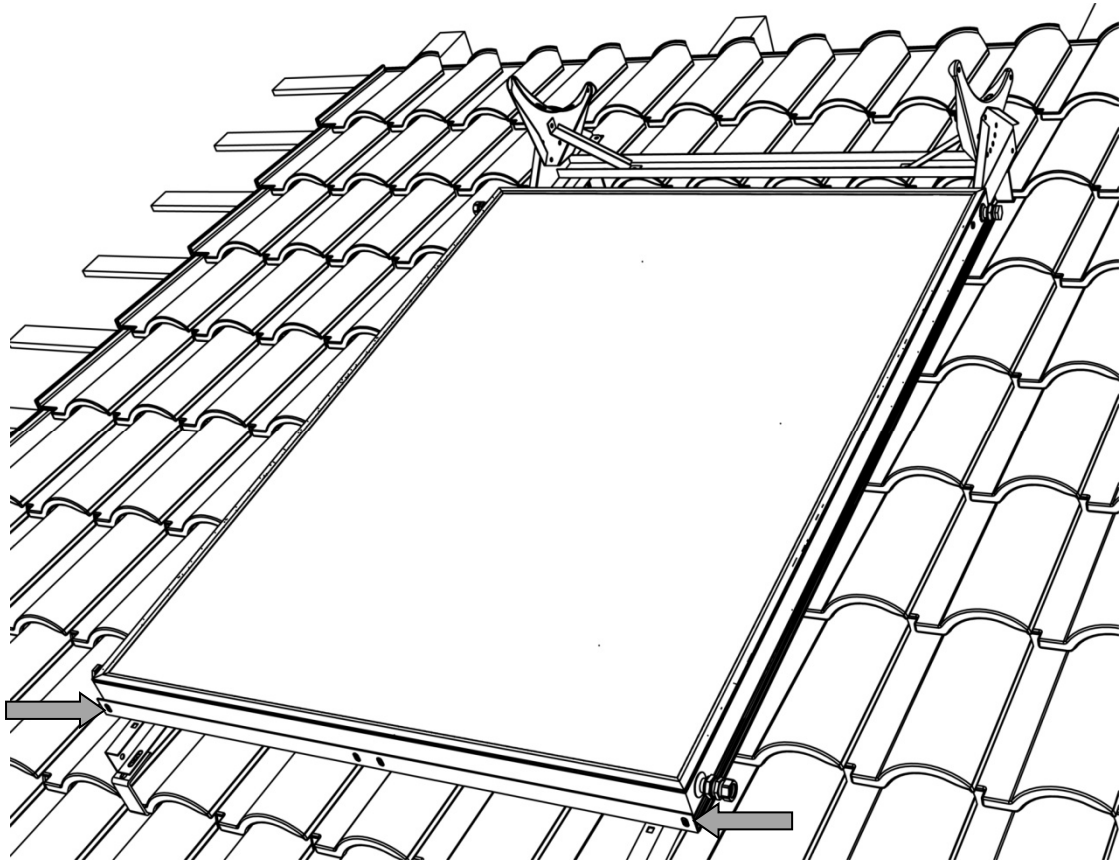


STEP 5

Install the two L beams supporting the collector. The distance C between the vertical mounting faces of two beams should be set according to Table 3 to fit the height of the collector. Secure only the bottom beam and slide the top beam upwards to ease collector installation.

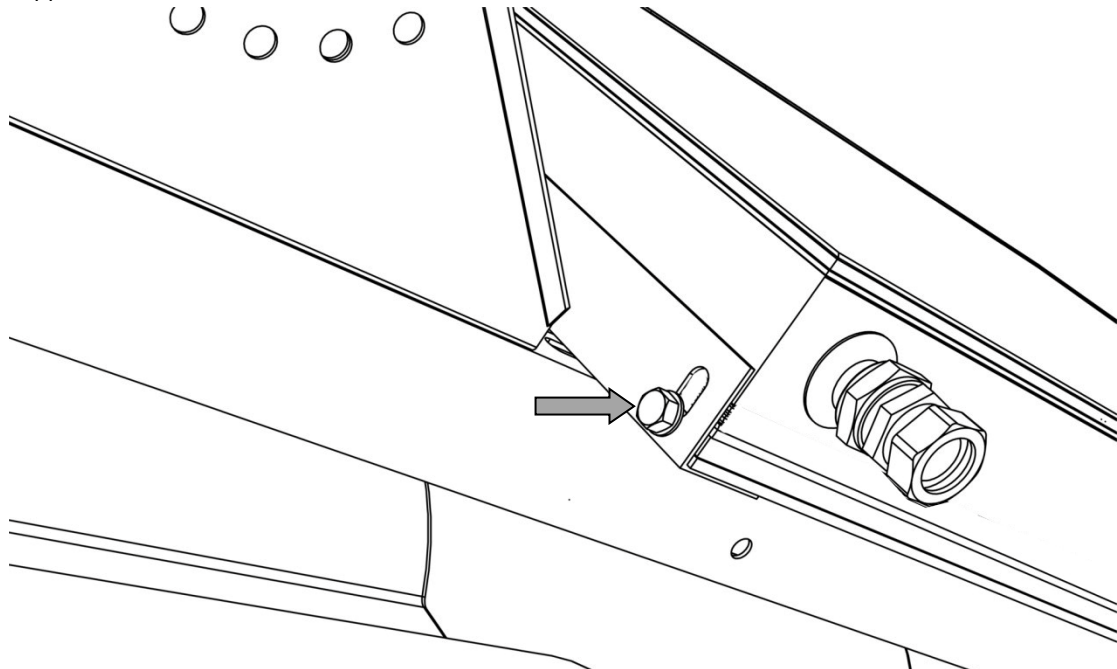
TABLE 3

DIMENSION	160/2	160/2.5	200/2.5	200/4	300/4	300/5
C	1600	1994	1994	1600	1600	1994



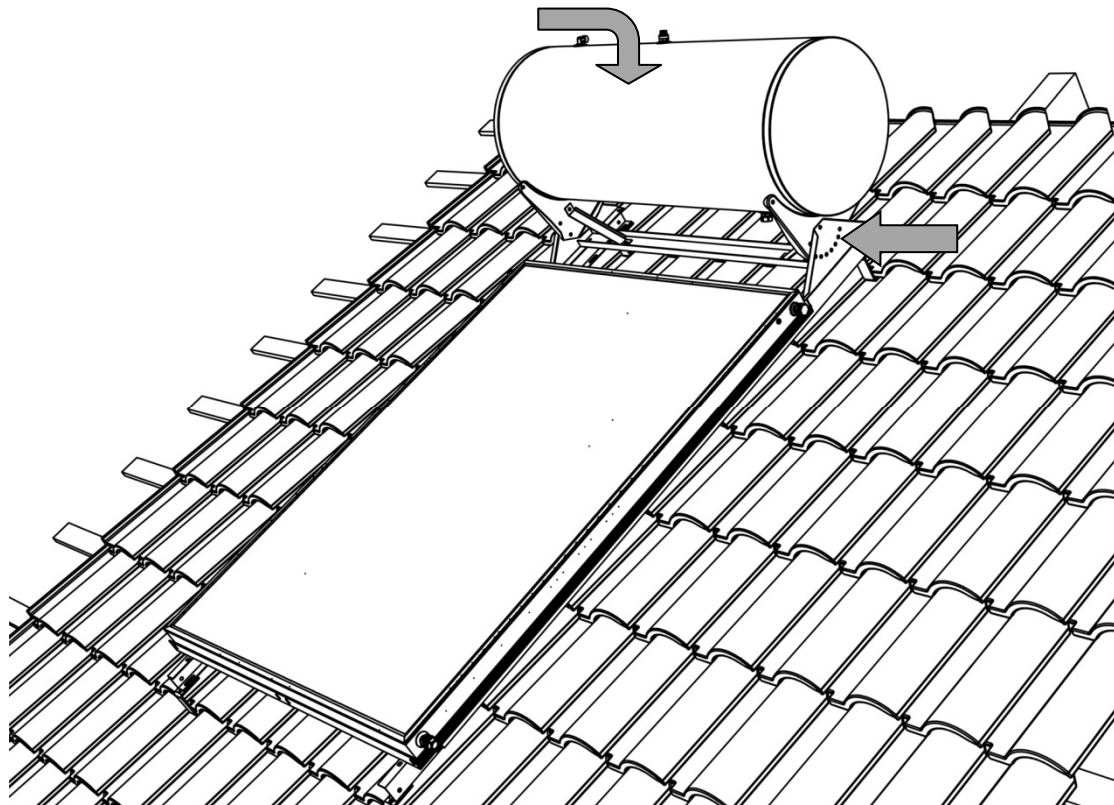
STEP 6

Place the collector(s) on the base assembly. Tighten the bottom securing bolts against the bottom support beam.



STEP 7

Slide the top support beam against the collector and tighten the support bolts. Tighten the support beam onto the longitudinal base sections.



STEP 8

Adjust the tank support to a horizontal position and install the tank.

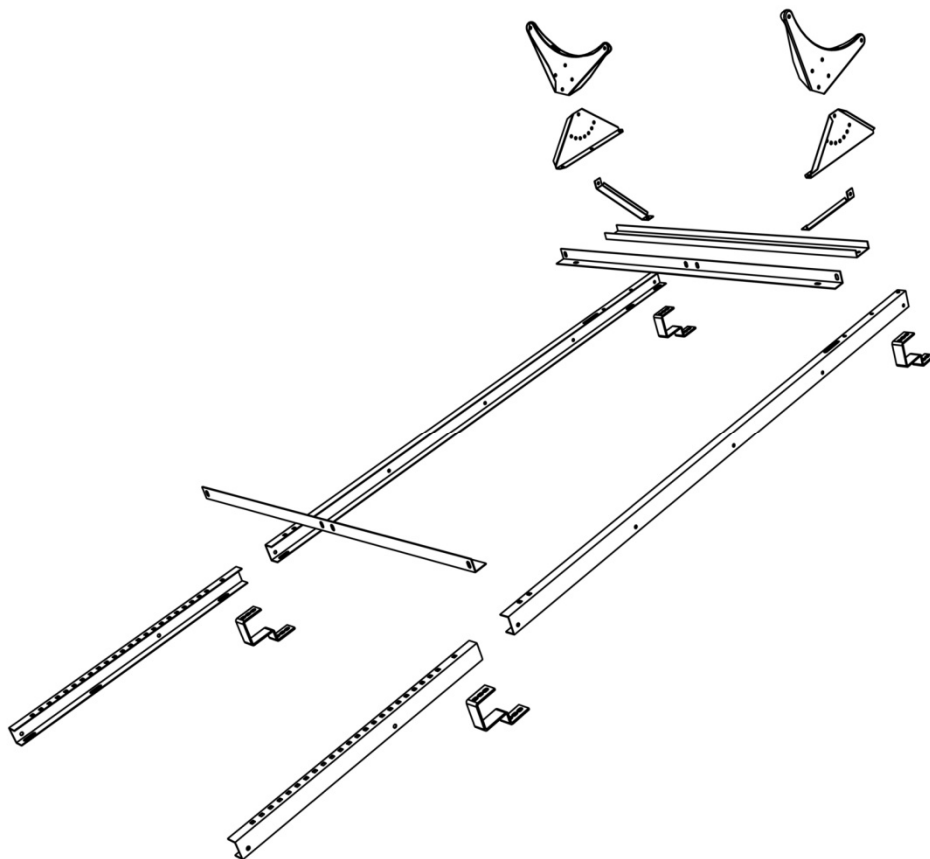


Figure 1: Components of the inclined roof base system.

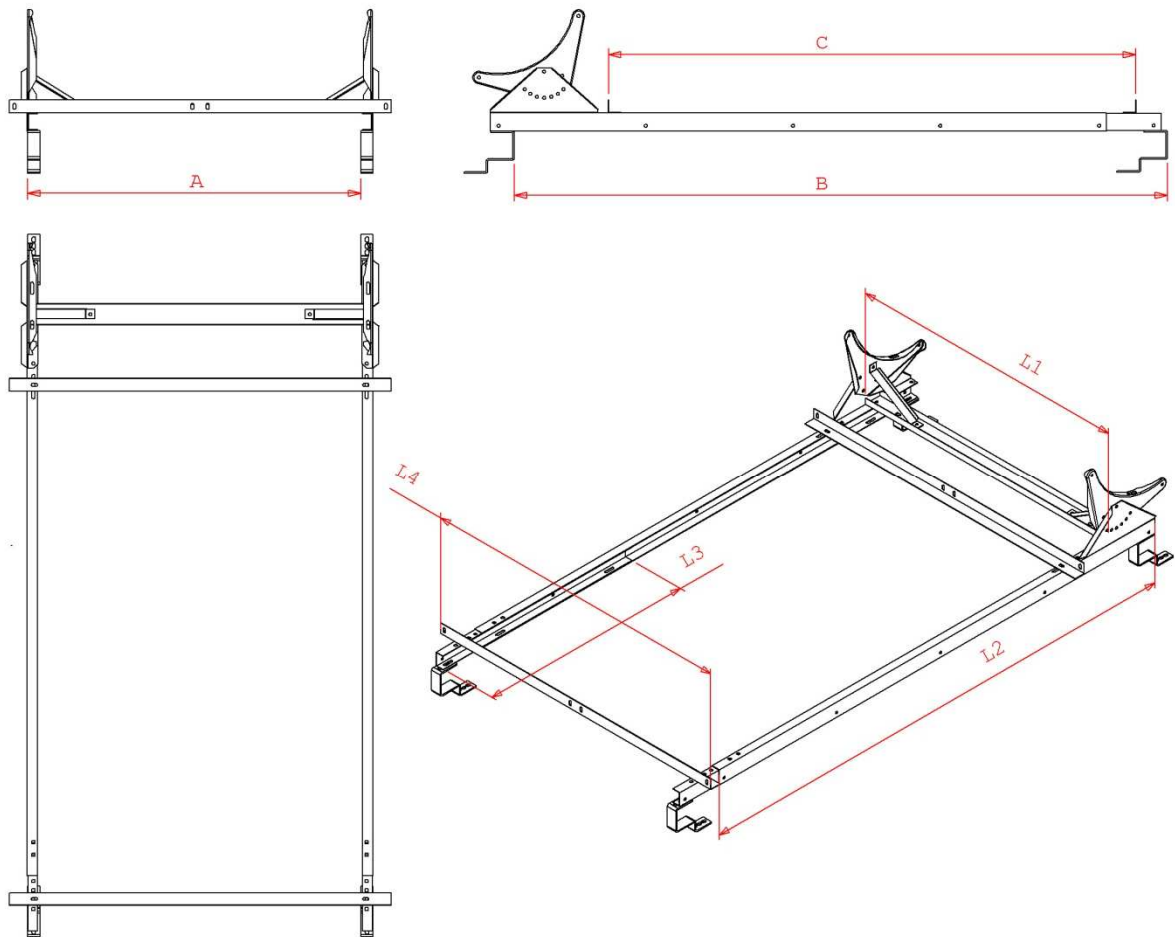


Figure 2: Installation and base system dimensions. See Table 4 for values.

TABLE 4

DIMENSION	160/2	160/2.5	200/2.5	200/4	300/4	300/5
A	1090	1090	1090	1090	1090	1090
B	2000	2400	2400	2000	2000	2400
C	1600	1994	1994	1600	1600	1994

VII) HYDRAULIC CONNECTION OF SYSTEM [All systems]

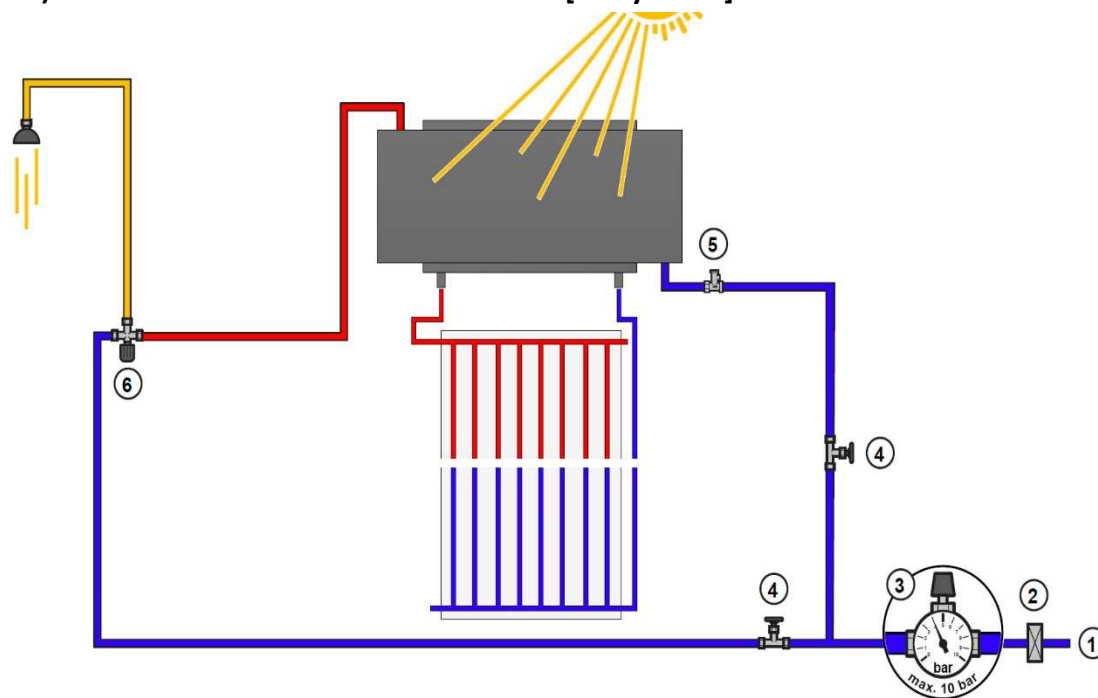


Figure 3: Schematic of complete system. [1] Domestic cold water supply according to DIN EN 806 or to country-specific regulations. [2] Water filter. [3] Pressure reduction valve MAX 10 bar. [4] Cut off valve. [5] Non return valve + 10 bar safety valve. [6] Cold/hot mixer for domestic hot water use, e.g. shower.

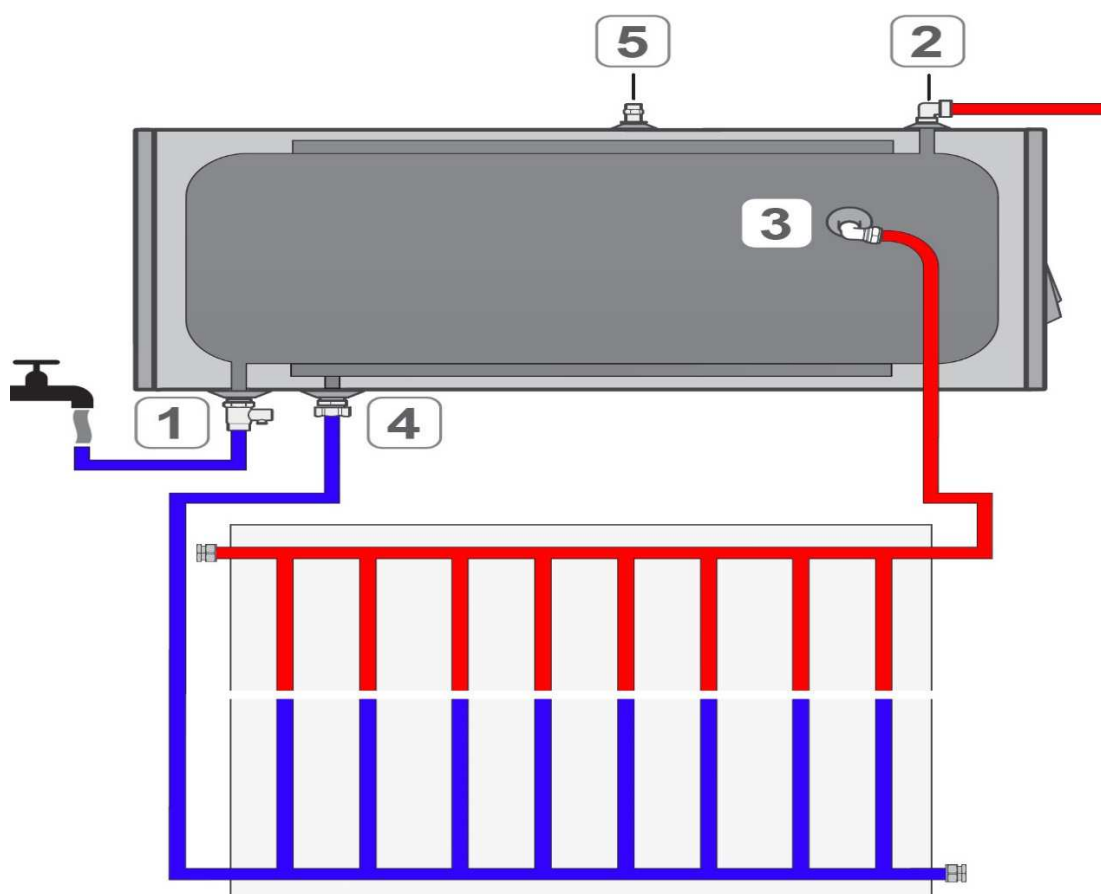


Figure 4: Thermosiphonic system layout and connections. [1] Domestic cold water supply, 10bar safety valve + non return valve. [2] Hot water outlet. [3] Closed circuit, hot inlet port. [4] Closed circuit, cold outlet. [5] 2.5 bar safety valve.

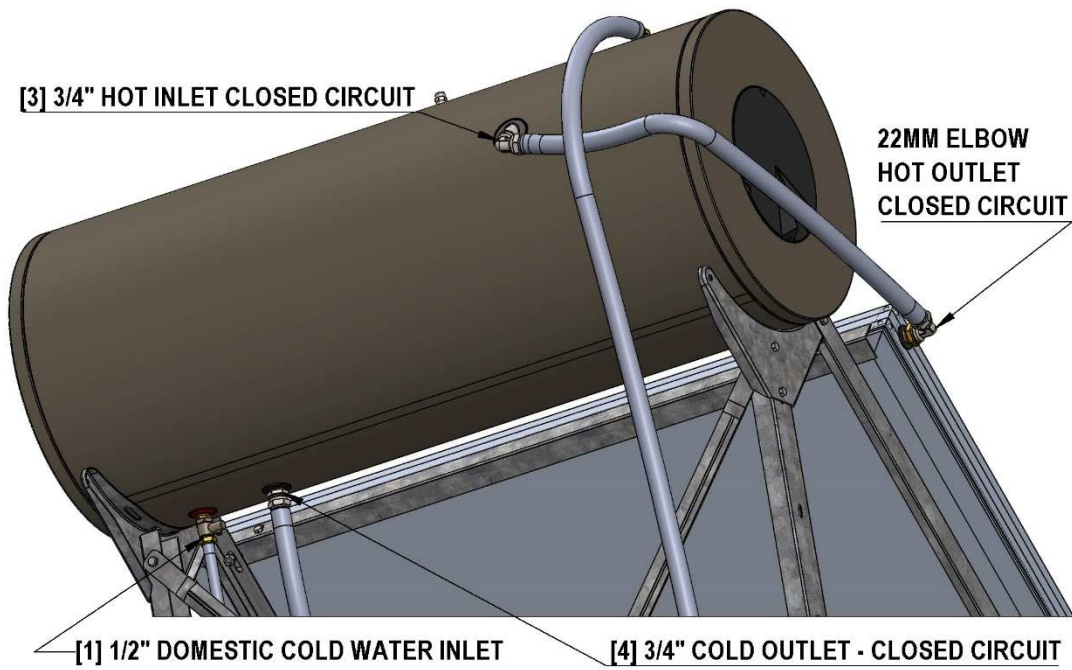


Figure 5: Thermosiphonic connection sizes.

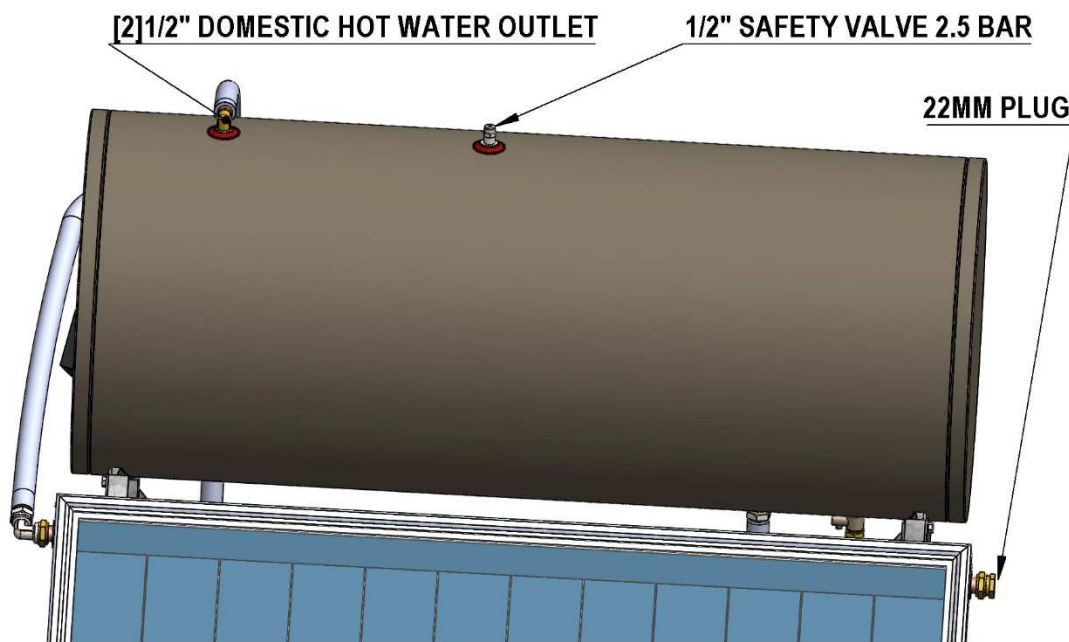
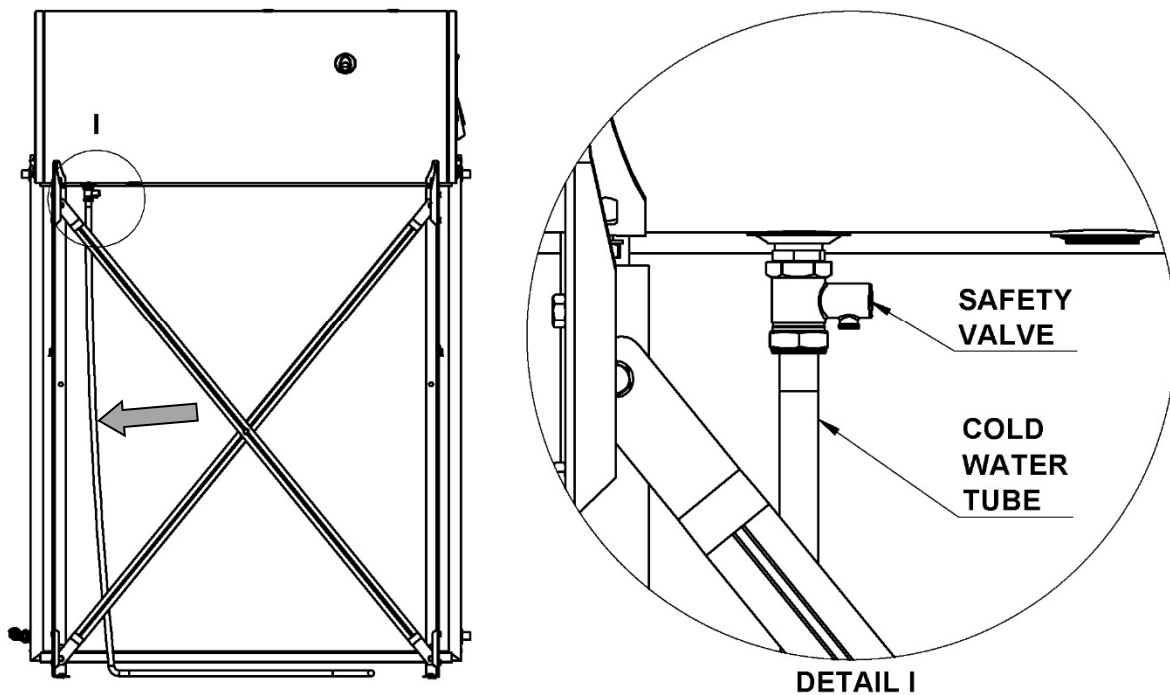


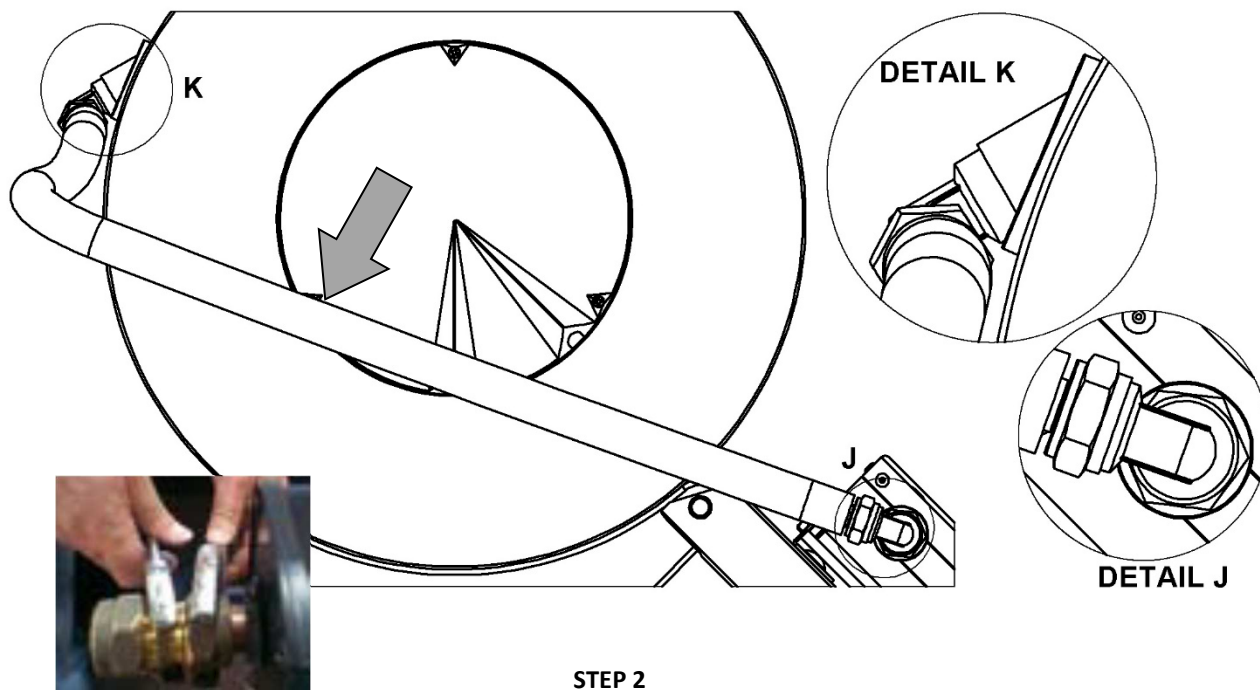
Figure 6: Thermosiphonic connection sizes. System shown is not Prisma, however the connection are identical.

NOTE: System shown is not Prisma, however the procedure is identical.



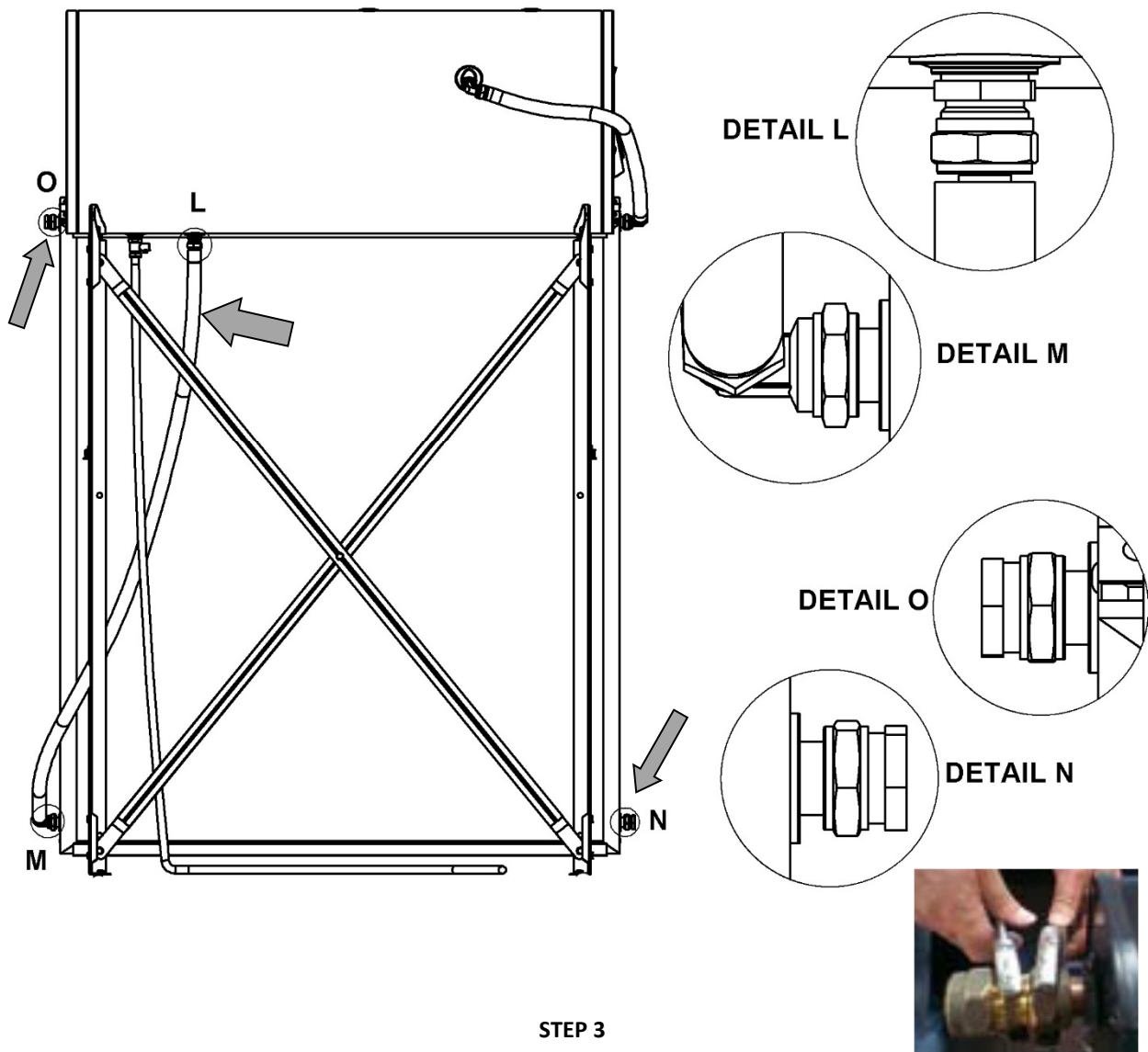
STEP 1

Connect the cold water supply tube and the safety and non-return valve onto the tank. To save time you may start filling the tank at this point. When water starts overflowing from the hot water open circuit outlet close the water supply.



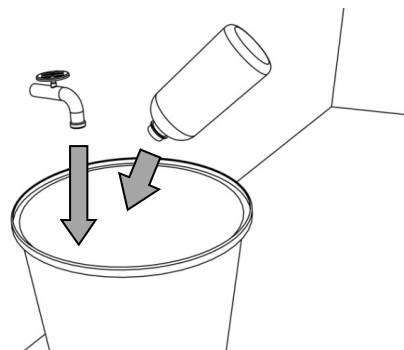
STEP 2

Install the elbow fittings on collector and tank and connect the insulated hot water closed circuit flexi tube. Ensure that the tube follows an upwards route towards the tank. ATTENTION: When tightening the fittings on the collector exit make sure you use 2 spanners, 1 for tightening and 1 against to avoid damaging the absorber.



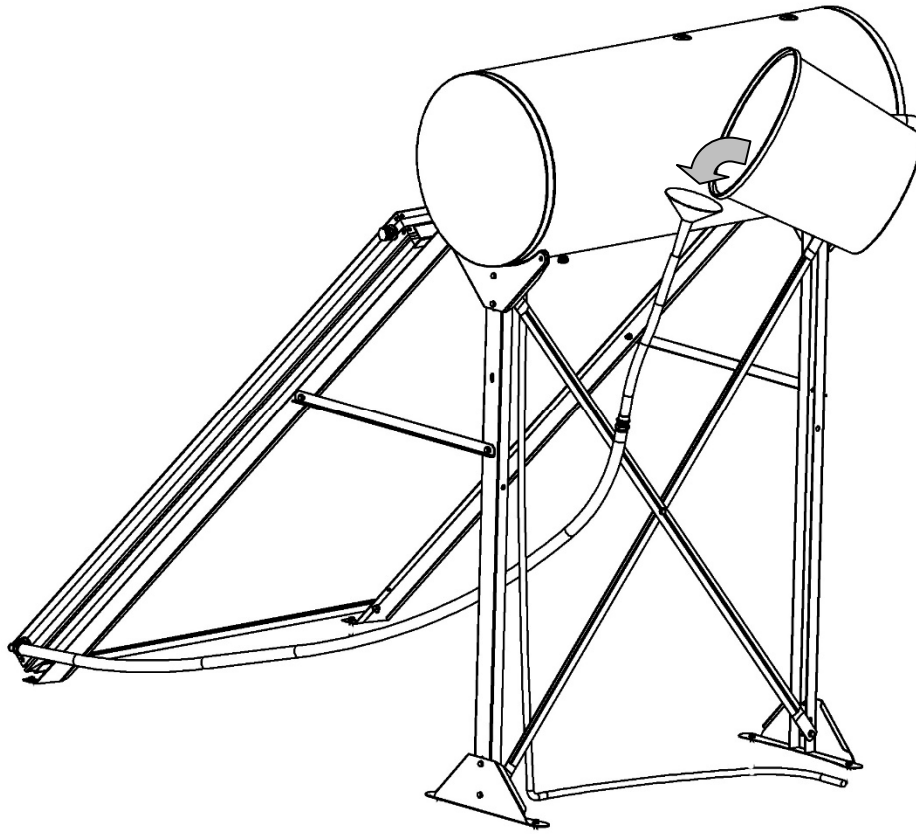
STEP 3

Connect the cold closed circuit tube between the collector and the tank M-L. Ensure that the tube follows an upwards route towards the tank. **ATTENTION:** When tightening the fittings on the collector inlet make sure you use 2 spanners, 1 for tightening and 1 against to avoid damaging the absorber. Make sure the length and shape of the tube is appropriate. Do not tighten the tube on the tank side. Install the tube caps as well.



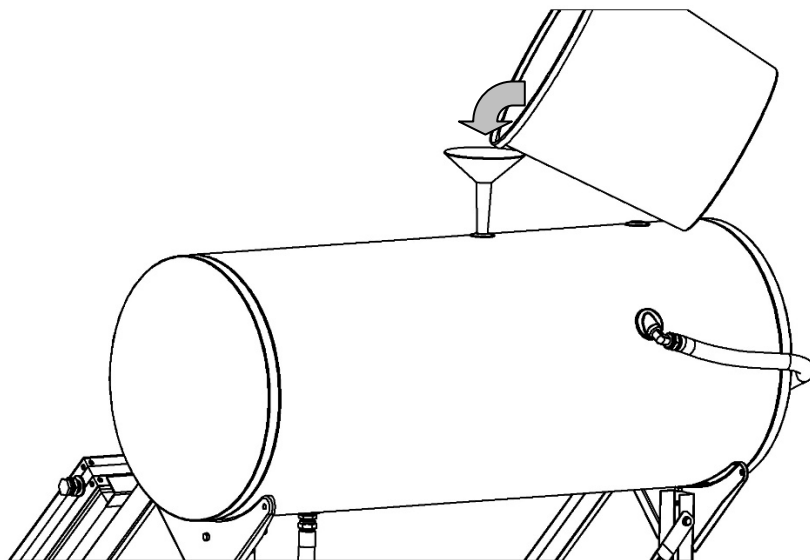
STEP 4

Mix water and NOX fluid in a bucket according to the table in Chapter 1.



STEP 5

Detach the cold closed circuit tube from the tank. Pour the solution slowly into the tube in order to fill the collector. Let the liquid overflow through the outlet of the tank until no air bubbles come out and then attach and tighten the cold fluid union to the tank. You may need to attach an auxiliary tube to the cold closed circuit tube so as to pour the solution from a point higher than the closed circuit hot inlet of the tank.



STEP 6

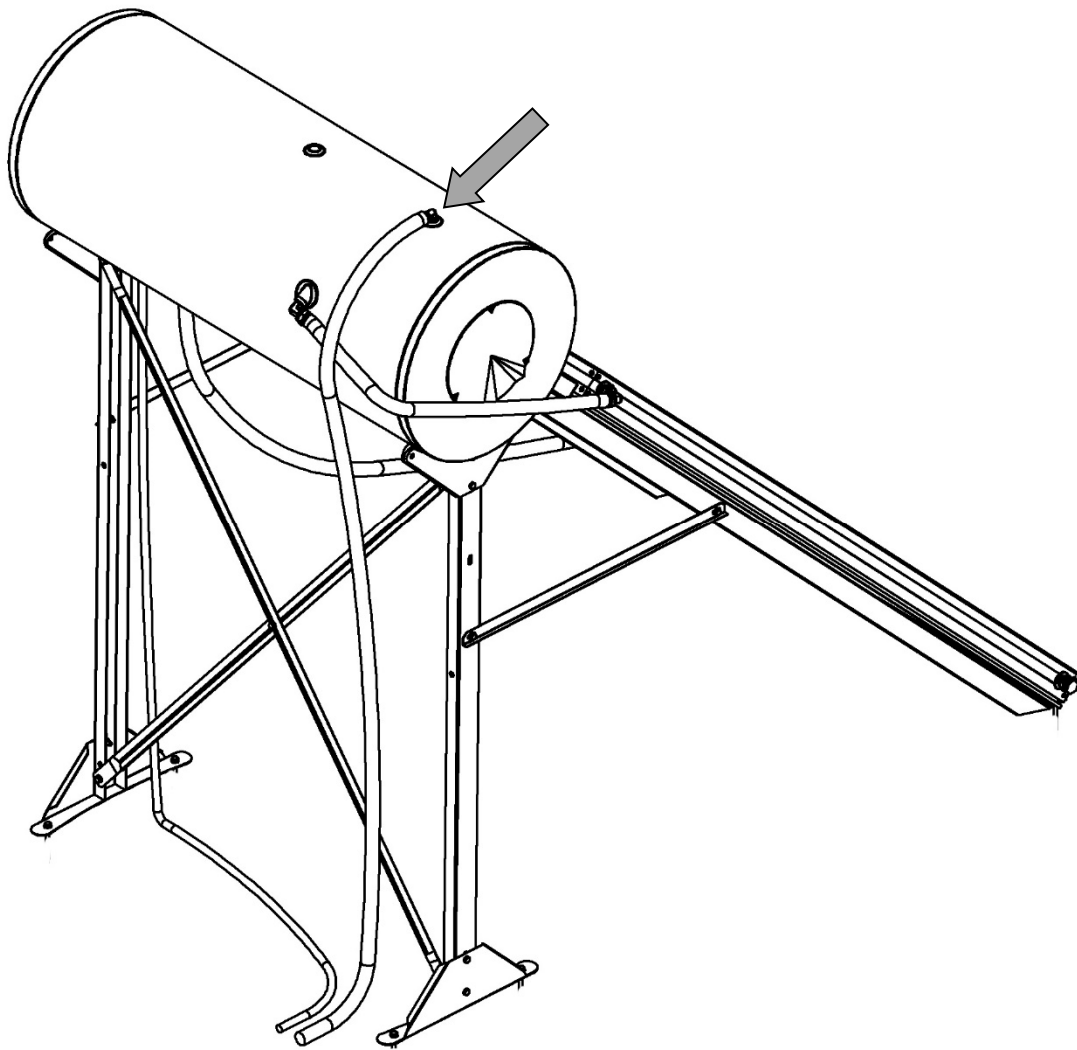
Complete filling the closed circuit with the solution from the safety valve outlet at the top of the tank.

STEP 7

Assuming the tank is filled with water and the closed circuit is filled with solution you may remove the cover sheet from the collector at this point. If it is a sunny day the solution will start overflowing from the safety valve outlet at the top of the tank as it heats up. If there is no overflow check that:

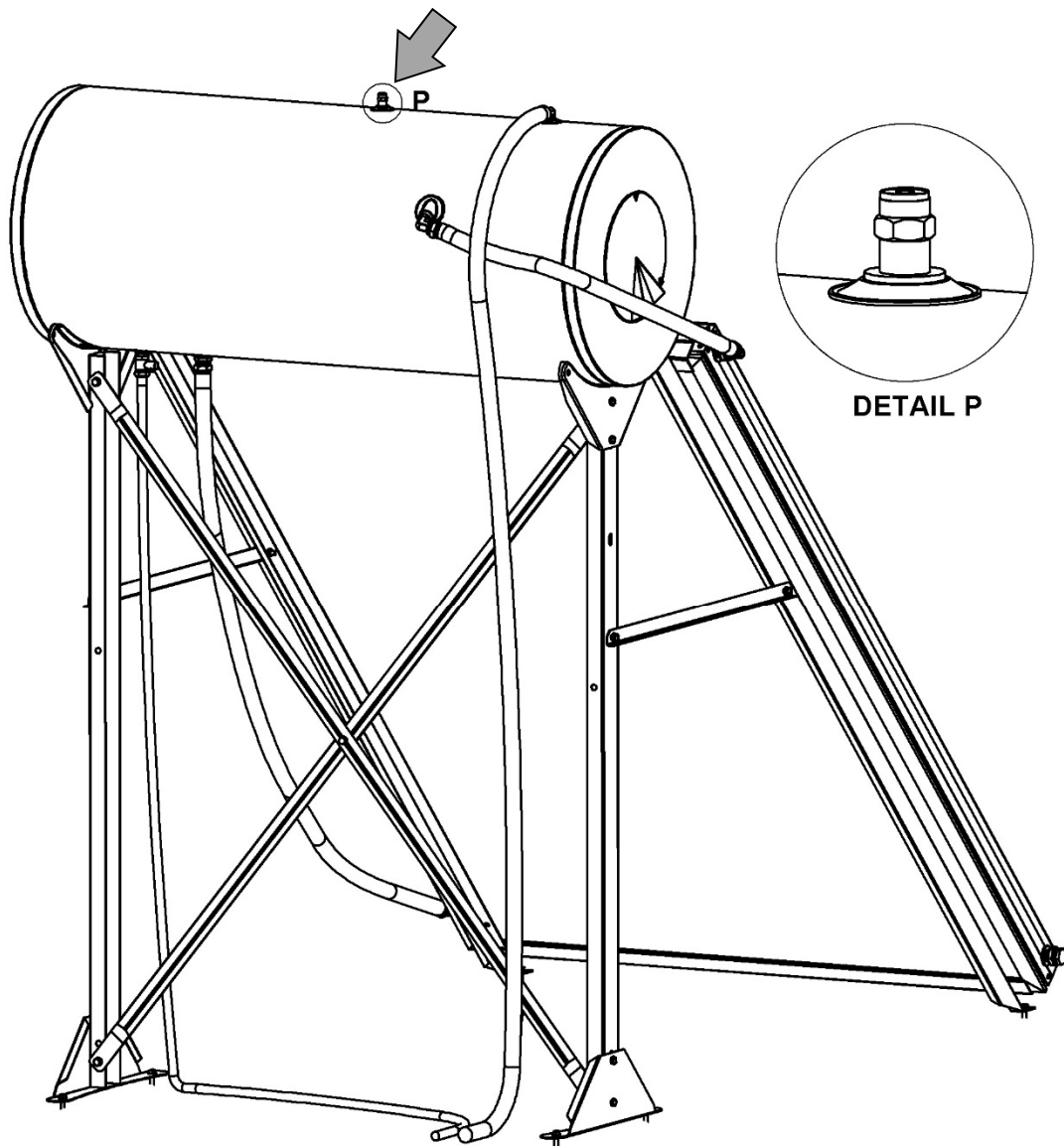
1. The closed circuit is filled.
2. There is no air in the closed circuit.
3. There are no leaks in the closed circuit connections.

Take the appropriate action until there is overflow.



STEP 8

Connect the domestic hot water tube. Turn on the domestic cold water supply and check for leaks. The domestic water pressure should cause the closed circuit solution to overflow from the safety valve outlet at the top of the tank. If there is no overflow perform the diagnostic tests of Step 7.



STEP 9

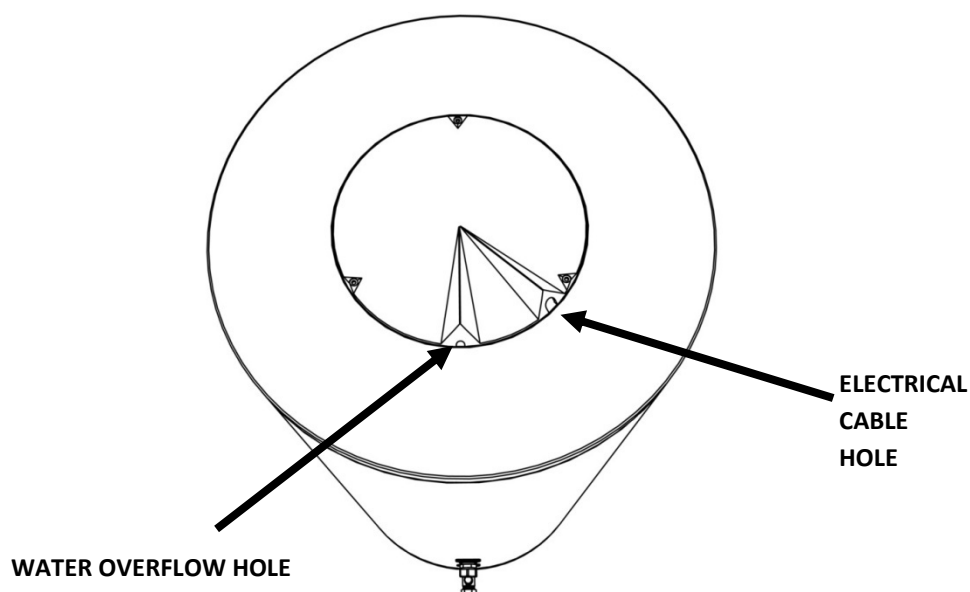
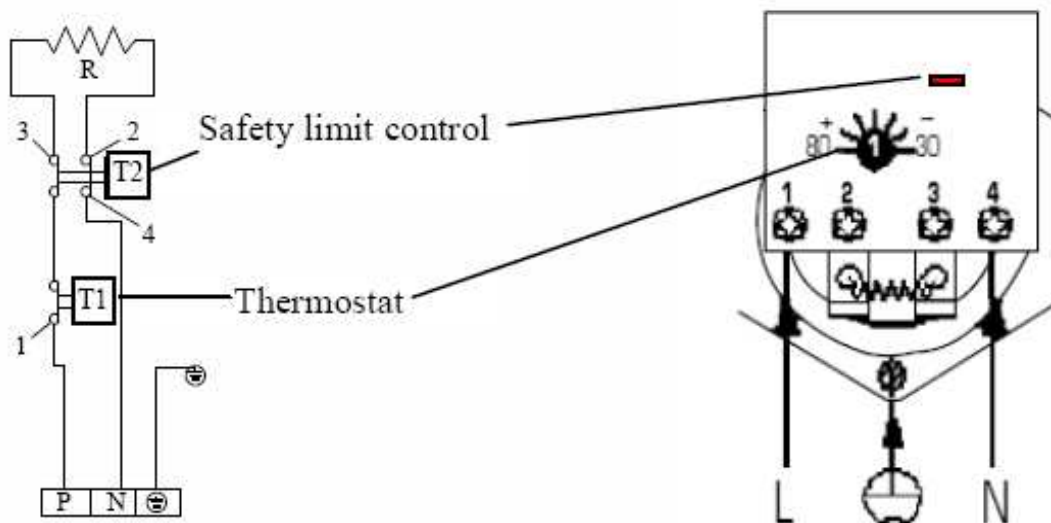
After approximately 20 minutes you may install the closed circuit safety valve at the top of the tank.

TABLE 5

CHECKLIST BEFORE START - UP			
NUMBER	ACTION	YES	NO
1	Is the thermosiphonic system facing South for the North hemisphere and North for the South hemisphere?		
2	Did you check that the thermosiphonic system is not located in the shadow throughout the whole year?		
3	Was the collector installed with an installation angle between 15° - 45°?		
4	Is the thermosiphonic system installed at least 1m distance from the walls or the end of the roof?		
5	Did you use the provided manual during installation?		
6	Is max operational pressure 10bar?		
7	If the pressure of the cold water is more than 10bar, did you install a pressure reducer?		
8	Did you notice the statics?		
9	Did you get required measures to prevent water penetration? Did you seal accordingly?		
10	Did you insulate all piping according to local weather conditions to avoid freezing and UV damage?		
11	Did you connect all the fittings?		
12	Are all hydraulic connections free of heavy loads?		
13	Did you check for leakages?		
14	Did you use the original glycol for freezing protection?		
15	Did you check that all valves are working properly?		
16	Did you check the mounting system for visible damage?		
17	Did an authorized electrician install the original electrical heater?		
18	Did you install the system according to manual?		
19	Are all connections done correctly (screws are tighten, etc.)		
20	Is the tank fastening done correctly?		
21	Did you do the starting up of the system according to manual?		
22	Did you do a functional check 30 minutes after installation?		

VIII) ELECTRICAL CONNECTIONS

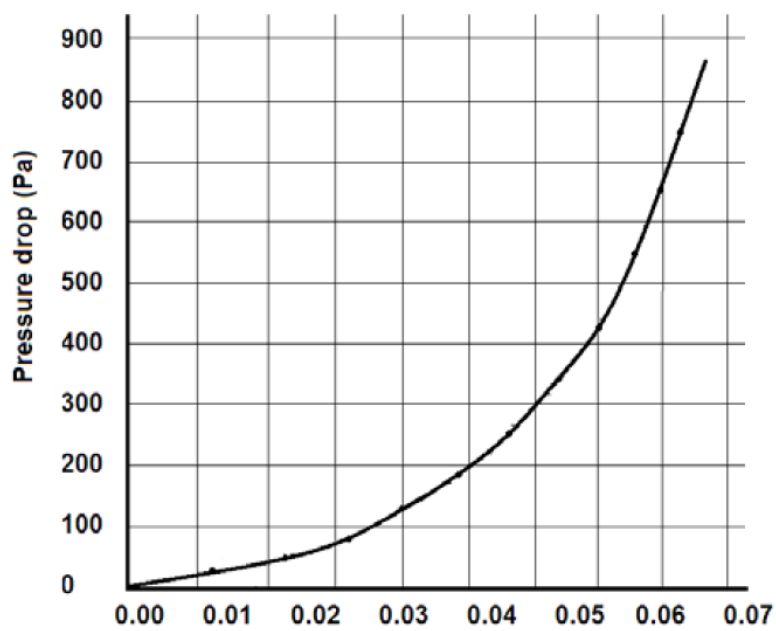
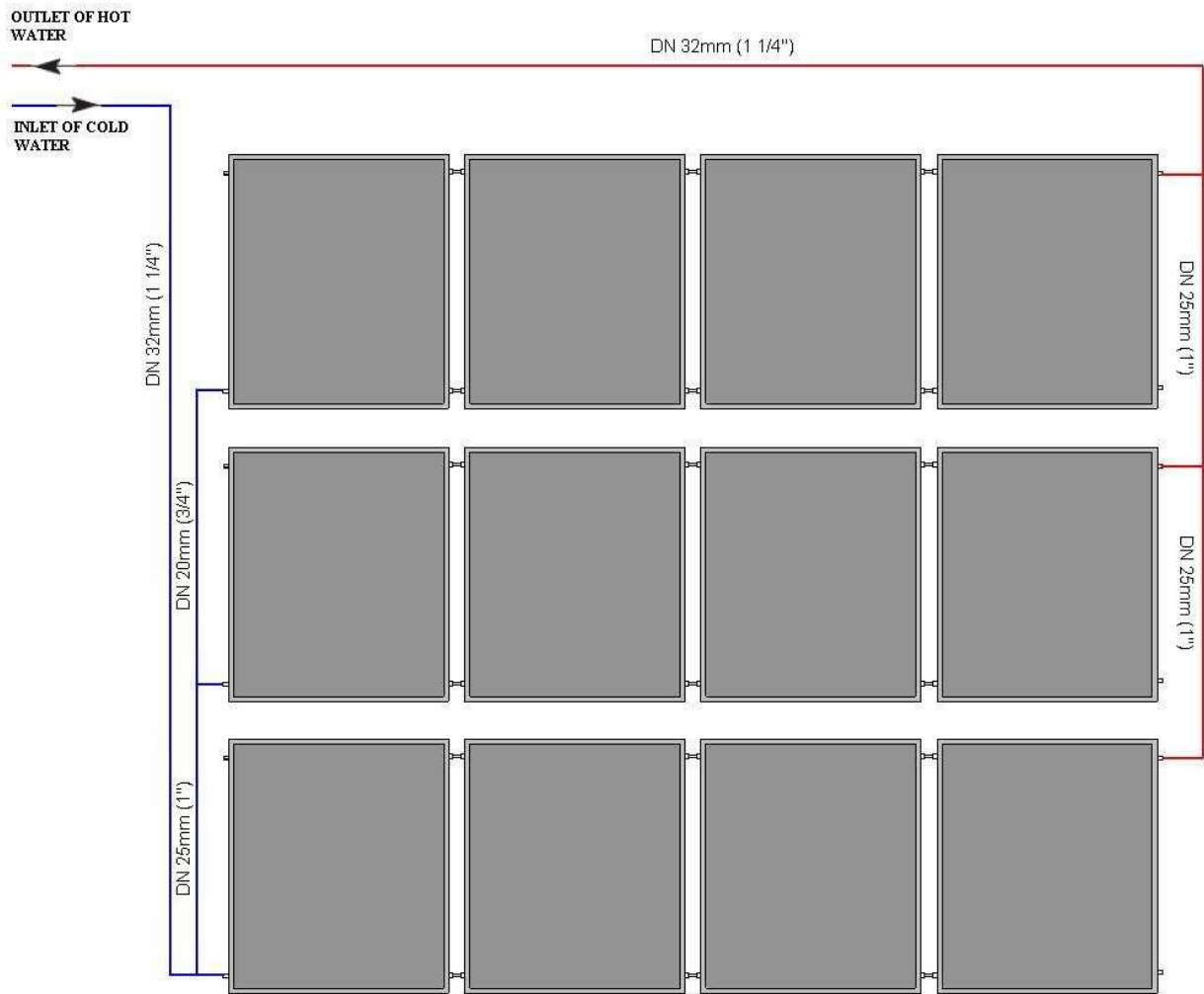
The electrical connections must be in compliance to the regulations applied in the country of installation and must always be realized by a certified electrician. Below is a diagram of how the power supply is connected to the heating element through the thermostat.



IMPORTANT: The electrical connections plastic cover on the side of the water tank should be installed as shown in the drawing above. The smaller hole is for the overflow of any water leaking into the electrics cavity and should be placed at the lowest point of the cover. The electrical cable hole is larger to accommodate for the diameter of the cable and protective sheath.

CAUTION: If you **DO NOT** connect the electrical resistance with the electrical panel of your house, you need to earth the anode with the roof's slab or with elsewhere made of concrete or wood and certainly **NOT** with the electrical earthing in order to fulfill the warranty conditions of your solar water heater.

IX) INSTALLATION OF COLLECTOR ARRAYS UP TO 20m²



X) FUNCTION AND MAINTENANCE

In order to protect the system from overheating, during high irradiation periods, it is highly recommended to install a T-P valve at the domestic hot water outlet, allowing the direct evacuation of the overheated sanitary water to the sewerage system. This T-P valve shall be set up to 60 °C. Otherwise cover the surface of the collector partially when there is low consumption or fully when there is no consumption at all (long period of absence). For this purpose choose the specialized covers for Calpak ES8 collectors.

It is also possible to install an expansion vessel at the upper part of the tank, which will store the liquid of the closed circuit when expanding and prevent it from spreading in the atmosphere. In this case the safety valve is installed above the expansion vessel.

In case the solar heater's performance drops, check that:

1. Orientation to the south is correct (or North for the South hemisphere)
2. The collector is at the appropriate angle, free of shadow and obstacles
3. All the connections are tight, with no leaks
4. The tubes of the closed circuit have the correct angle and do not generate siphoning
5. There are not any air bubbles in the closed circuit
6. The closed circuit is full of thermal fluid
7. There is no leakage or a mixing mistake in the domestic hot water supply.

For proper system maintenance a specialist should check every year (preferably September or October):

1. The magnesium rod of the tank, which should be free from salt deposits and to a size larger than 50% of its initial state. Otherwise must be replaced.
2. If the closed circuit of the tank needs to be filled with Nox Fluid (see page 1 for correct proportion) to ensure both the corrosion and antifreeze protection of the tank as well as the good performance of the heat exchanger.
3. The proper operation of the electrical resistance
4. If the safety valve at the cold water inlet is normally operating (if there are accumulated salts and is not possible to be cleaned, it must be replaced).
5. If the collector's glass is clean
6. Any other possible damage

XI) DECOMMISSIONING

Before decommissioning the system you must make sure local legislation is met. Contacting local authorities is highly recommended.