



X-AIR 14 VACUUM SOLAR COLLECTOR
ASSEMBLY AND USER'S MANUAL
RUNNING INSTRUCTIONS
Ver. 02 29/01/2015

PLEION
SMART SOLAR SYSTEMS



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RUNNING INSTRUCTIONS

X-AIR 14

VACUUM SOLAR COLLECTOR

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Before the beginning of works, if rooftop you must prearrange fall prevention and safety devices as required by law in accordance with DIN 18338 (works of roofing and sealing of roof) and DIN 18451 (work on scaffolding with safety net). Please, always strictly observe the safety regulations of the related Country!



Safety harness such as body-holding devices must be fastened only to fixed elements and possibly above the user!



For technical reasons if there are no fall prevention devices or general safety devices, you always must wear body-holding devices!



It is forbidden to use ladders or any other safety device supposed to be not fully efficient!



You must use only controlled safety devices with mark issued by authorized testing bodies!



Place the support ladders in a safe condition, keep the exact tilt angle, being sure they cannot slip away.



Failure to use safety and fall prevention devices can cause accidents with serious or even fatal consequences!



Place the ladders only against safe and fixed point of support, and in a traffic area you must protect them with gates!



When using support ladders, dangerous falls may occur if the ladders are not positioned in a proper way!



Accidental contact with electric lines under voltage can be lethal!



If installation works are made next to the electric lines, you must keep the minimum safety distances!



Failure to observe the safety rules and all information in this manual can cause serious accidents and/or damage to the product! In any case, the manufacturer declines any liability!



When drilling works and handling of collectors, you must wear protective glasses!



During installation of collectors, you must wear safety shoes!



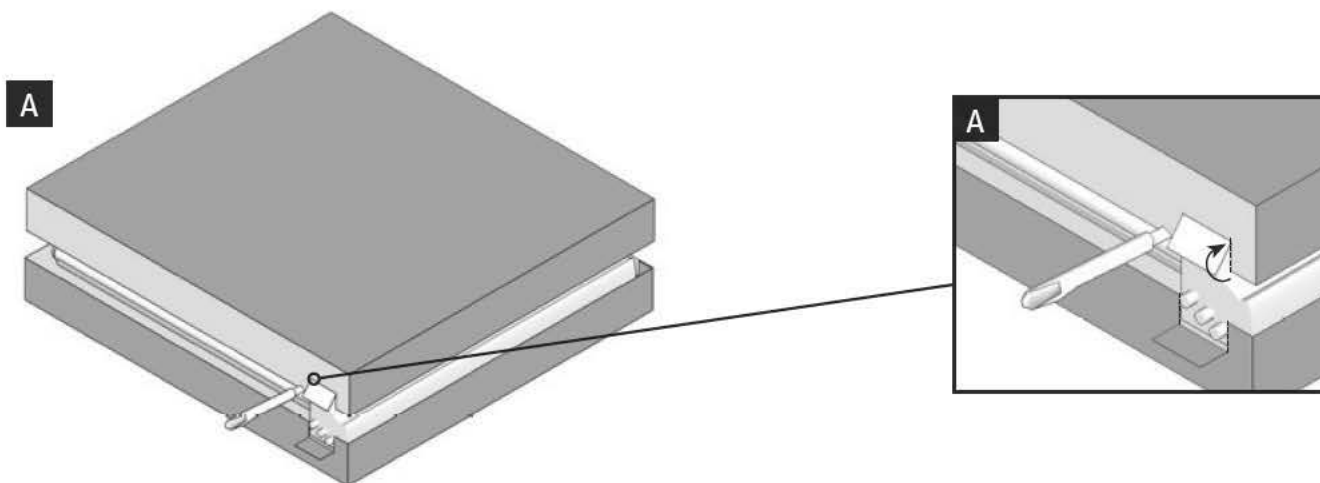
During handling and installation of collectors, you must wear protective gloves! Attention, note that the collector has many sharp edges!



You must wear the safety helmet!

SUN BOX

Waxed cardboard box for external use for the collector covering and protection from extreme irradiance. Remove only after system running.

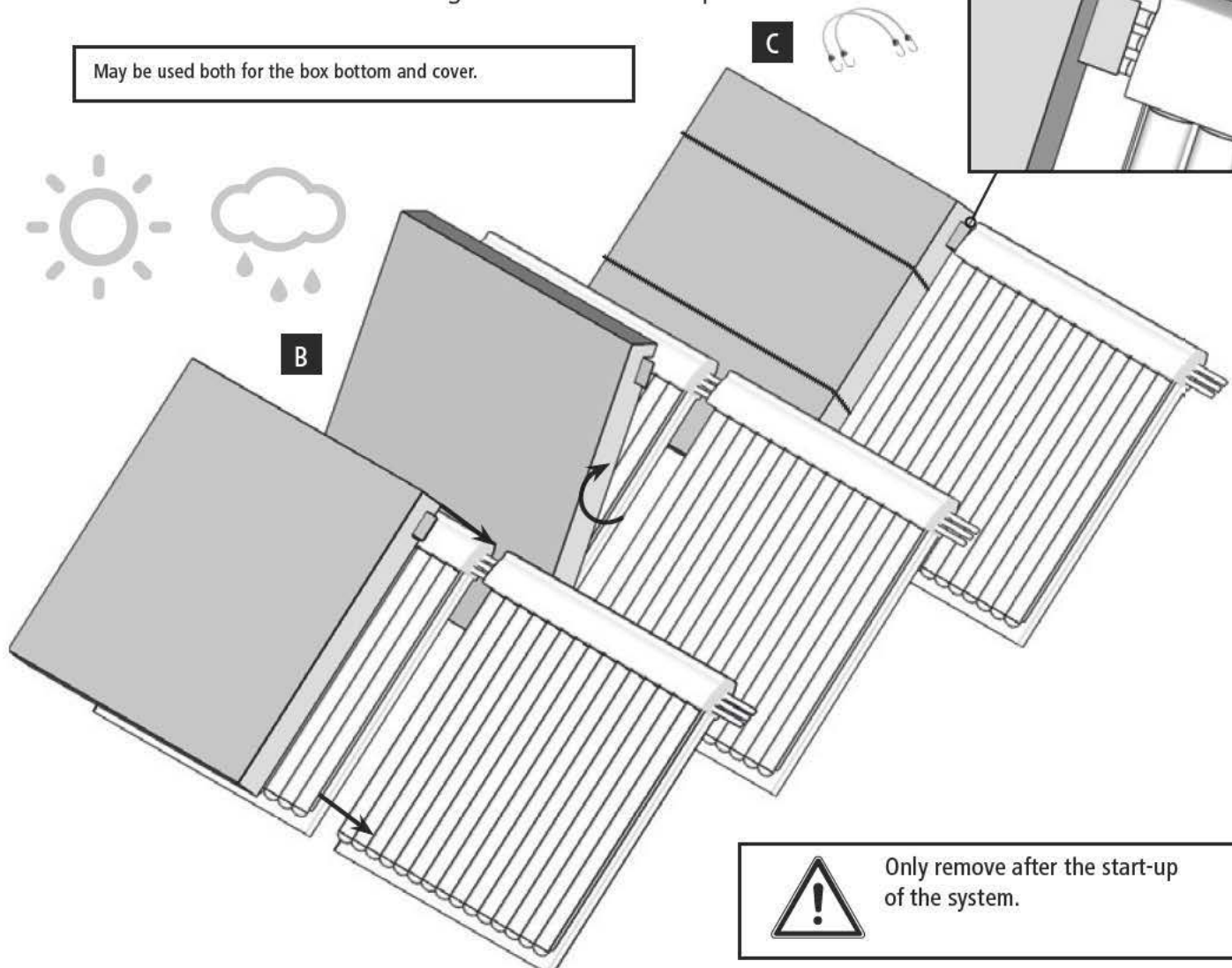


A – Cut the cover along the dotted line and fold upwards.

B – Place above the installed collector.

C – Fasten the collector with a bungee cord or adhesive tape.

May be used both for the box bottom and cover.



Only remove after the start-up of the system.

General information

Installation must be performed by qualified personnel in full compliance with safety regulations and as specified in this document.

We recommend you to use only original components specially developed for the solar collector.

Before installing and putting-into-service the system, please inquire about rules, laws and regulations about where the system is to be positioned.

For collector transportation, we recommend you the use of suitable carrying straps. Do not lift the collector up by using threaded hydraulic connections. Avoid any critical hits or mechanical actions on the collector, above all protect the glass tubes which can be shattered because of their material.

Static

The assembly of solar collectors must be made exclusively on properly solid surfaces.

The static capacity of the roof or the installation surface must be tested before the beginning of the installation operations, if necessary please contact a structural engineer. Also carefully evaluate the suitability of the structure concerning all fixing and clamping systems. For installation in windy weather areas a/o with heavy snowfall, directly contact the manufacturer.

Lightning protection / potential compensation of the building

According to the current standard on Lightning Protection EN 62305, it is forbidden to connect the collectors field to the anti-lightning protection of the building. Any conductive object nearby must be placed at a safe distance of at least 1 meter. In order to make the potential compensation of the building, you have to connect the metal pipes of the solar circuit, and all slots of the collectors and fixing systems, according to EN 8001-1 regulation or specific standards of the related installation sites, with the main bar of the potential compensation. Such operation must be performed by an authorised electrical engineer.

Connections

Combine the collectors together by using only the hydraulic compensators supplied, developed suitably to contain the linear expansions caused by changes in temperature of the pipes in the collector. Failure to use those components may cause irreversible damages to the very same collectors.

Inclination of collectors / General Information

Solar collector and its related fixing systems are designed for inclinations ranging from 15° and 70°. For different installation conditions, ask the manufacturer for authorisation.

Covering the collectors

When installations have been carried out, cover the whole solar field, immediately and definitively and avoid direct solar radiation. Collectors must be covered also during the loading/starting-up phases, then they will be uncovered by the installer only when those stages will be completed.

If solar collectors are left empty and under solar radiation, in any season and condition, they can be permanently damaged because of that very exposure, not for the product itself.

Conventional warranty

Solar collector X-AIR 14 has a conventional warranty lasting 5 (five) years.

Such warranty is valid only if installation is performed in a workmanlike manner by qualified personnel and in full compliance with manufacturer guidelines. **Warranty conditions and validity are shown up on the Certificate of Conventional Guarantee given by Pleion s.r.l. together with the product.**

Flushing and Filling

Flushing and filling operations must be carried out only with cold solar field (see section "Covering the collectors"). For the system loading, use only water/antifreeze mixture recommended by the manufacturer.

Antifreeze recommended by the manufacturer: SENTINEL R 100

After the first loading, collectors cannot be completely emptied, so in case of freeze risk, use water/antifreeze mixture also for functioning and tightness tests! Warranty does not include any damage.

Assembly of temperature Probes

Temperature Probes must be placed in the proper slot, on the head of the collector, located on the delivery side of the collectors field (hot side). In order to ensure the best contact, and so for an accurate reading, we suggest you to fill up the probe holder sheath with a conductive paste. Probes must be made of high thermo-stability level material (250°C).

Operating pressure

The standard operating pressure ranges up to 2-3 bar. The maximum test pressure is 10 bar.

Deaerating process

System deaerating process must be carried out with a specific accuracy:

- when putting-into-service
- 4 weeks after putting-into-service operations
- when necessary, for ex. in case of faults a/o maintenances.

Checking the heat transfer fluid

You have to check periodically (max. every 2 years) antifreeze properties and pH value of heat transfer fluid.

- Check antifreeze efficiency and replace it if necessary. Nominal value -20°C
- Check pH value with a measuring instrument. pH nominal value 7,5
- Replace heat transfer fluid if value decreases under pH 7

Collector maintenance

You have to check periodically and inspect visually collectors field in order to verify the presence of any damages, tightness loss or extreme dirt.

Check with special attention the vacuum status of tubes which make the collectors:

- metallised tip of tube = vacuum OK;
- matt tip of tube = vacuum loss.

Replace the damaged tubes if any, only with original spare parts supplied by the manufacturer.

Before replacing the glass tubes, cover the involved collectors. In any case, please verify that metal parts are not particularly hot; be careful to the danger of burns due to internal circuits. Wear suitable protective gloves.

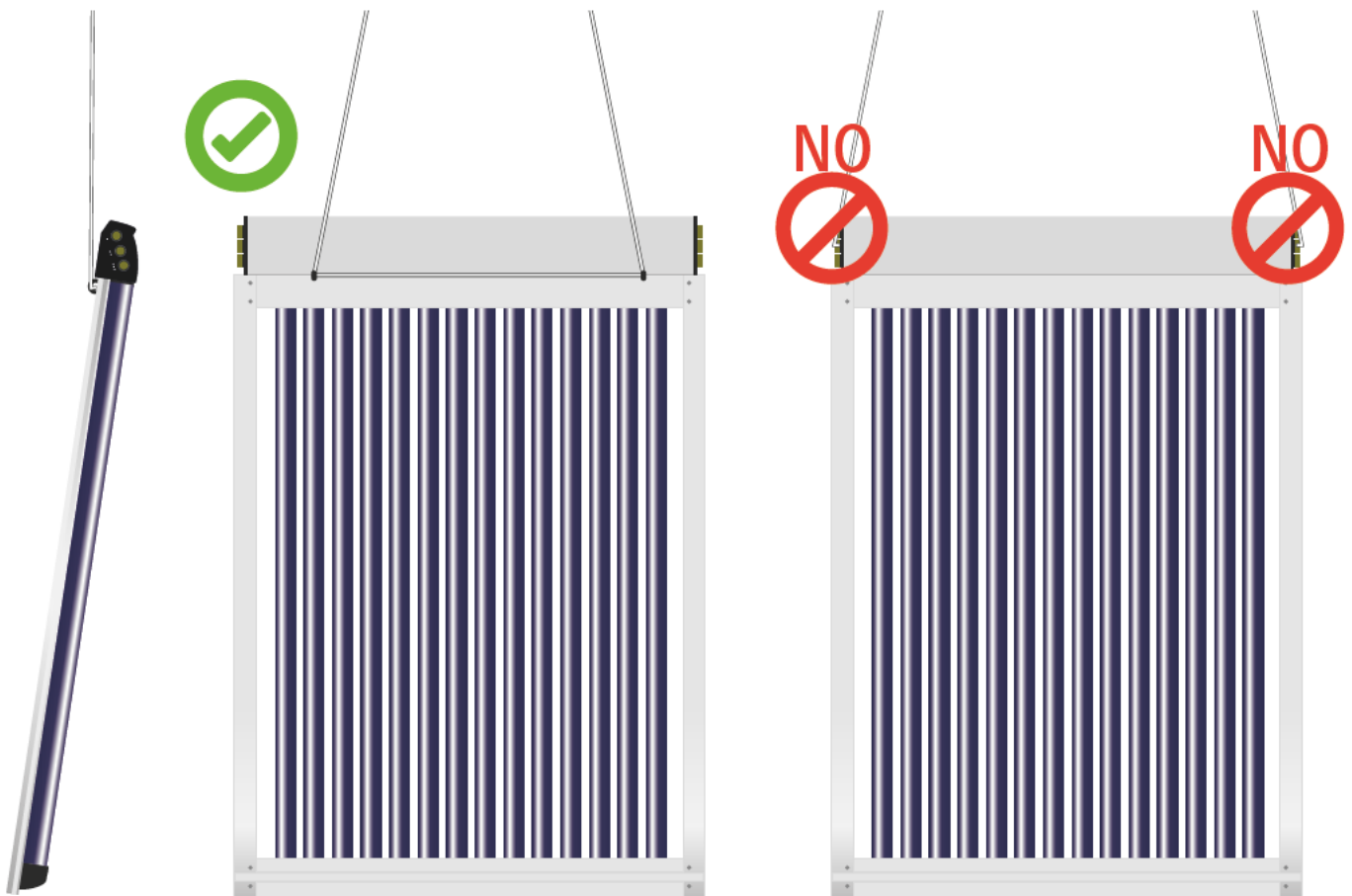
TRANSPORT INSTRUCTIONS

You must transport and handle solar collectors with their original packing, which has to be removed only before placing the collector on roof or any other fixing structure.

When handling collectors, we recommend you to be at least in 2 people (weight is about 65 kilos) and to wear always personal protection equipment suitable for handling.

When transporting collectors, we recommend the use of ropes to pass in the eye bolts supplied (see image below).

Use carabiners and ropes certified with breaking load greater than 2000 kg.



Do not lift the collector up, by using threaded hydraulic connections, do not lift the collector up by weighing or pulling on the glass tubes.

Avoid any critical hits or mechanical actions on the collector, above all protect the glass tubes which can be shattered because of their material.

Fix the ropes accurately for the lifting up: attention, danger of serious accidents!

DESCRIPTION

Vacuum solar collector X-AIR 14 at high efficiency made of n° 14 glass tubes of external diameter of 58 mm, in borosilicate glass with double air gap in which vacuum is created internally.

Distance between vacuum tubes: 84 mm.

Frame made of anodised aluminium profiles giving strength to all structure.

Direct and diffuse solar radiation penetrates from the outer tubes and is captured by the absorber.

A special aluminum absorber on the inside of the glass tube, transfers heat to the "U" type copper circuit inserted in the same one.

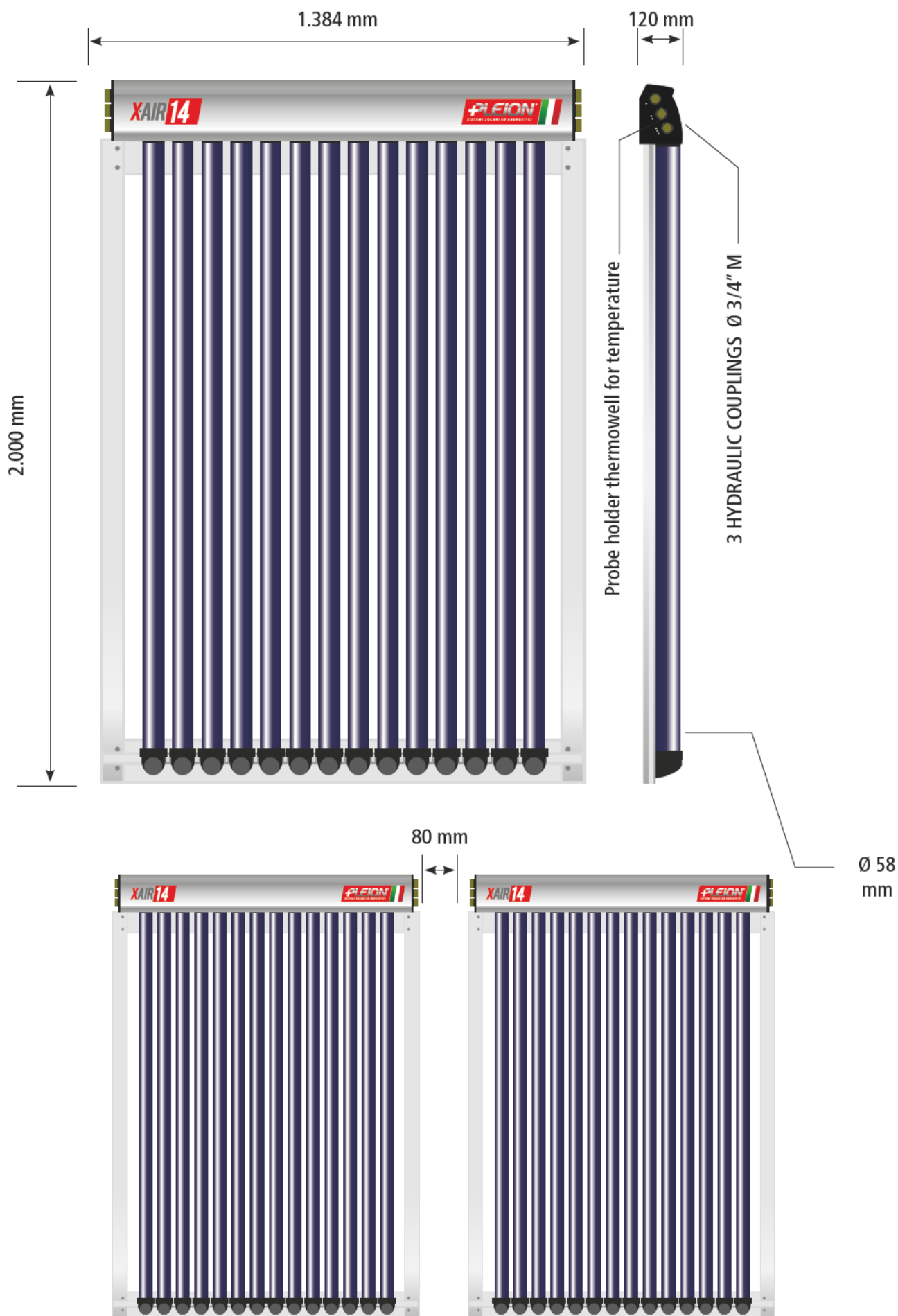
Robustness, energy performance and its unique design, are quality characteristics for the solar thermal market.

The exclusive hydraulics of the collector X-AIR14 with integrated third tube allows to connect in cascade up to 6 solar collectors, with the extreme advantage of not having the external return line.

This dramatically reduces cost and installation times, provides hydraulically balanced systems, with a clean and elegant aesthetic. Installation is possible thanks to the fixing systems on any type of surface.

The third side coupling allows the integrated hydraulic connection, with hydraulic distribution in parallel improving energy performance compared to common collectors in series.

Technical specifications	U.M.	Values
DIMENSIONS (length x width x height)	[mm]	2000x1384x120
GROSS SURFACE	[m ²]	2,770
OPENING SURFACE	[m ²]	1,330
360° ABSORBING SURFACE	[m ²]	1,145
EMPTY WEIGHT	[kg]	65,0
LIQUID CONTENT	[l]	2,83
MAXIMUM OPERATING PRESSURE	[kPa]	1000
RECOMMENDED FLOW RATE	[l/min m ²]	0,75
PEAK POWER	[W]	973
PERFORMANCE	η_0	73,20
TRANSMISSION COEFFICIENT a1	[W/m ² K]	0,518
TRANSMISSION COEFFICIENT a2	[W/m ² K ²]	0,032
ABSORBING COEFFICIENT	[%]	93,0
EMISSION COEFFICIENT	[%]	6,50
GLASS TRANSMISSION COEFFICIENT	[%]	92,0
CONNECTIONS	[inch]	6 x 3/4" M
STAGNATION TEMPERATURE (30 °C - 1.000 W/m ²)	[°C]	300



Collector connection

The following section provides general instructions for the dimensioning of the hydraulic lines connecting the collectors. However, it is necessary to get a proper sizing borne by the designer of the single system. Use metal pipes suitable for contact with glycol solution and high temperatures. Also make hydraulic seals suitable for contact with glycol solution and high temperature.

Pipes measurement

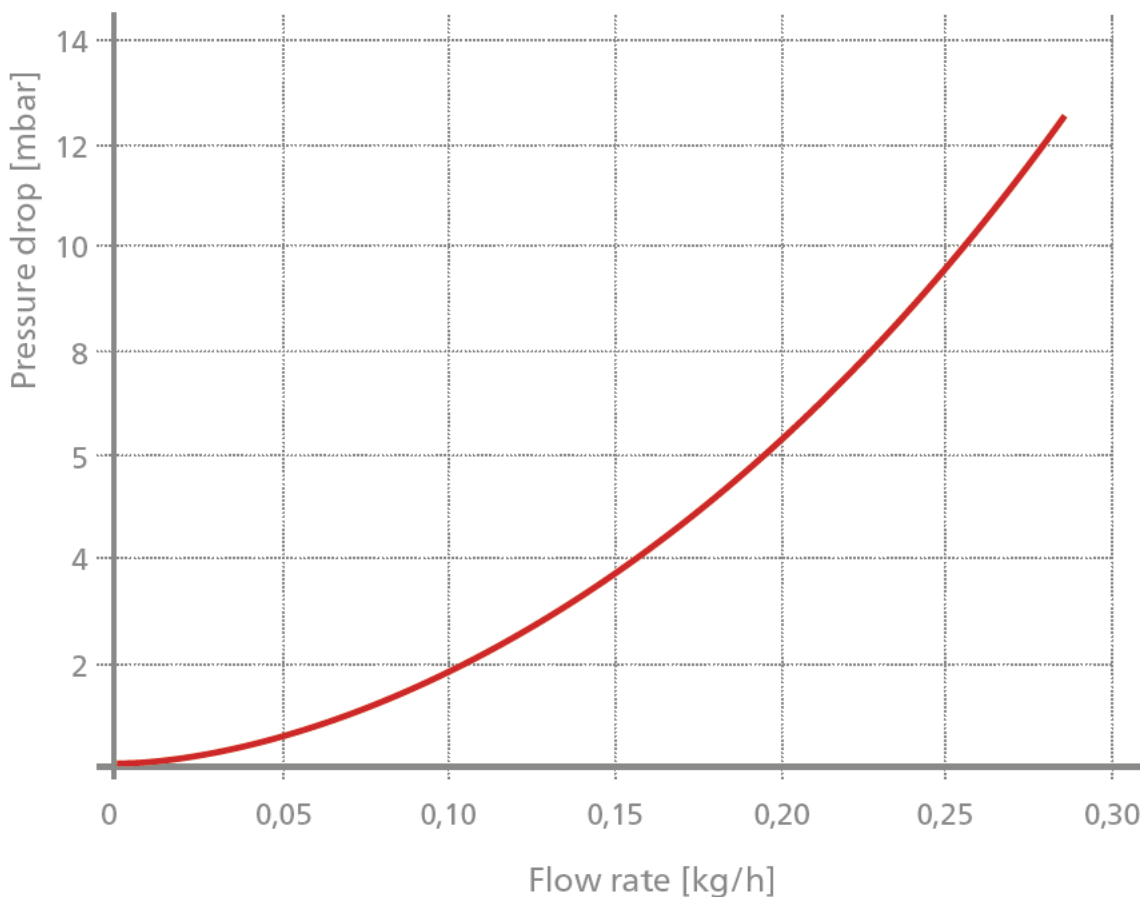
Collector field measure [m ²]	4	8	12	24
Copper pipe measure [mm]	18	22	22	28
Corrugated stainless steel pipe diameter	DN 16	DN 20	DN 20	DN 25

Heat transfer fluid flow rate

In order to ensure a proper solar system functioning, there has to be a specific heat transfer fluid nominal flow rate of 45 l/h m² (1 l/min collector) for collectors field up to 6 X-AIR 14 modules.

Pressure drop

In the following graph, you can see the solar collector power loss curve. (Please Note: measured value)



CLAMPING TYPES

There are many different clamping types for X-AIR 14 collector, in order to satisfy all installation conditions.

Whatever your clamping type is, follow the instructions to the chosen anchorage and go to section "performing final clamping system" which is useful for all solutions suggested below.

For anchorage

For anchorage point distances, please refer to the pages listed below depending on the type of brackets, for sloped roof or flat roof.

Sloped roof: System hook for covering shingles page	13
System hook for covering roof tiles page	14
Screw system page	15
Corrugated metal sheet system page	16
Crimped sheet system page	17
Triangle frame system page	19
Sloped roof: Distances for anchorage points for sloped roof page	18
Anchorage point distances for flat roof page	21
Performing final clamping system page	22

ATTENTION

Packaging does not include screws and wall plugs to fix the structure to the underlying surface.

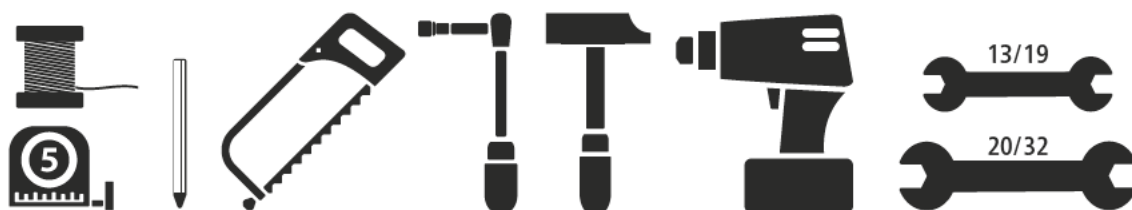
Installer should use screws/wall plugs depending on the type of structure, application and material to be set up.

Weights of panels and any additional weights are supported by the clamping elements, which hold themselves to the roofing, so you need to consider the capacity of the covering itself.

Positions for anchorage points are described here as follows, anyway they can be modified depending on covering shapes and types.

TOOLS FOR INSTALLATION

Diagram of tools required for solar collector installation.



SLOPED ROOF System hook for covering shingle

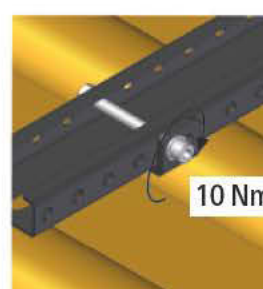
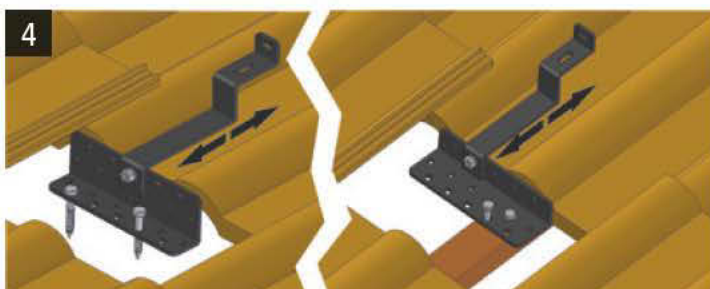
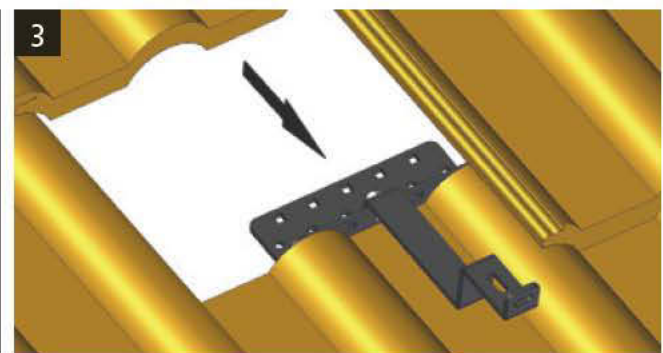
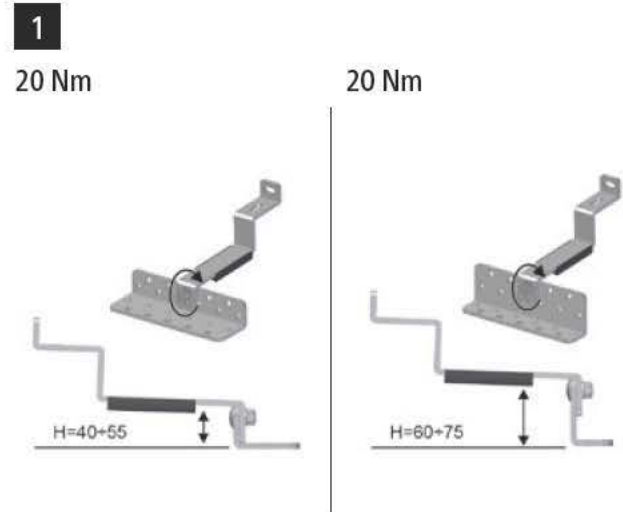


PLEASE NOTE: For distances between anchorage points, go to page 18 of this manual.

After finishing point **4** go on with the instructions on page 22 of this manual.

	SET BASE
	X 4
	X 4
	X 4
	X 4

MOUNTING SEQUENCE



SLOPED ROOF System hook for covering roof tile

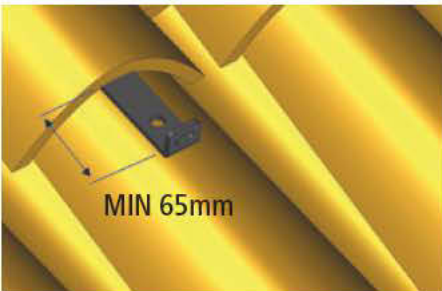
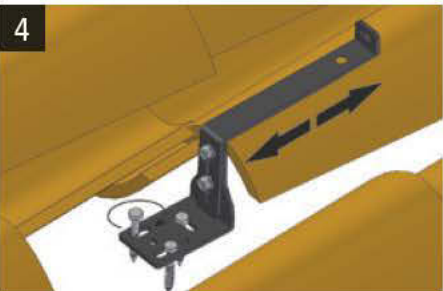
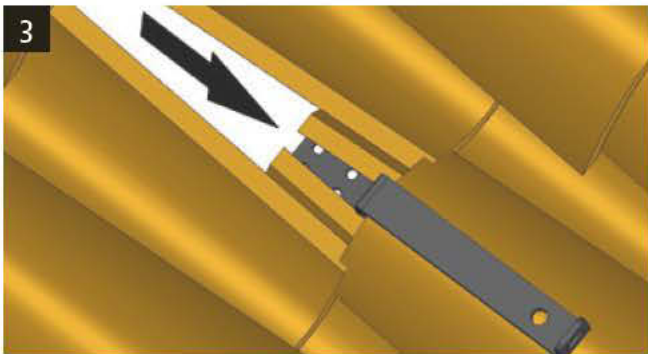
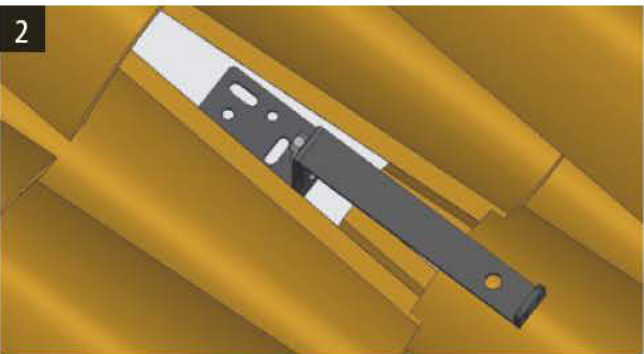
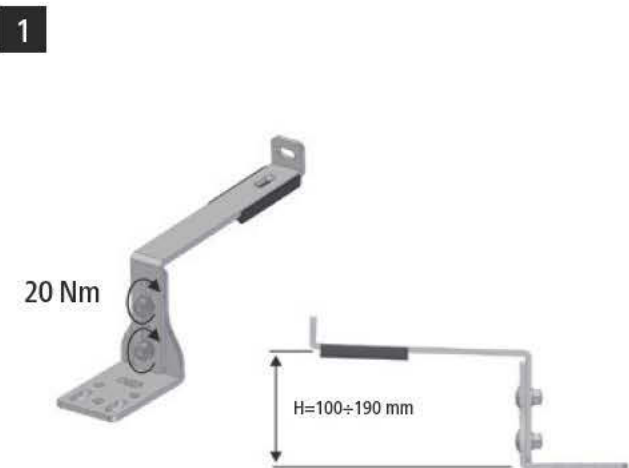


PLEASE NOTE: For distances between anchorage points, go to page 18 of this manual.

After finishing point **4** go on with the instructions on page 22 of this manual.

	SET BASE
	X 4
	X 4
	X 4
	X 8

MOUNTING SEQUENCE





SLOPING ROOF Screw system

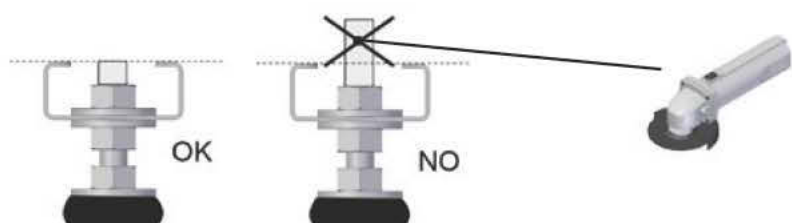
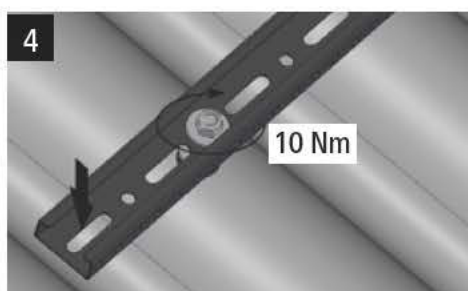
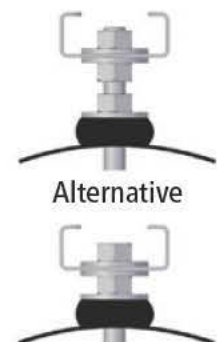
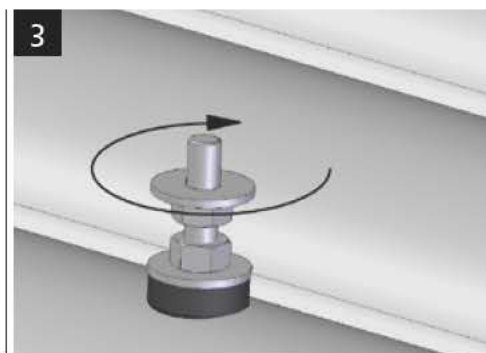
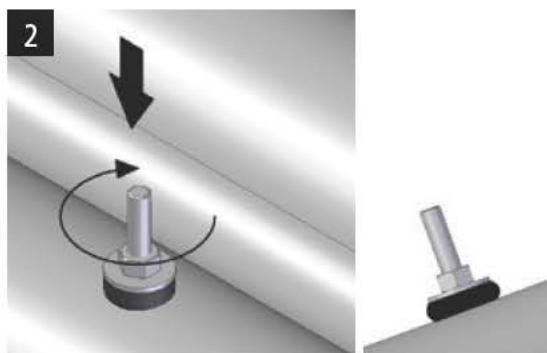
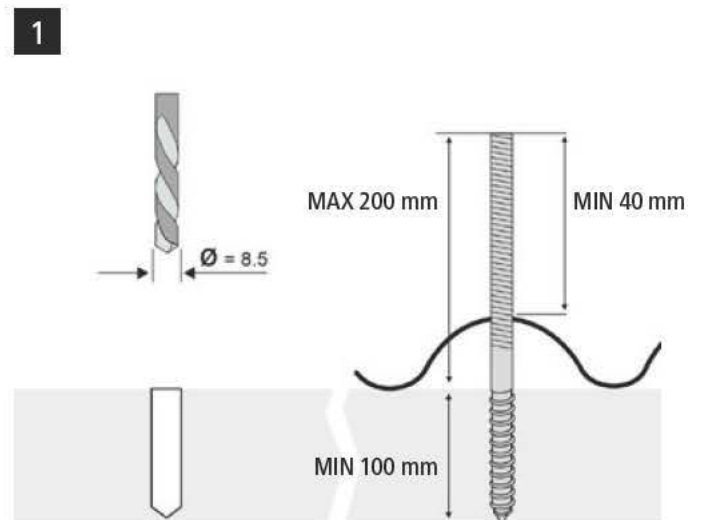


PLEASE NOTE: For distances between anchorage points, go to page 18 of this manual.

After finishing point **4** go on with the instructions on page 22 of this manual.

	SET BASE
12x300 (M12)	X 4
	X 4
	X 12
M12	X 12

MOUNTING SEQUENCE



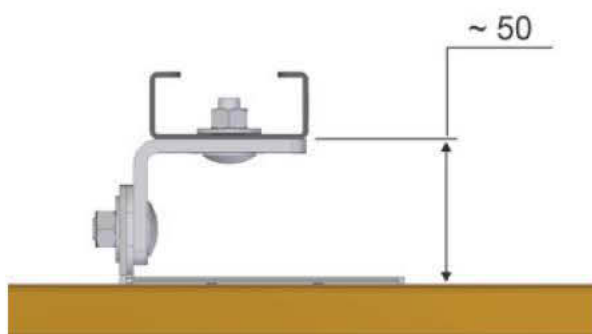
SLOPING ROOF Corrugated metal sheet system



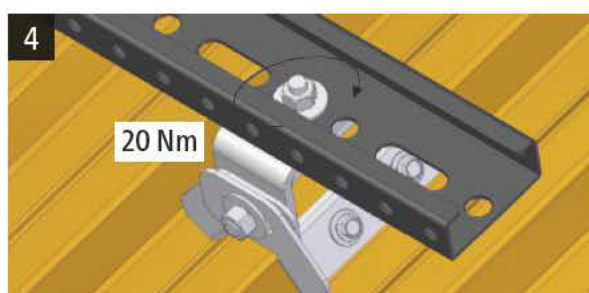
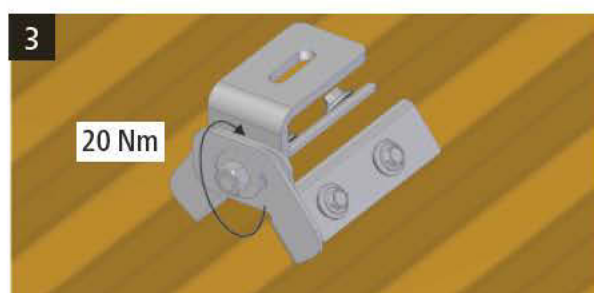
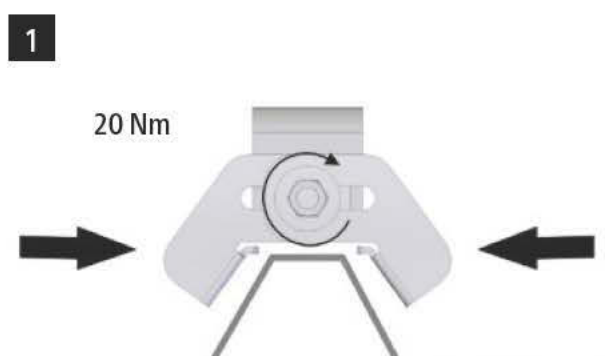
PLEASE NOTE: For distances between anchorage points, go to page 18 of this manual.

After finishing point **4** go on with the instructions on page 22 of this manual.

	SET BASE
	X 4
	X 4
	X 4
	X 7
	X 14



MOUNTING SEQUENCE





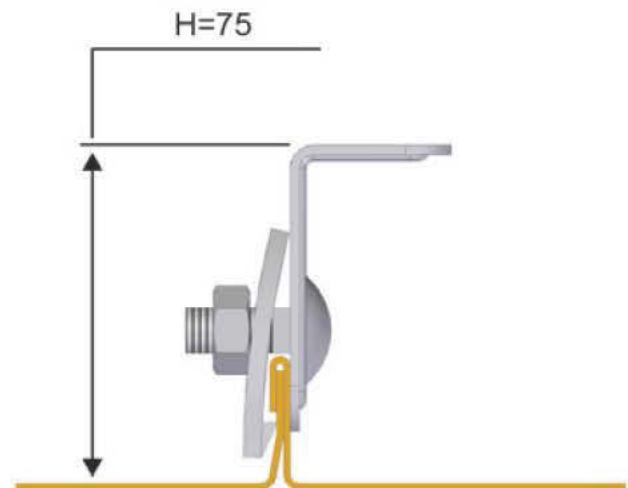
SLOPING ROOF Crimped sheet system



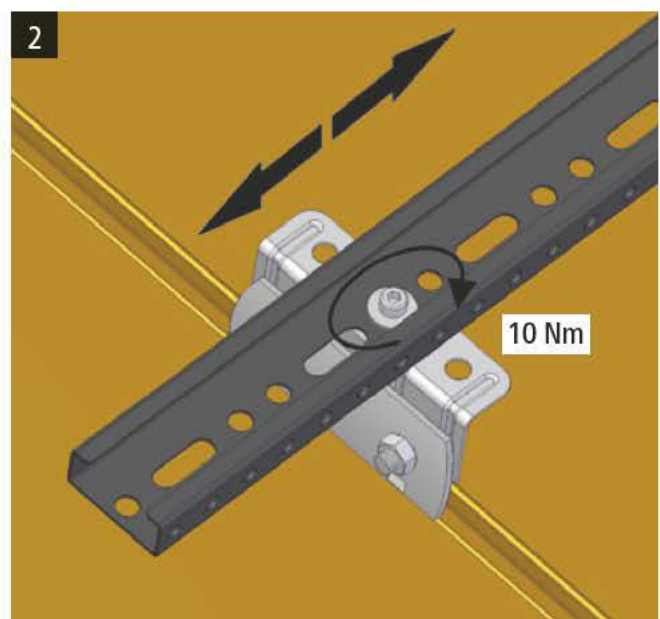
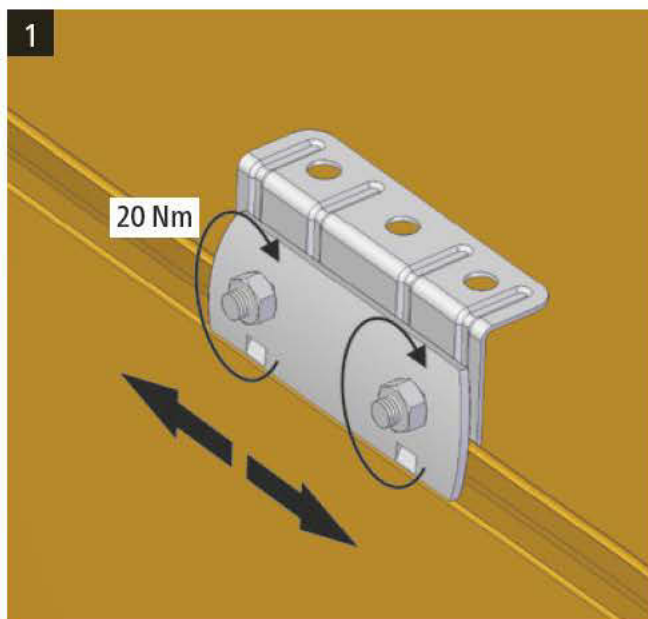
PLEASE NOTE: For distances between anchorage points, go to page 18 of this manual.

After finishing point **2** go on with the instructions on page 22 of this manual.

	SET BASE
	X 4
	X 4

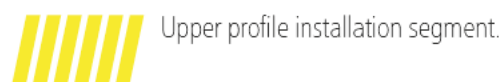


MOUNTING SEQUENCE







Each X-AIR 14 collector must be installed on four fixing points, so you need a base fixing kit for each collector.

Measures are in millimetres.

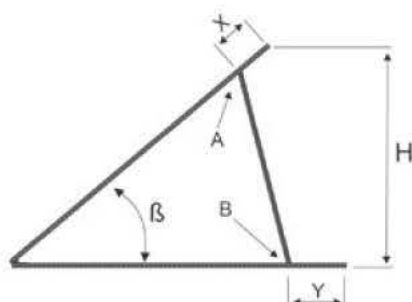
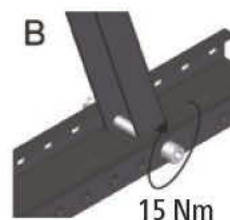
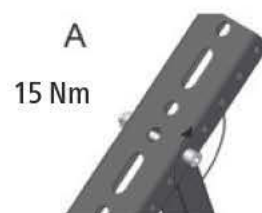
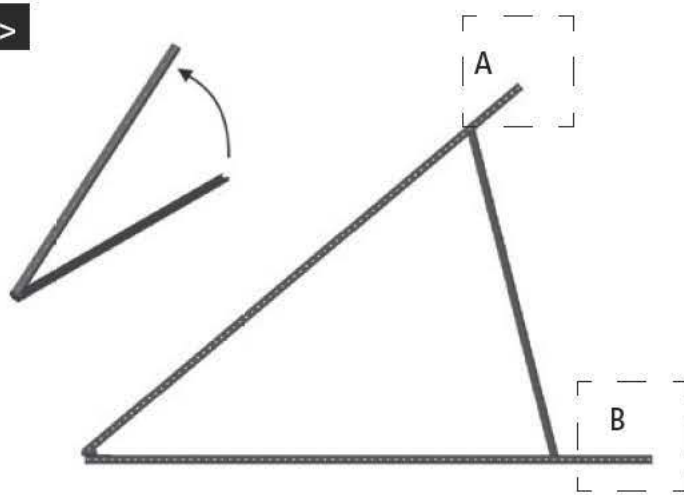


FLAT ROOF Triangle frame system



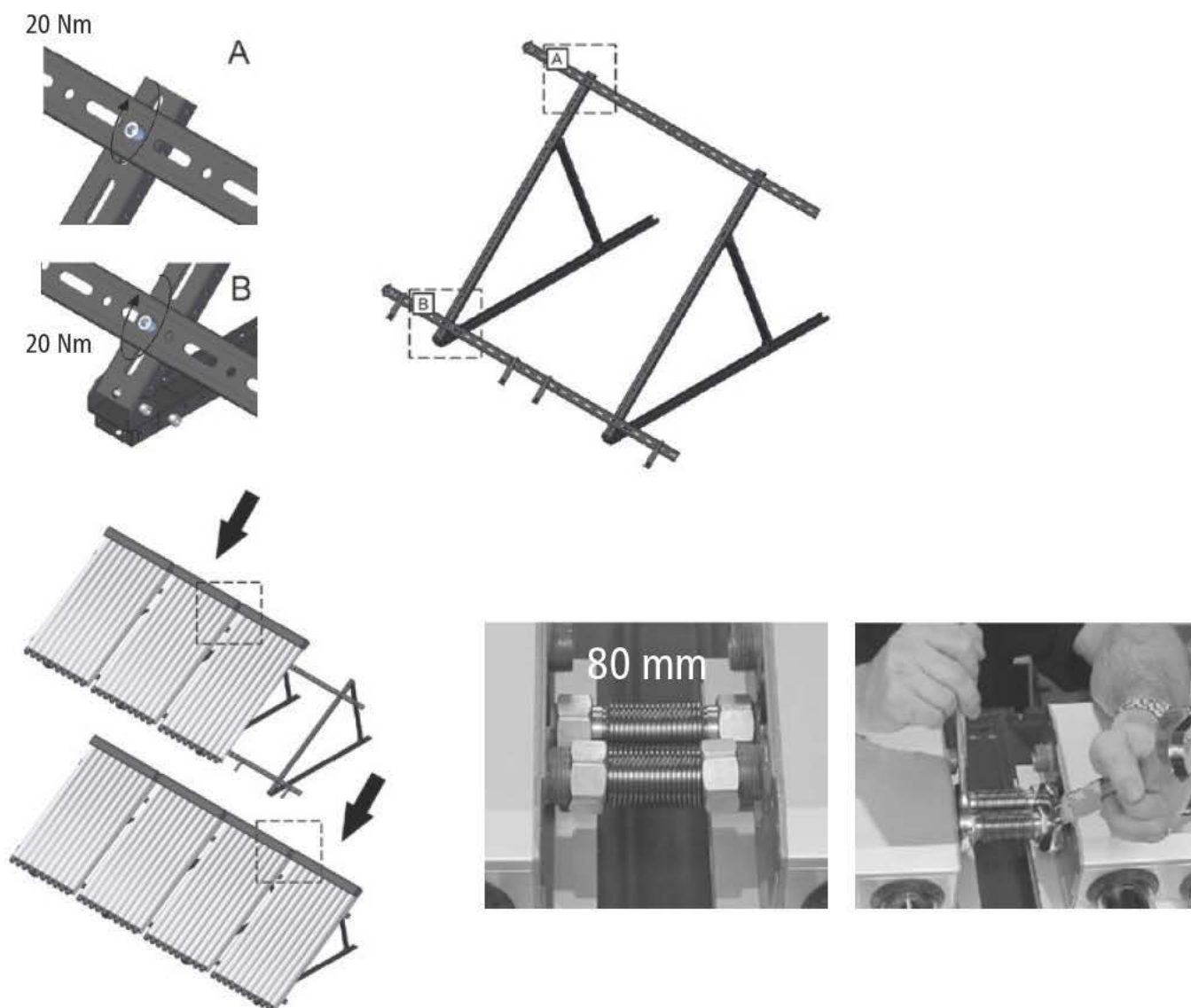
	SET BASE		
35 x 25 x 1100 mm 	X 2		X 2
	X 4		
	X4		

MOUNTING SEQUENCE



β	mm		n° Ø		mm
35°	X = 100	Y = 100	A = 1	B = 1	1060
40°	X = 210	Y = 310	A = 9	B = 13	1200
45°	X = 310	Y = 560	A = 13	B = 23	1300
50°	X = 460	Y = 660	A = 19	B = 27	1420

For distances between anchorage points go to page 21 of this manual.
After finishing the above mentioned points, go on with the instructions on page 22 of this manual.



OPTIONAL MATERIAL






In extreme windy conditions, you can also have tie-rods to ensure a better balance of the structure (optional).



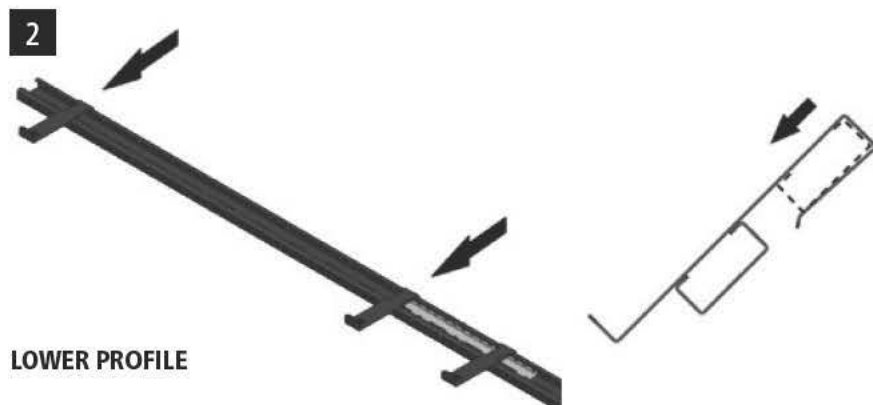
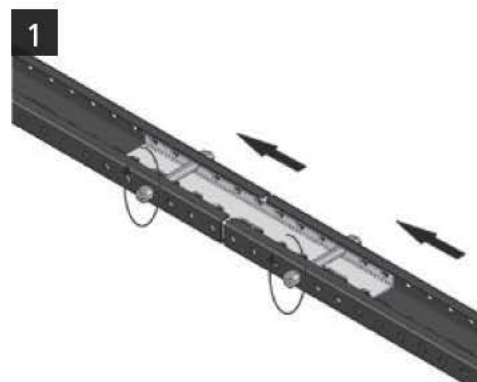
PERFORMING FINAL CLAMPING SYSTEM

Once your clamping system has been installed on rooftop, whatever type of installation you choose, you must carry out the final installation with the suitable parallel profiles (indicated below). Parallel profiles assembly is useful for solar collectors installation.

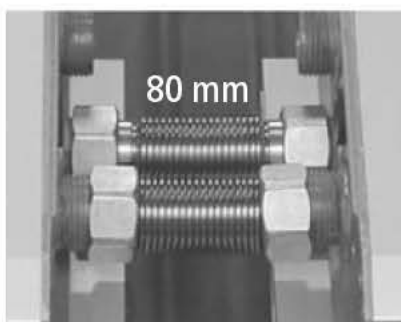
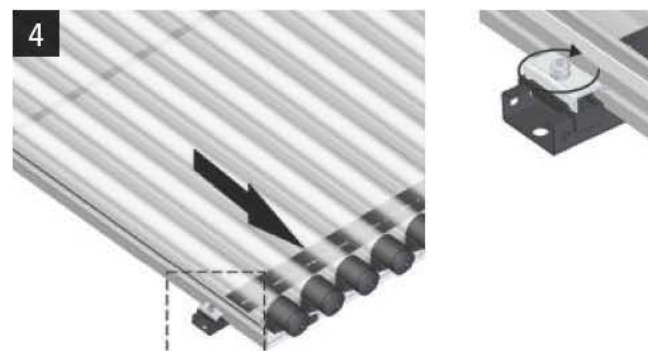
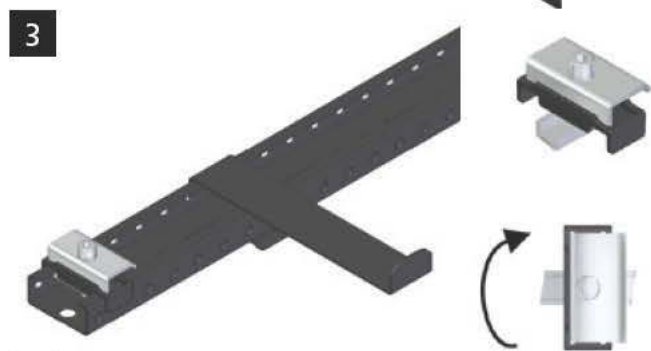


Material supplied for 1 panel:	
	X 4
	X 2
	X 2 - 60x25x1795 mm
	X 4 - TCEI M8 X 75
	X 2 - 55x20x295 mm

MOUNTING SEQUENCE



LOWER PROFILE



HYDRAULIC CONNECTIONS

X-AIR 14 collector head has three connections on its left side and three on its right side. On each side, hydraulic connections are marked with raised dots (see the side image).

Connection marked with one dot identifies the "third pipe", that is the translational pipe.

Connections marked with two or three dots are welded in the internal circuit of vacuum tubes.

For connections of solar piping feed (delivery and return) please refer to images shown in this section.



THIRD PIPE



CIRCUIT



CIRCUIT



PRESCRIPTIONS

Firmly cover the collectors from solar radiation, starting from the very first installation phases. Then uncover the collectors only when they have been loaded with glycol.

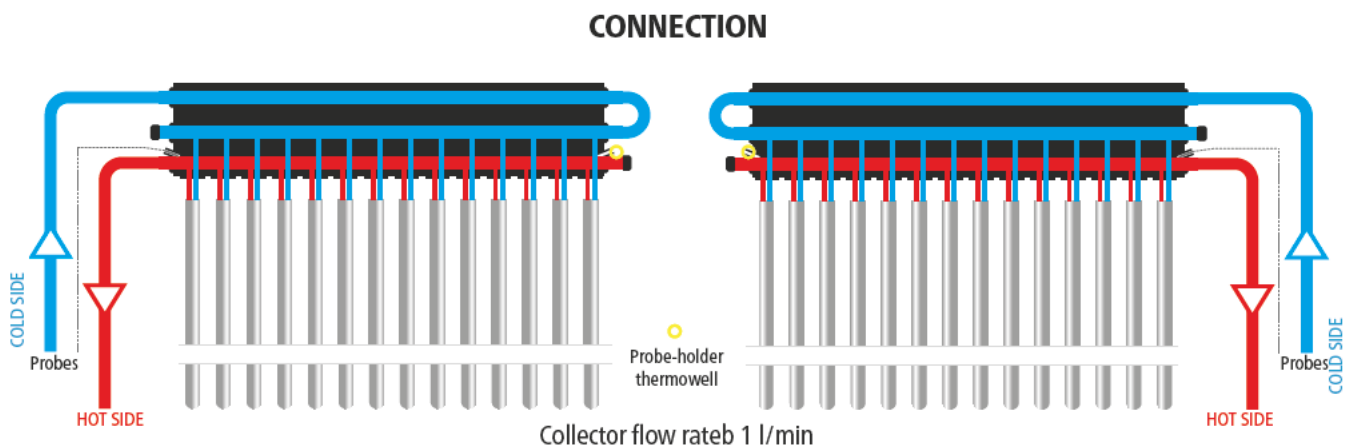
Do not fill up the system in sunlight, possible danger of steam flow!

X-AIR 14 collector with third pipe in parallel

X-AIR solar collector has the third piping, fully integrated in its head, it also has three hydraulic connections allowing the hydraulic distribution in parallel on each module of the string.

Collector has also lateral probe-holder thermowell to make reversible the connection of the external piping, both right and left side.

No matter how many collectors there are, feeds must be performed as shown below:



Connect the feed pipe, coming from the thermal power plant, on the right side of the collectors sequence.

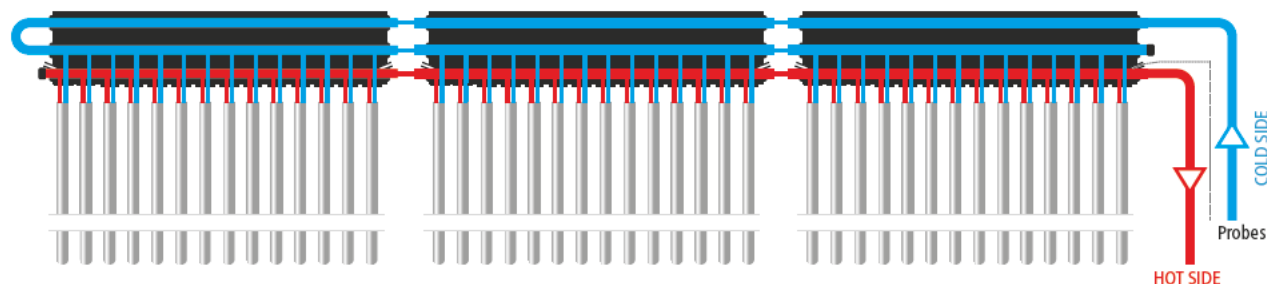
Connect the return pipe (cold side) to the upper coupling of the first collector (the first one on the right), plug the central coupling and connect the delivery (hot side) to the lower coupling. On the last string collector, connect the 180° curve between the first and the second coupling and plug the third coupling (lower part). Place the temperature probe in the probe-holder pit of the first collector (the first one from the right).

FEED FROM RIGHT SIDE

Connect the feed pipe, coming from the thermal power plant, on the right side of the collectors sequence.

Connect the return pipe (cold side) to the upper coupling of the first collector (the first one on the right), plug the central coupling and connect the delivery (hot side) to the lower coupling. On the last string collector, connect the 180° curve between the first and the second coupling and plug the third coupling (lower part).

Place the temperature probe in the probe-holder pit of the first collector (the first one from the right).

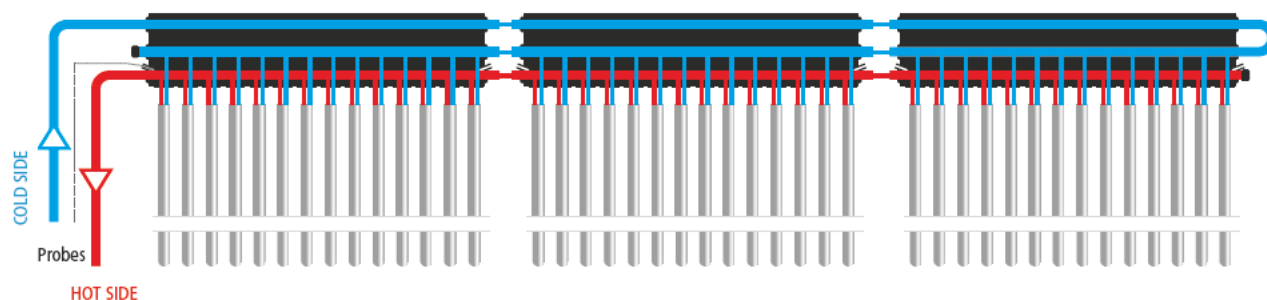


FEED FROM LEFT SIDE

Connect the feed pipe, coming from the thermal power plant, on the left side of the collectors sequence.

Connect the return pipe (cold side) to the upper coupling of the first collector (the first one from the left), plug the central coupling and connect the delivery (hot side) to the lower coupling. On the last string collector, connect the 180° curve between the first and the second fitting and plug the third coupling (lower part).

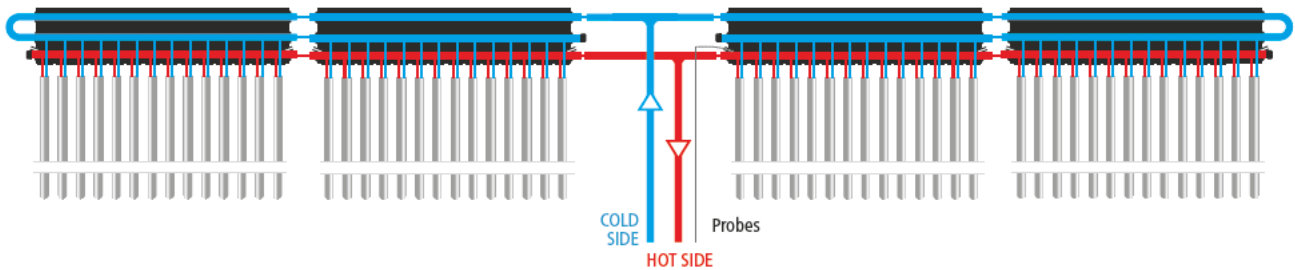
Place the temperature probe in the probe-holder thermowell of the first collector (the first one from the left).



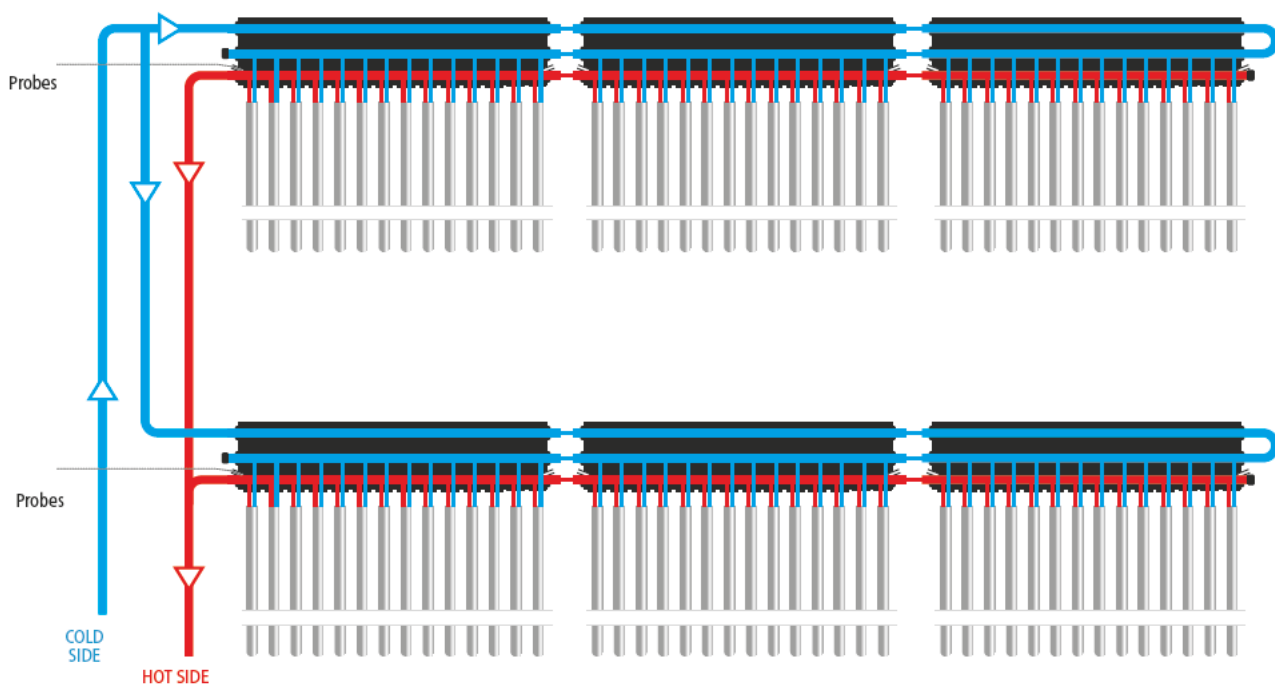
BIG SYSTEMS

For big systems, for example more than 6 X-AIR 14 collectors, it is possible to arrange two strings in line, by making a balanced connection with the feed halfway between the two strings.

Attention: the two strings must have the same number of collectors.



As an alternative, connect the collectors on multiple parallel rows and perform balanced hydraulic connections, as shown below.

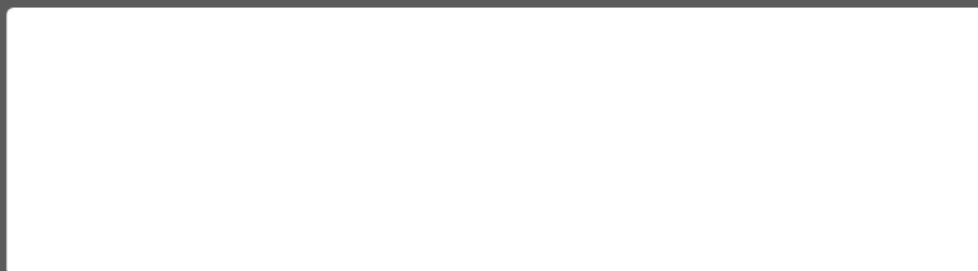


> We suggest you to prearrange more probes, on the related strings of collectors, in order to interchange them in case of fault and check for a proper balance of the circuit when operating.



PLEION Srl
Via Venezia, 11 - Cerea Verona
infoline +39 0442 320295
info@pleion.it

PLEION PARTNER



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