

100% MADE IN PLEION

X-RAY R

TECHNICAL MANUAL
INSTALLATION ISTRUCTIONS AND START-UP

SOLAR VACUUM COLLECTORS
- *NEW RANGE* -

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SAFETY WARNING



Regulation-compliant, non-personal fall protection or safety netting or other catch equipment, in accordance with DIN 18338 Roof Covering and Roof Sealing Work and DIN 18451 Scaffolding Work with Safety Net, must be installed before starting work.



Safety harnesses must be secured above the user if possible. Only secure safety harnesses to building elements or connection points with sufficient load – bearing capacity.



If no personal fall protection or fall arrest system or equipment has been installed for technical reasons, safety harnesses must be worn.



Do not use damaged ladders e.g. splintered stringers and rungs on wooden ladders, bent or kinked metal ladders. Do not patch up splintered or broken stringers, step and rungs of wooden ladders.



Only use safety harness equipment (harnesses or belts, ropes and straps, fall arresters, rope shorteners) that have been approved by authorised testing authorities.



Make sure that lean-to ladders are propped securely. Apply the correct leaning angle (68° - 75°). Secure lean-to ladders against slipping, falling over and sinking into the ground e.g. by using wider feet, adjusting the ladder feet to the ground surface, securing/hook fixtures.



If no personal fall protection or fall arrest system is used there is a risk of falling from a great height which can lead to serious or fatal injury if no safety harness or equipment is used.



Only lean ladders against secure supporting surfaces. Cordon off ladders in traffic areas.



When using lean-to ladders, there is a risk of dangerous falls if the ladder sinks, slips or falls over.



Contact with live overhead electrical cables and wiring can lead to fatal injury.



Work in the vicinity of live, electrical cables and wiring, where contact is possible, can only be carried out if safety distances and precautions are observed.



The manufacturer declines any responsibility for failure to observe safety. Regulations and/or information contained in this manual which may cause serious accidents/damage.



Wear protective goggles when drilling or handling collectors.



Wear safety shoes when carrying out installation work.



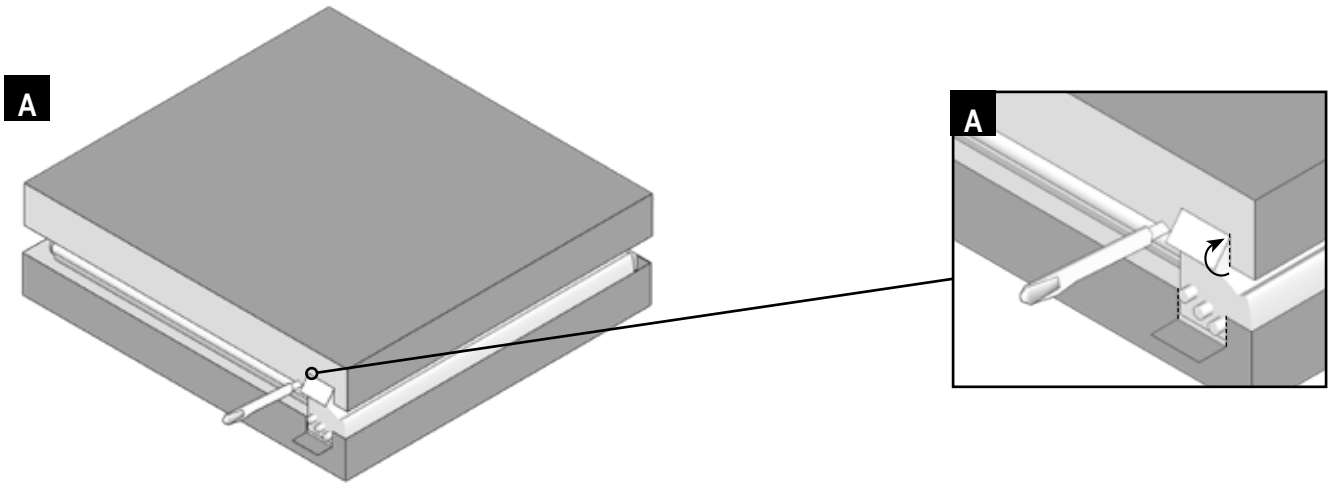
Wear cut-proof safety gloves when carrying out installation work or handling collectors due to sharp edges.



Wear a safety helmet when carrying out installation work.

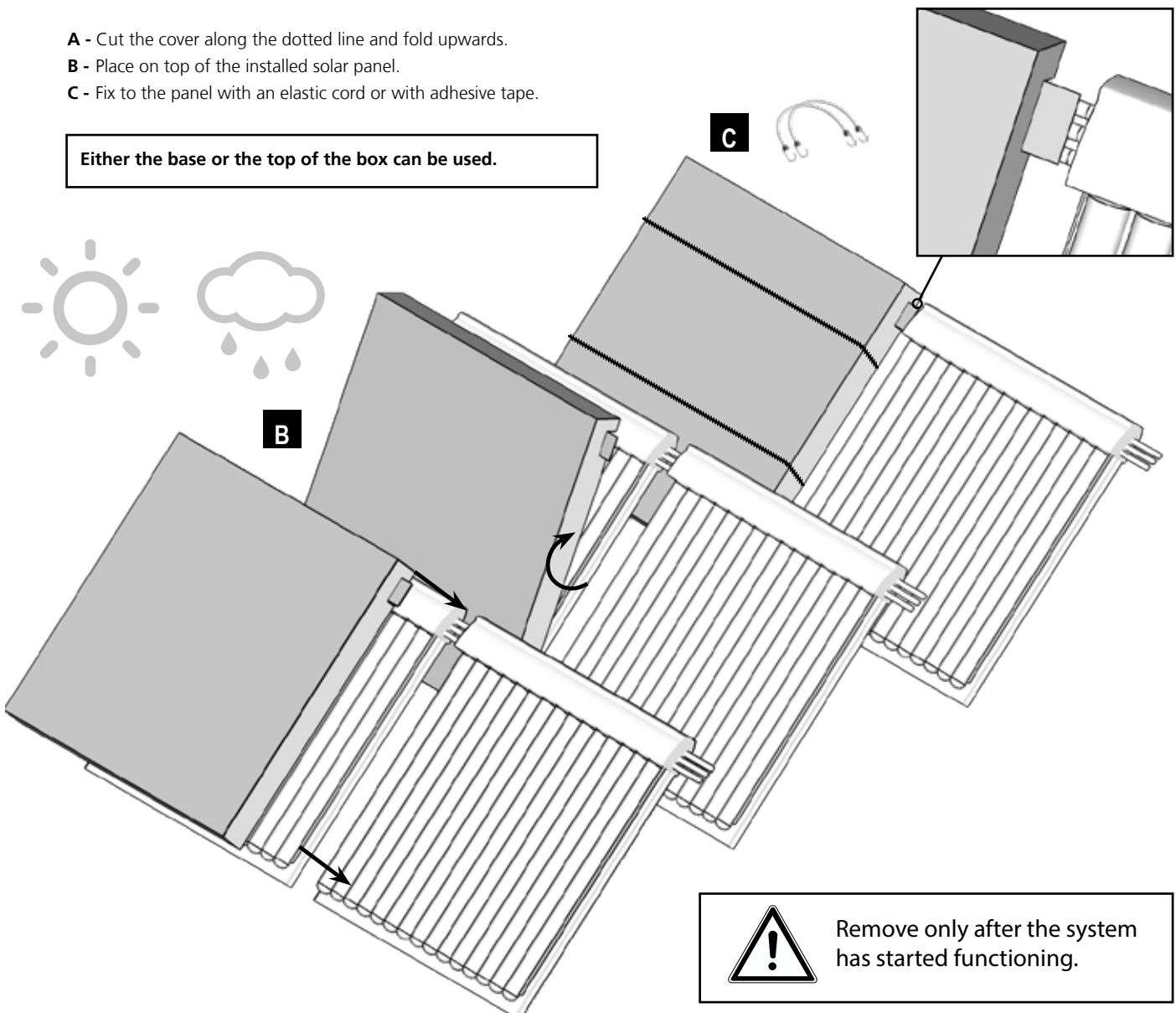
SUN BOX

PARAFFINED CARDBOARD BOX FOR OUTDOOR USE TO COVER THE SOLAR PANEL AND TO PROTECT AGAINST SUNLIGHT.



- A** - Cut the cover along the dotted line and fold upwards.
- B** - Place on top of the installed solar panel.
- C** - Fix to the panel with an elastic cord or with adhesive tape.

Either the base or the top of the box can be used.



INTRODUCTION

GENERAL INFORMATION

Read carefully all the instructions for assembly and for first activation. Assembly and first activation must be carried out only by authorised installers. The guarantee shall not be valid if the indications of Pleion are not followed.

Installation must be carried out only by qualified personnel and in full respect of safety regulations and of the indications contained in this document. We recommend that only original components, specifically designed for the series of solar thermal vacuum panels, be used.

Before the installation and start-up of the system, knowledge of the standards, laws and provisions of the locality in which the systems are situated must be obtained. Suitable belts should be used to transport the solar panels. Do not lift the solar panels using the threaded hydraulic connections. Do not allow the solar panels to sustain blows or mechanical action; special care must be paid to protect the glass tubes which, for their nature, can be shattered.

STATIC

Solar collectors must be installed on a sufficiently sturdy surface. Static capacity must be checked by a structural engineer prior to any installation. Check suitability for fixing systems. For installation in particularly snowy and/or windy sites please contact manufacturer.

LIGHTNING PROTECTION / EQUIPOTENTIAL BONDING OF THE BUILDING

In accordance with the lightning protection standard ÖVE/ÖNORM EN 62305 Part 1-4 the collector array cannot be connected to the building's lightning protection. A safety distance of at least 1 m must be maintained from any possible adjacent conducting object.

For installations on metal substructures at the installation site, qualified electricians must be consulted.

To carry out a building potential equalization, the metal tubes of the solar circuit and all collector cases or fastenings must be connected to the main potential equalization bus by a qualified electrician in accordance with ÖVE/ÖNORM E 8001-1 or the country-specific standards.

CONNECTIONS

Connect the collectors together with the flexible connectors supplied which regulate any linear thermal expansion in the pipes and collector. Irreparable damage may occur if such connectors are not used.

COLLETTOR ANGLE / GENERAL NOTES

The solar collector and fixing systems have been designed for angles between 15° and 70°. Please contact manufacturer for authorization under different installation conditions.

COVER THE PANELS

During installation, it is essential to cover the area of the panels that is sensitive to sunlight, immediately and during the entire preparation of the system. The panels must remain covered also during the successive loading and start-up steps; they will be uncovered by the installer only when said steps have been completed. The solar panels, if left empty and under the rays of the sun, in any season and condition, can undergo irremediable damage not ascribable to the products but to said exposure.

START UP

FLUSHING AND FILLING

Flushing and filling must be carried out only when the collectors are covered (see the paragraph "Covering the collectors" above). Fill the collectors with anti-freeze/water mixture supplied by manufacturer.

Anti-freeze recommended by manufacturer:

SOLAR LIQUID FAST G28



Premixed solar liquid ready for use in solar thermal vacuum panels, blue in colour based on monopropylene glycol, suitable for temperatures as low as -28°C. The chemical formula which includes corrosion inhibitors prevents the corrosion of the metals with which it comes into contact, and thus protects metals like aluminium and copper of which the main parts of a solar system are made.

Insoluble metal oxides, which can develop if the system is not bled and which cannot be removed, will form mud which over time can deposit on the heat exchange surfaces thus decreasing the yield, and therefore the mixture includes additives with a dispersing action so that any deposits are kept in suspension. Available in drums of 10 and 20 litres.

CHEMICAL AND PHYSICAL CHARACTERISTICS

Appearance	Blue liquid
Smell	Not offensive
PH as is	8,5-9
Freezing point	-28°C
Boiling point	From 103 to 172°C (1 bar - 8 bar)

After the first filling the collectors cannot be emptied completely, so to avoid any "risk of freezing" this anti-freeze/water mixture must be used to test working operations and wet sealing. Any damage caused by freezing is not covered by warranty.

INSTALLATION OF TEMPERATURE SENSOR

The temperature sensor must be installed in the specific holder on the collector head (hot side) to ensure optimal contact for accurate readings, sensor holder should be filled with conducting compound. Sensor must be temperature resistant up to 250°C.

OPERATING PRESSURE

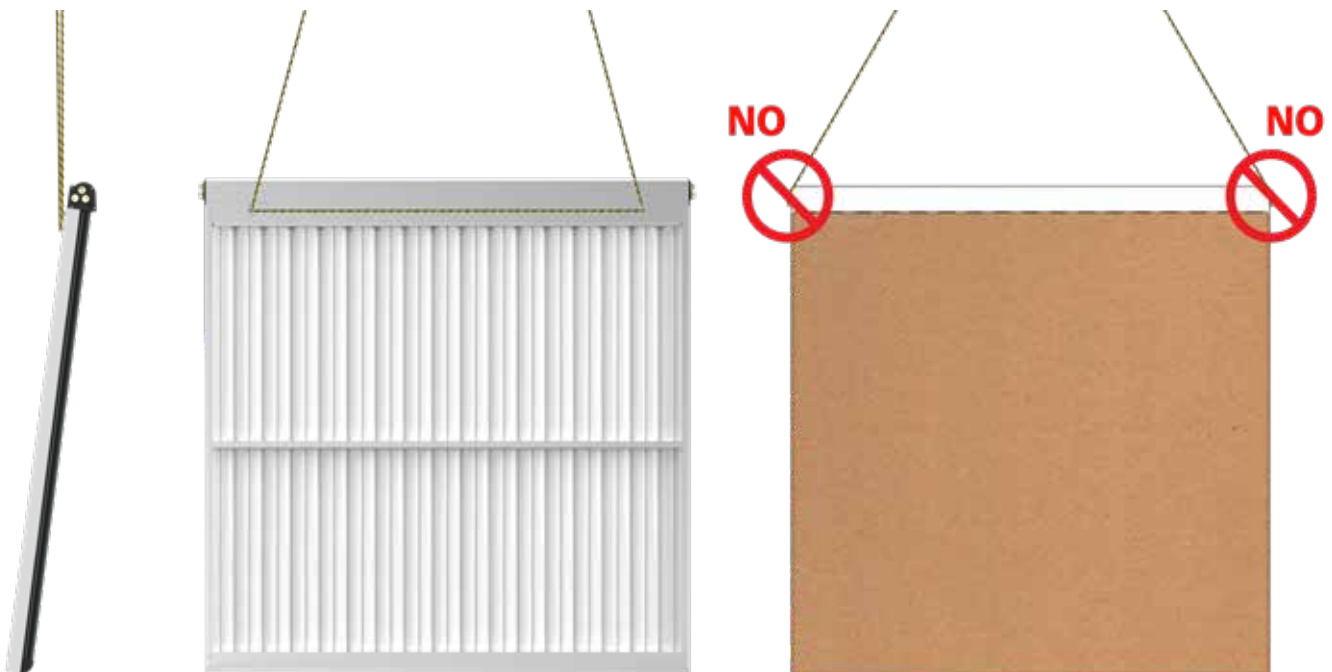
The normal operating pressure is 2-3 bar.
The maximum test pressure is 10 bar.

TRANSPORT INSTRUCTIONS

In the system installation and loading phase, the solar panels must be transported and handled in their original packaging, which must not be removed until they are positioned on the roof, or any other structure on which they are to be installed, in accordance with the paragraph "Cover the panels".

When handling and lifting the solar panels, personal protective equipment suitable for the handling should always be worn. The panels should be transported with the aid of ropes passed through the eyebolts provided (see the figure below). The eyebolts must be screwed to the bolts provided on the rear part of the panel head profile.

It is obligatory to use certified karabiners (spring catches) and ropes that have a breakage point above 2000 kg.



**Do not lift the manifolds by connecting to the threaded hydraulic connections.
Do not lift the collectors by putting on or pulling on the glass tubes.**

Prevent collectors from being struck or mechanically damaged, especially protect glass pipes which by their nature are particularly fragile.

Attach any lifting belts carefully to avoid serious accidents!

INFORMATION

DESCRIPTION

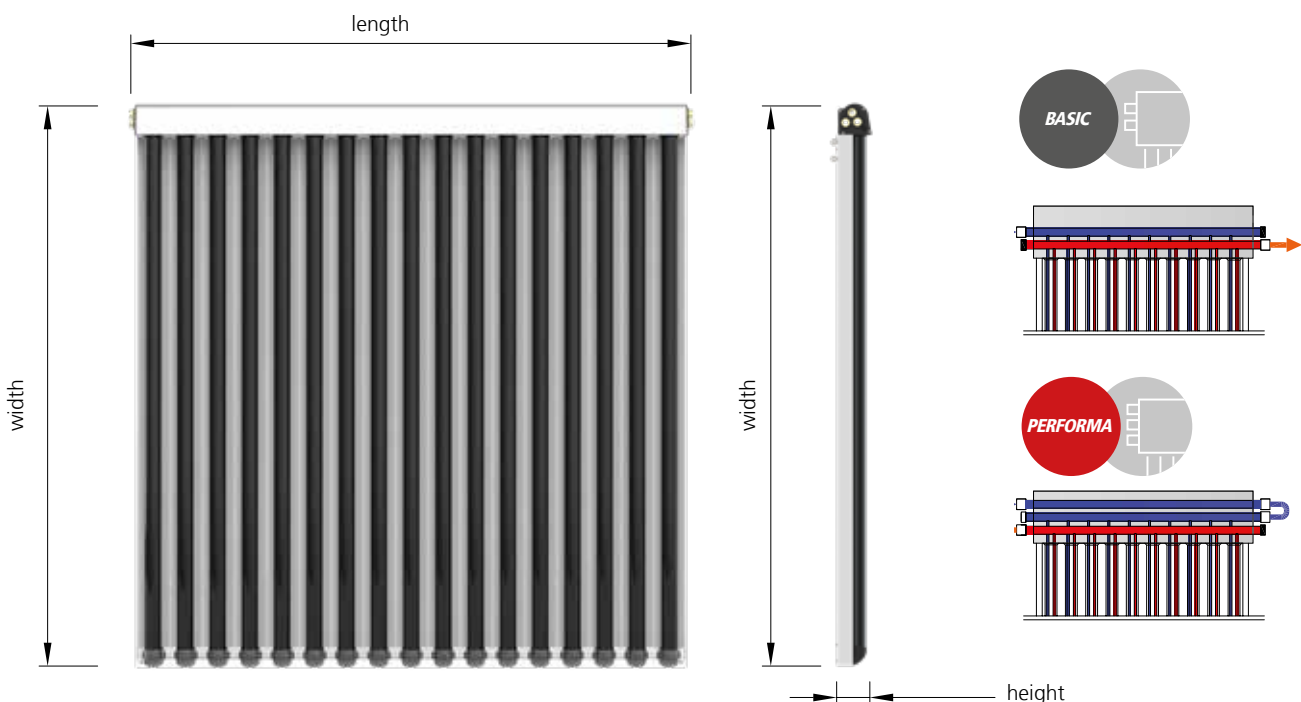
The panels with X-RAY R tubes have three main pre-assembled components:

- ~ Vacuum tubes;
- ~ Curved CPC mirrors;
- ~ A collector with a heat distribution unit and integrated return tubing

Each vacuum tube is composed of two concentric glass tubes; every single tube is closed at one end by a hemisphere, and is connected with another tube at the other end. The vacuum is created in the space between the tubes. The recipient which is thus formed can be considered a heat recipient. To more effectively store the solar energy, the internal glass tubes (protected by the hollow space containing the vacuum) are coated with aluminium nitrite, which allows the tubes to capture the heat very efficiently.

Highly reflecting CPC (compound parabolic concentrator) mirrors, resistant to atmospheric agents, have been placed behind the vacuum tubes to further increase their efficiency. The geometry of the mirrors allows both direct and diffused sunlight to hit the captivating surface even when the rays of the sun strike them at an unfavourable angle. The input and return tubes are located in the upper part of the panels. The input tubes branch into heat absorption units; these are U shaped copper ducts provided with heat deflectors in sheet aluminium, which transfer the heat from the glass tubes to the U shaped tubes through which the vector liquid flows. The hot liquid flows through the tubes and reaches the heat exchange unit for the production of hot water for domestic use or to supplement the central heating system.

The vacuum collectors are supplied completely pre-assembled and therefore they are fast and easy to install. They are a reference point for the solar market thanks to their physical resistance, energy performance and exclusive design. The exclusive hydraulics of the X-RAY R collectors with a built-in third tube allow for connecting up to 6 solar panels in cascade mode, with the extraordinary advantage that an external return line is not required. This drastically reduces the installation cost and time, and guarantees a hydraulically balanced system with a clean and elegant line. Installation is possible thanks to the anchorage system which allows for installation on any type of surface. The third lateral connection allows for integrated hydraulic connection, with parallel hydraulic distribution which improves the energy performance compared with normal panels connected in series.



TECHNICAL DATA

	modelli	X-RAY R 10 R	X-RAY R 11 R	X-RAY R 12 R	X-RAY R 13 R	X-RAY R 14 R	X-RAY R 15 R
TECHNICAL DATA							
Evacuated tubes	[N]	10	11	12	13	14	15
Measurements (length x width x height)	[mm]	1106 x 1921 x 114	1216 x 1921 x 114	1326 x 1921 x 114	1436 x 1921 x 114	1546 x 1921 x 114	1656 x 1921 x 114
Gross surface area	[m ²]	2,12	2,34	2,55	2,76	2,97	3,18
Aperture Area	[m ²]	1,91	2,11	2,29	2,48	2,65	2,87
Absorber surface 360°	[m ²]	2,57	2,82	3,09	3,34	3,59	3,85
Weight when empty	[kg]	40,0	43,6	48,2	52,8	54,5	58,2
Fluid content	[lt]	1,78	1,96	2,15	2,35	2,5	2,68
Max test pressure	[bar]	10	10	10	10	10	10
Recommended capacity	[l/min]	1,50	1,65	1,80	1,95	2,10	2,25
Peak Power	[W]	1272	1404	1530	1656	1826	1955
Optical efficiency	[%]	60,0	60,0	60,0	60,0	61,5	61,5
Tramittance coefficient a1	[W/m ² K]	0,910	0,910	0,910	0,910	0,850	0,850
Tramittance coefficient a2	[W/m ² K ²]	0,013	0,013	0,013	0,013	0,009	0,009
Absorber coefficient	[%]	92	92	92	92	92	92
Emission coefficient	[%]	6,5	6,5	6,5	6,5	6,5	6,5
Coefficient transfer of the glass	[%]	92	92	92	92	92	92
Connections	[Ø]	4-6 x 3/4 " M	4-6 x 3/4 " M	4-6 x 3/4 " M	4-6 x 3/4 " M	4-6 x 3/4 " M	4-6 x 3/4 " M
Stagnation temperature	[°C]	176	176	176	176	176	176
Head insulation thickness	[mm]	30	30	30	30	30	30
Diameter - vacuum pipe length	[mm]	58/47 - 1800	58/47 - 1800	58/47 - 1800	58/47 - 1800	58/47 - 1800	58/47 - 1800
Recommended inclination	[°]	15 - 75	15 - 75	15 - 75	15 - 75	15 - 75	15 - 75
Incidence angle correction factor	[K50°]	1,05	1,05	1,05	1,05	1,05	1,05
Energy produced annually EN 12975 - Wurzburg - Temperature 50°C	[kWh]	1231	1359	1481	1603	1844	1974
Test report EN 12975-2	[-]	RP.2018. COL.202a.1	RP.2018. COL.202a.1	RP.2018. COL.202a.1	RP.2018. COL.202a.1	RP.2018. COL.202b.1	RP.2018. COL.202b.1
DIN CERTCO number of registration	[-]	16084 Rev.0 KIWA	16084 Rev.0 KIWA	16084 Rev.0 KIWA	16084 Rev.0 KIWA	16083 Rev.0 KIWA	16083 Rev.0 KIWA

THE BENEFITS REFER TO THE GROSS SURFACE ACCORDING TO EN ISO 9806: 2013

modelli		X-RAY R 16 R	X-RAY R 17 R	X-RAY R 18 R	X-RAY R 19 R	X-RAY R 20 R	X-RAY R 21 R
TECHNICAL DATA							
Evacuated tubes	[N]	16	17	18	19	20	21
Measurements (length x width x height)	[mm]	1766 x 1921 x 114	1876 x 1921 x 114	1986 x 1921 x 114	2096 x 1921 x 114	2206 x 1921 x 114	2316 x 1921 x 114
Gross surface area	[m ²]	3,39	3,60	3,82	4,03	4,24	4,45
Aperture Area	[m ²]	3,06	3,25	3,45	3,63	3,82	4,02
Absorber surface 360°	[m ²]	4,10	4,36	4,62	4,87	5,13	5,39
Weight when empty	[kg]	63,6	65,5	69,2	73,5	76	80
Fluid content	[lt]	2,85	3,03	3,21	3,40	3,59	3,75
Max test pressure	[bar]	10	10	10	10	10	10
Recommended capacity	[l/min]	2,40	2,55	2,70	2,85	3,00	3,15
Peak Power	[W]	2085	2214	2349	2478	2607	2710
Optical efficiency	[%]	61,5	61,5	61,5	61,5	61,5	60,9
Tramittance coefficient a1	[W/m ² K]	0,850	0,850	0,850	0,850	0,850	0,690
Tramittance coefficient a2	[W/m ² K ²]	0,009	0,009	0,009	0,009	0,009	0,005
Absorber coefficient	[%]	92	92	92	92	92	92
Emission coefficient	[%]	6,5	6,5	6,5	6,5	6,5	6,5
Coefficient transfer of the glass	[%]	92	92	92	92	92	92
Connections	[Ø]	4-6 x 3/4 " M	4-6 x 3/4 " M	4-6 x 3/4 " M	4-6 x 3/4 " M	4-6 x 3/4 " M	4-6 x 3/4 " M
Stagnation temperature	[°C]	176	176	176	176	176	176
Head insulation thickness	[mm]	30	30	30	30	30	30
Diameter - vacuum pipe length	[mm]	58/47 - 1800	58/47 - 1800	58/47 - 1800	58/47 - 1800	58/47 - 1800	58/47 - 1800
Recommended inclination	[°]	15 - 75	15 - 75	15 - 75	15 - 75	15 - 75	15 - 75
Incidence angle correction factor	[K50°]	1,05	1,05	1,05	1,05	1,05	1,14
Energy produced annually EN 12975 - Wurzburg - Temperature 50°C	[kWh]	2104	2235	2371	2502	2632	2884
Test report EN 12975-2	[-]	RP.2018. COL.202b.1	RP.2018. COL.202b.1	RP.2018. COL.202b.1	RP.2018. COL.202b.1	RP.2018. COL.202b.1	RP.2018.COL.202.1
DIN CERTCO number of registration	[-]	16083 Rev.0 KIWA	16083 Rev.0 KIWA	16083 Rev.0 KIWA	16083 Rev.0 KIWA	16083 Rev.0 KIWA	16082 Rev.0 KIWA

LE PRESTAZIONI FANNO RIFERIMENTO ALLA SUPERFICIE LORDA CONFORMEMENTE ALLA NORMATIVA EN ISO 9806:2013

TYPES OF BRACKETS

Different types of X-RAY R manifolds are available to satisfy the different installation conditions. Whatever the type of fixture, follow the instructions for the chosen anchoring and continue to the paragraph "completion of the fixture system" which is common to all the solutions proposed below.

For the distances of the anchoring points, see the pages indicated below according to the type of brackets, both for a sloping roof or a flat roof.

TRACK SYSTEM (PARALLEL)

NB: valid for all sizes X-RAY R

Sloping roof:	Roofing tiles	pag 13
	Roofing shingles	pag 14
	Screw fastening system	pag 15
	Corrugated metal sheeting	pag 16
	Standing seam	pag 17
Flat roof:	Triangular structure system	pag 18
Distance between anchorage points		pag 20
Completing bracket system		pag 23

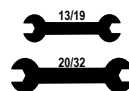
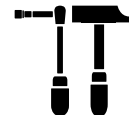
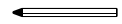
EASY SYSTEM (VERTICAL)

NB: valid for all sizes between X-RAY 10 R to X-RAY 17 R

Sloping roof:	Roofing tiles	pag 25
	Roofing shingles	pag 25
	Screw fastening system	pag 25
Flat roof:	Triangular structure system	pag 29
Distance between anchorage points		pag 27
Completing bracket system		pag 31

TOOLS FOR INSTALLATION

The tools necessary for the installation of solar collectors are schematically shown below.



CAUTION

Packaging does not include screws and screw anchors for fixing to underlying surfaces. The installer is responsible for selecting screws and screws anchors depending on type of structure, application and building material.

The weight of the panels and any additional weight is borne by the clamps which are supported by the roof which must therefore be assessed for load bearing capacity.

Anchorage points below may be modified depending on shape and type of roofing.

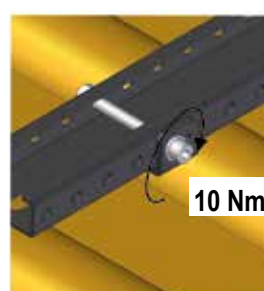
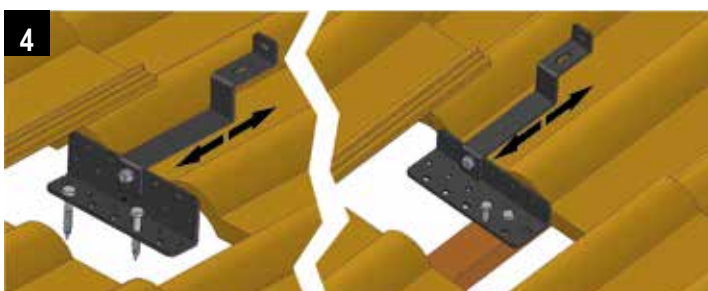
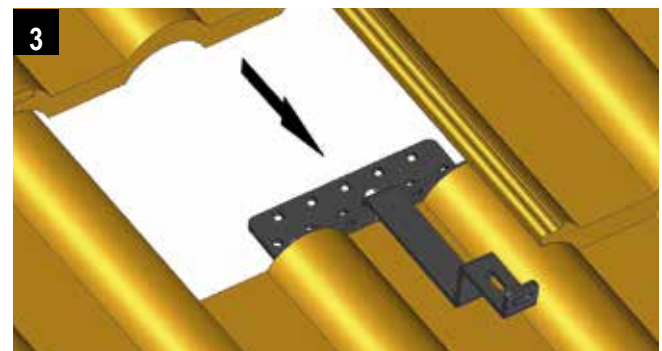
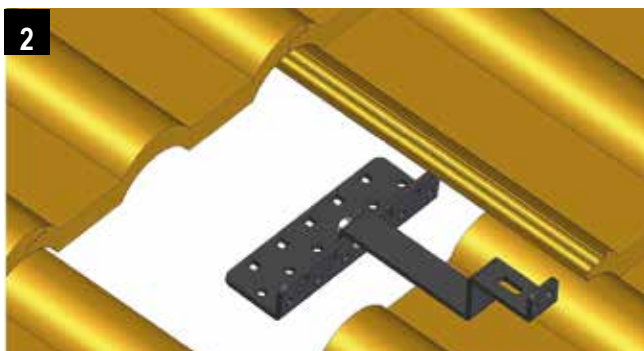
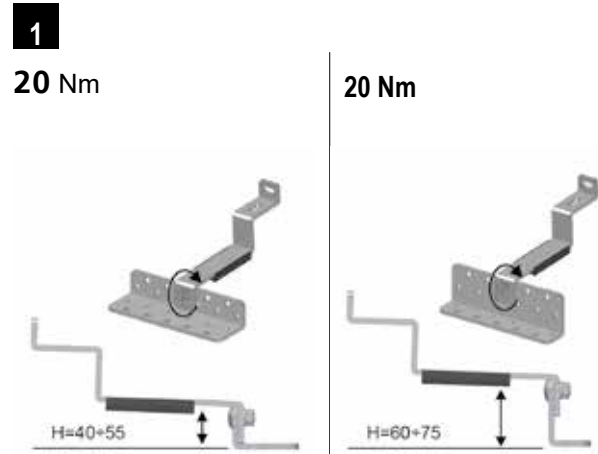
TRACK SYSTEM (PARALLEL) SLOPING ROOF BRACKET SYSTEM FOR TILES ROOFING



NB: For distance between anchorage points see page 20.
On completion of point **4** proceed with instructions on page 23.

	SET BASE
	X 4
	X 4
	X 4
	X 4

ASSEMBLY SEQUENCE



SLOPING ROOF BRACKET SYSTEM FOR ROOFING SHINGLES



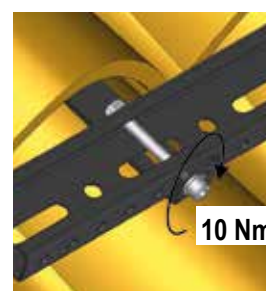
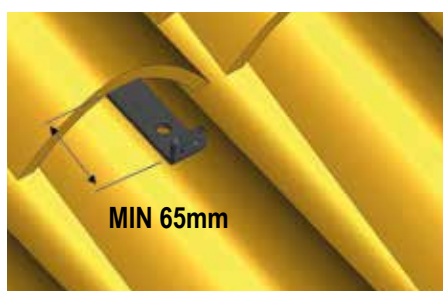
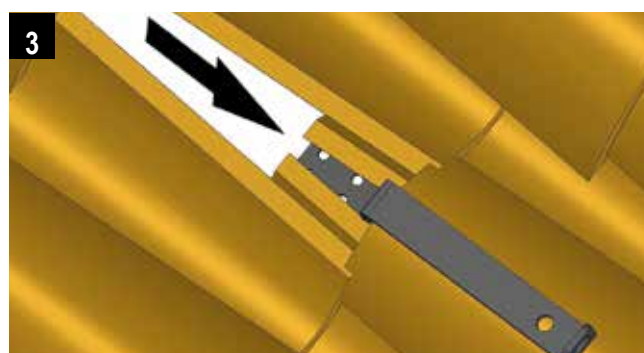
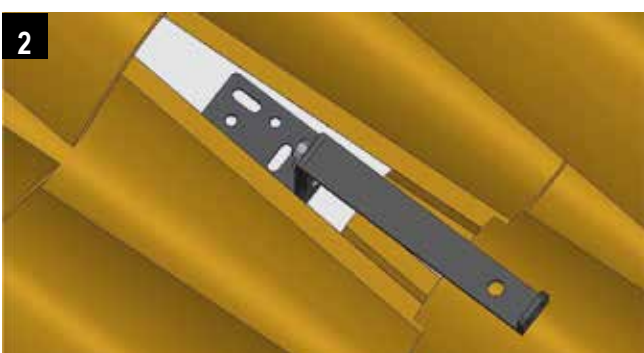
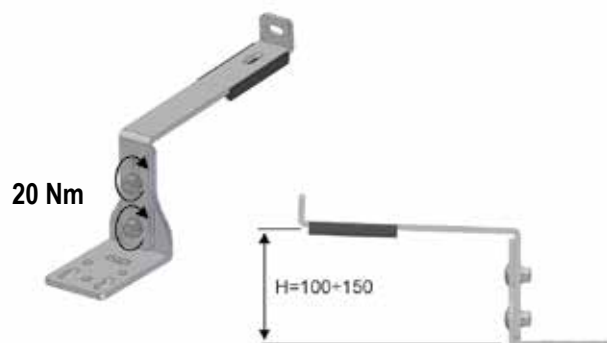
NB: For distance between anchorage points see page 20.

On completion of point **4** proceed with instructions on page 23.

	SET BASE
	X 4
	X 4
	X 4
	X 8

ASSEMBLY SEQUENCE

1



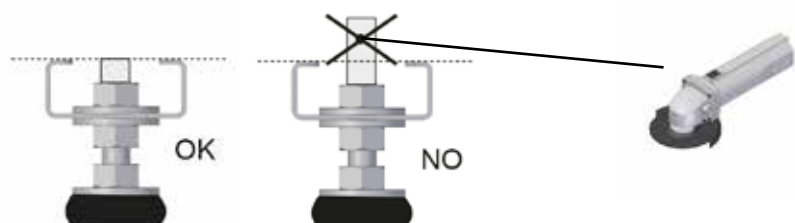
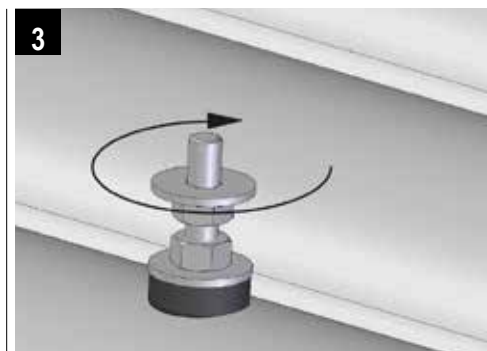
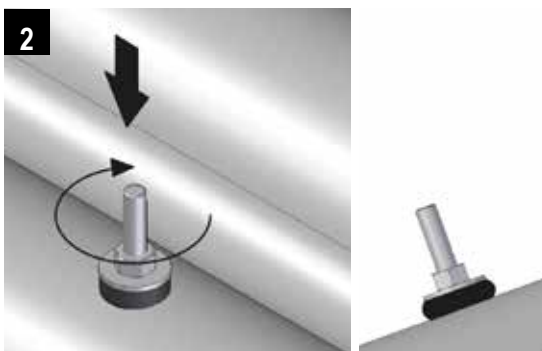
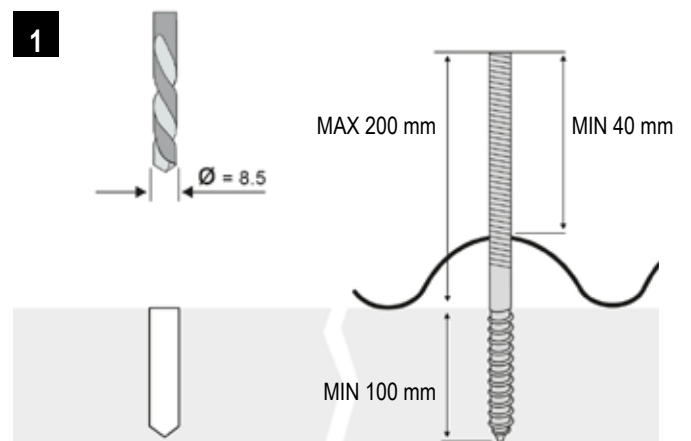
SLOPING ROOF SCREW FASTENING SYSTEM



NB: For distance between anchorage points see page 20.
On completion of point **4** proceed with instructions on page 23.

	SET BASE
	X 4
	X 4
	X 12
M12	X 12

ASSEMBLY SEQUENCE

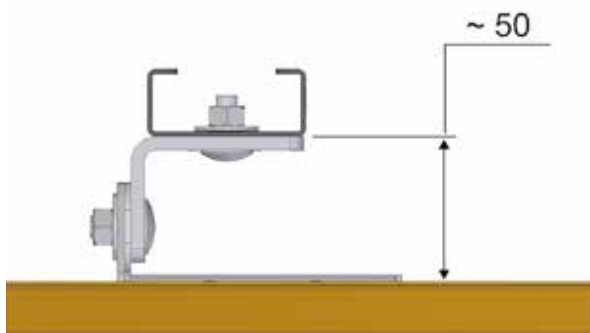


SLOPING ROOF CORRUGATED METAL SHEETING

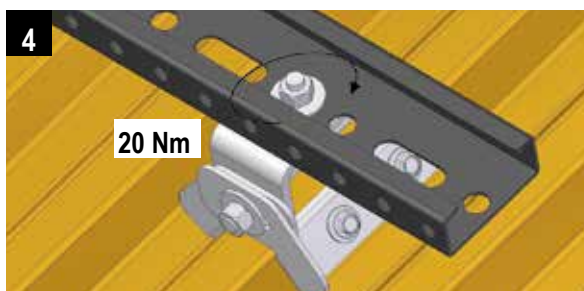
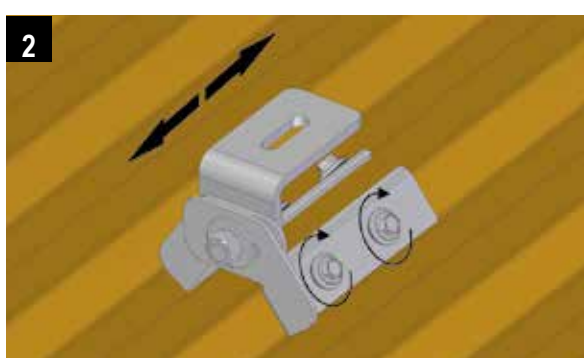


NB: For distance between anchorage points see page 20.
On completion of point **4** proceed with instructions on page 23.

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





1 ASSEMBLY SEQUENCE

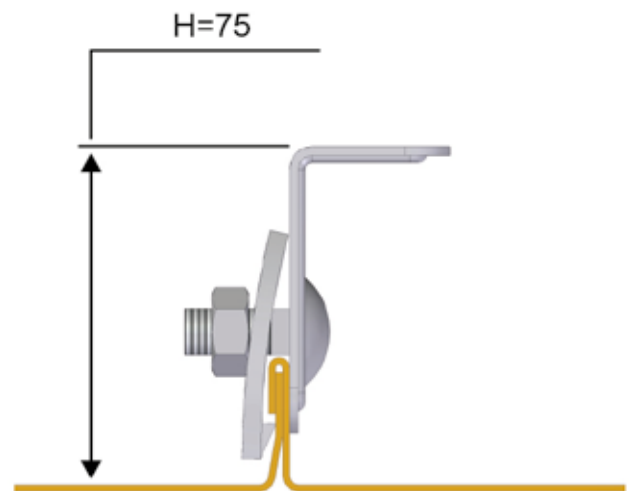


SLOPING ROOF STADING SEAM

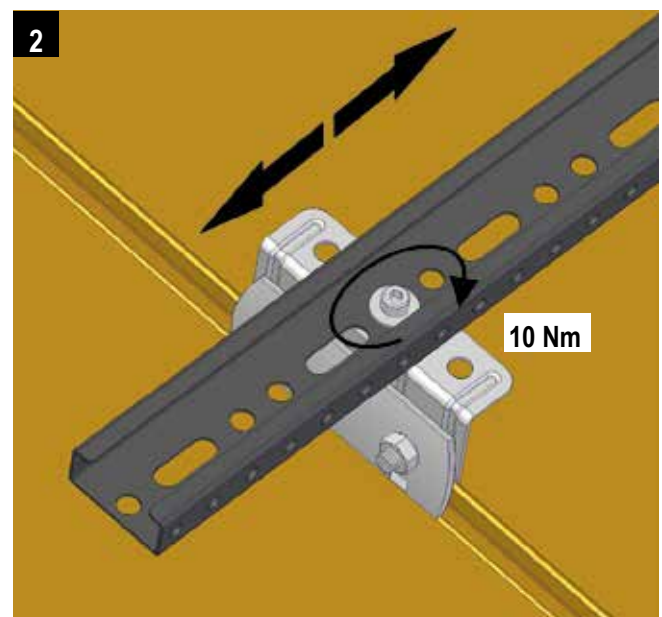
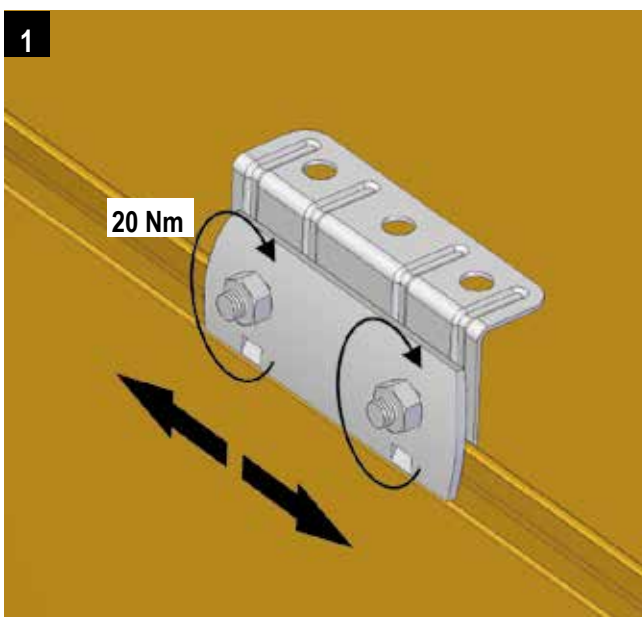


NB: For distance between anchorage points see page 20.
On completion of point **4** proceed with instructions on page 23.

SET BASE	
	X 4
	X 4







ASSEMBLY SEQUENCE



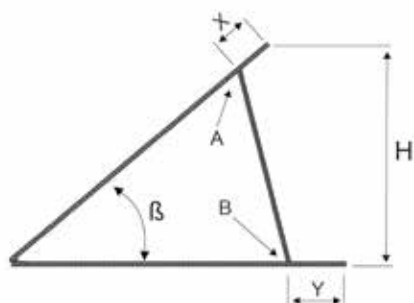
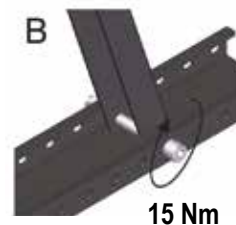
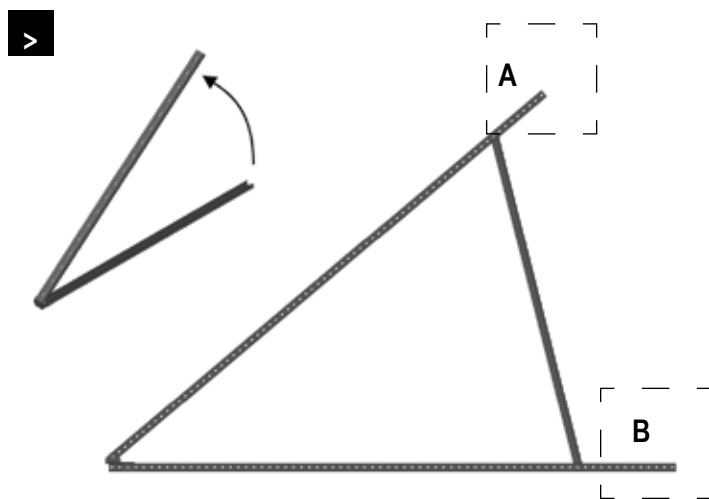
FLAT ROOF TRIANGULAR STRUCTURE SYSTEM



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

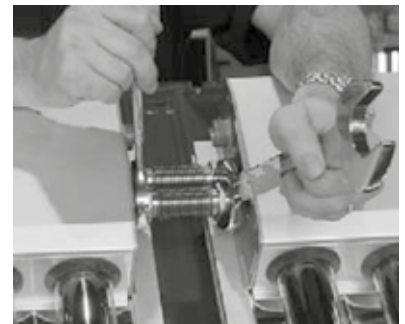
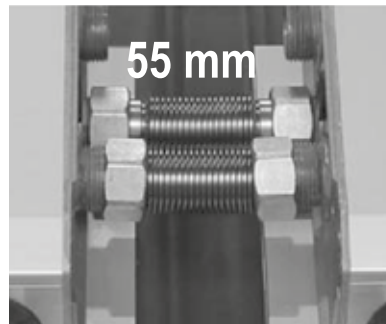
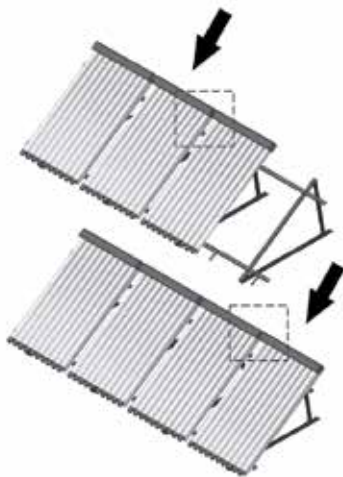
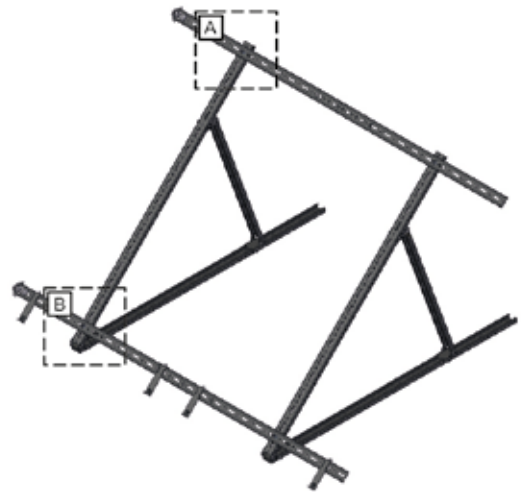
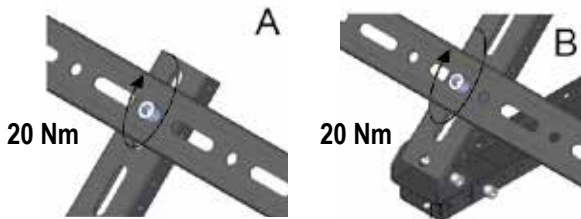
	SET BASE
	X 2

ASSEMBLY SEQUENCE



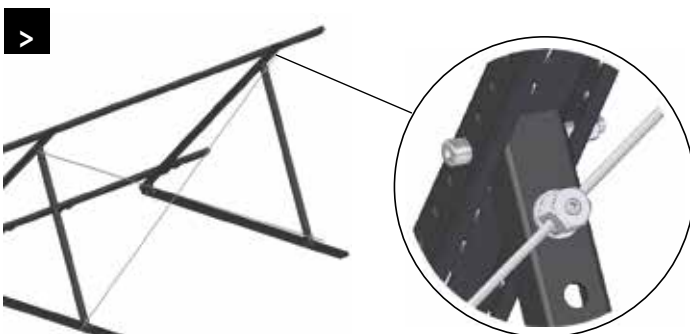
β	mm		n° Ø		H mm
35°	X = 100	Y = 100	A = 1	B = 1	1060
40°	X = 210	Y = 310	A = 9	B = 13	1200
45°	X = 310	Y = 560	A = 13	B = 23	1300
50°	X = 460	Y = 660	A = 19	B = 27	1420

For distance between anchorage points see page 20.
On completion of previous point proceed with instructions on page 23.



OPTIONAL MATERIAL

Tension wires may be installed to ensure more structural stability under extreme windy conditions.



Steel cables and connectors (optional)

DISTANCE BETWEEN ANCHORAGE POINTS

SLOPING ROOF – FLAT ROOF

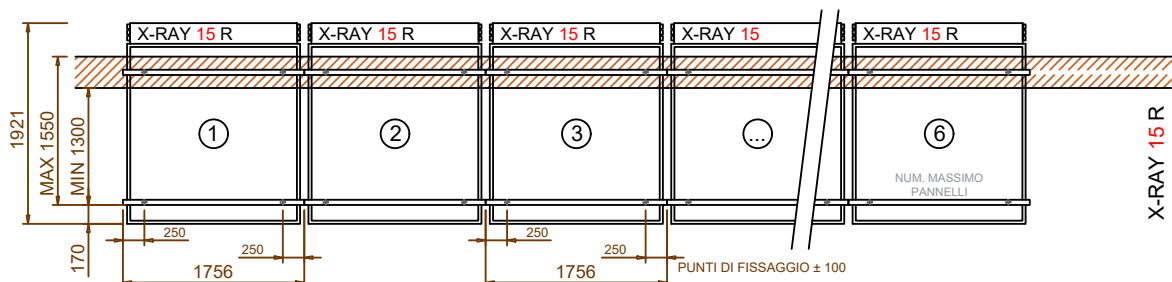
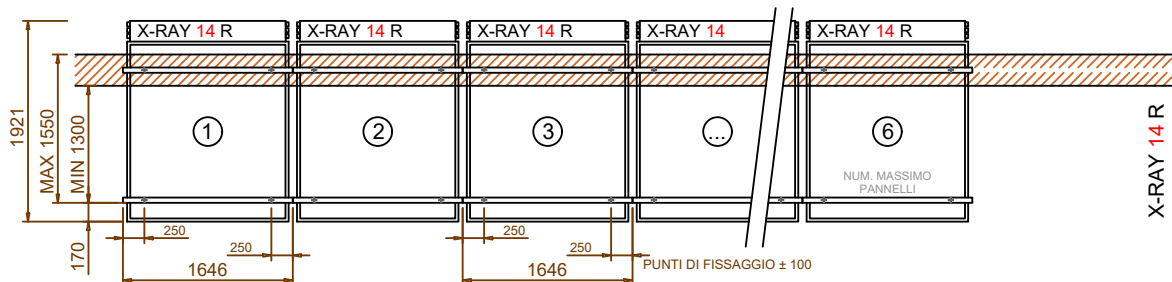
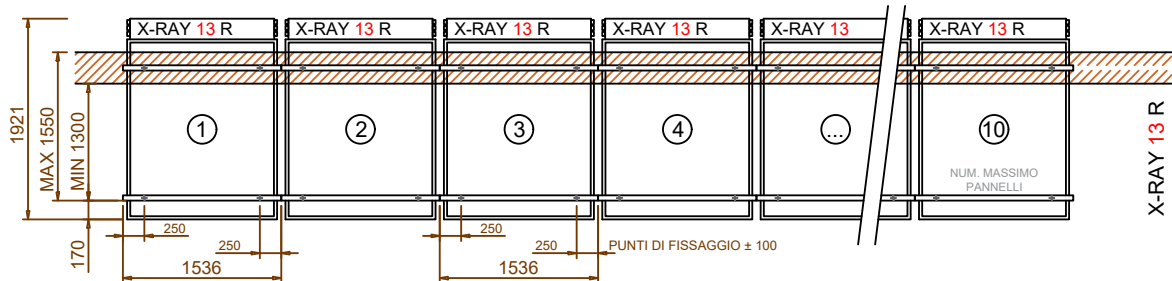
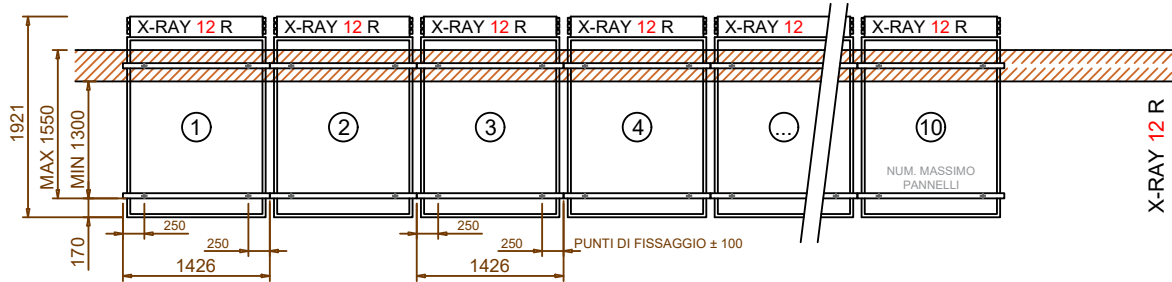
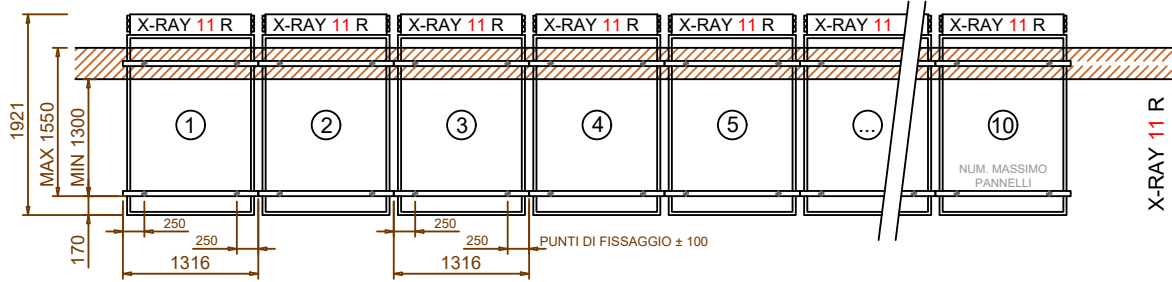
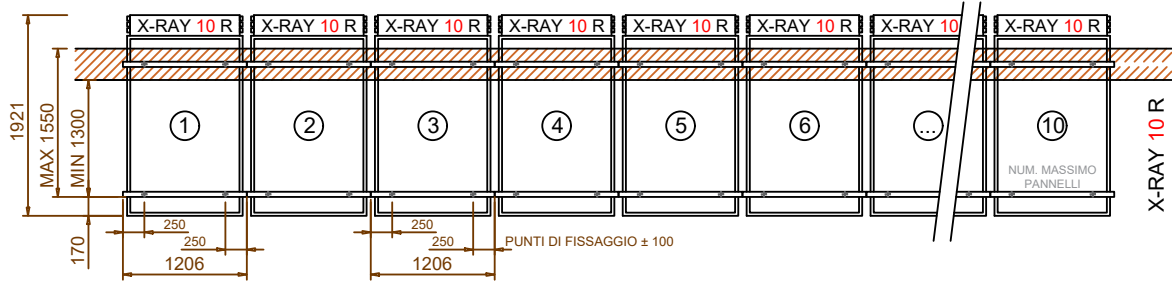
Each X-RAY R manifold must be installed on four fixing points and then use a fixing kit base for each manifold.

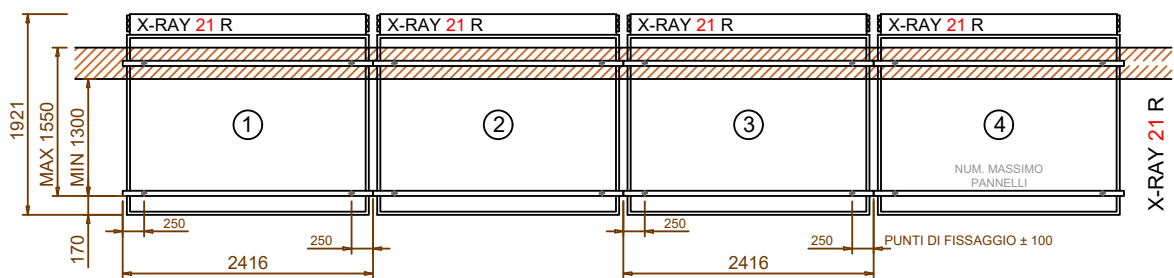
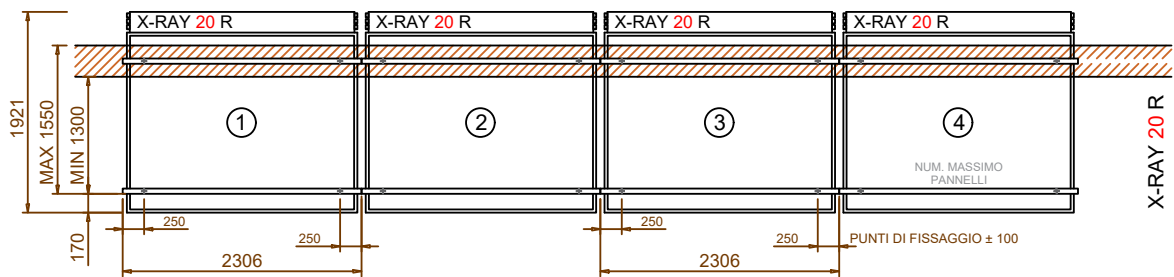
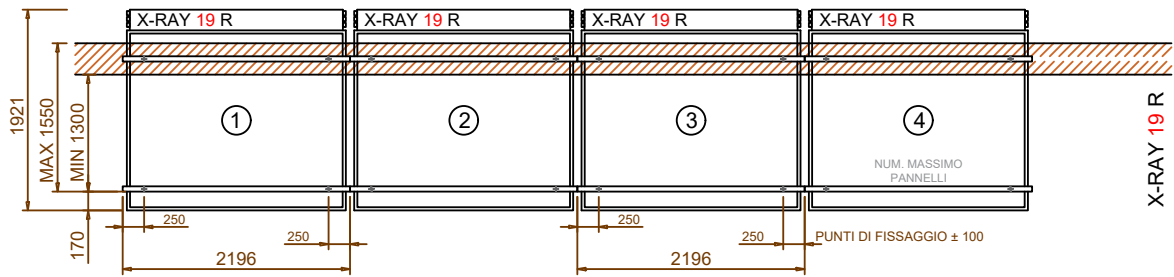
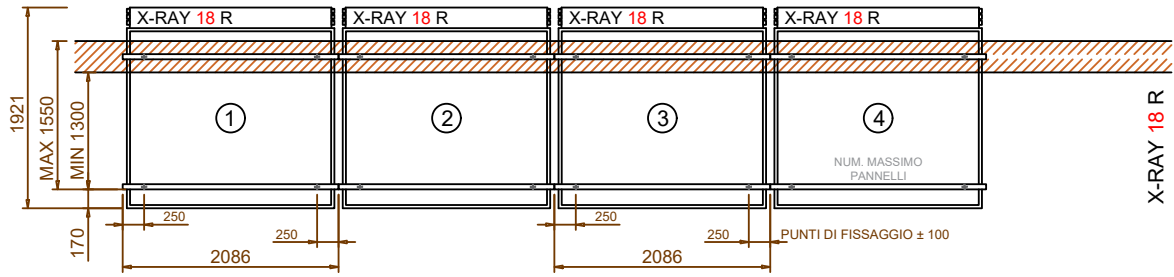
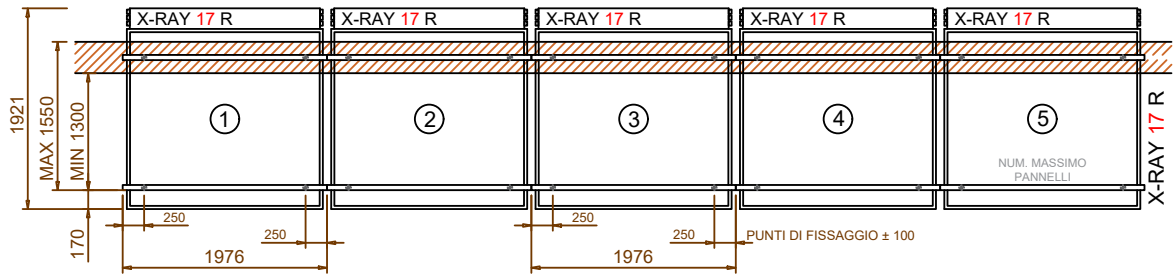
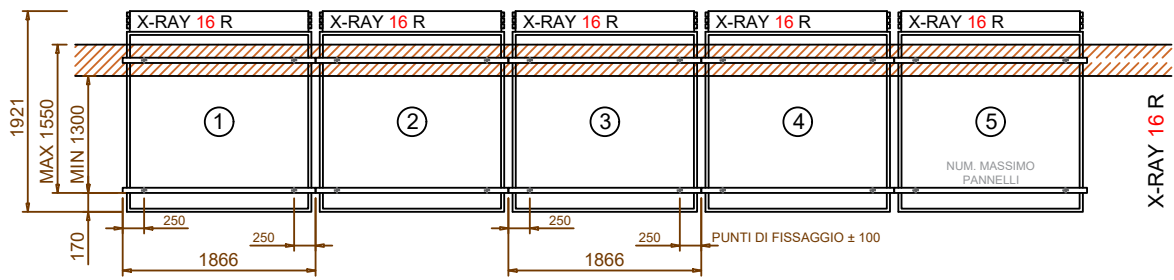
For positioning see the figure below.

Measurements are expressed in millimeters.

MAXIMUM NUMBER OF INSTALLATION FOR STRINGS






modello	1	2	3	4	5	6	7	8	9	10
X-RAY 10 R	•	•	•	•	•	•	•	•	•	•
X-RAY 11 R	•	•	•	•	•	•	•	•	•	•
X-RAY 12 R	•	•	•	•	•	•	•	•	•	•
X-RAY 13 R	•	•	•	•	•	•	•	•	•	•
X-RAY 14 R	•	•	•	•	•	•				
X-RAY 15 R	•	•	•	•	•	•				
X-RAY 16 R	•	•	•	•	•					
X-RAY 17 R	•	•	•	•	•					
X-RAY 18 R	•	•	•	•						
X-RAY 19 R	•	•	•	•						
X-RAY 20 R	•	•	•	•						
X-RAY 21 R	•	•	•	•						





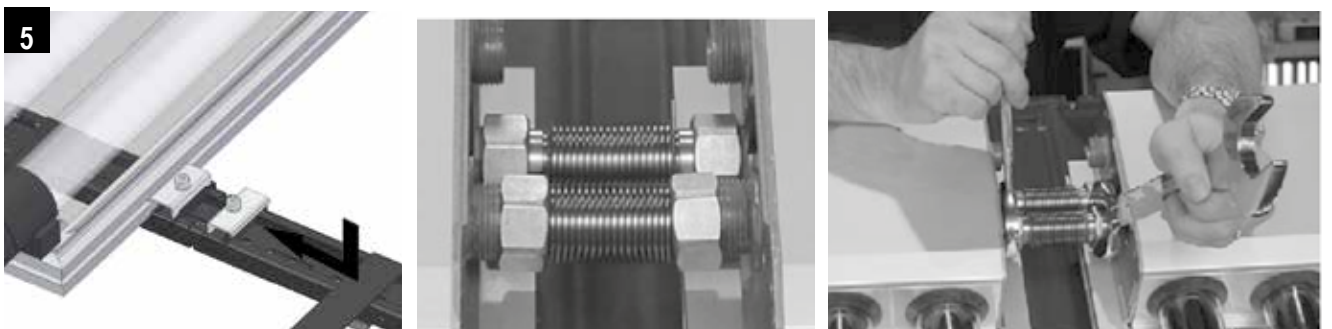
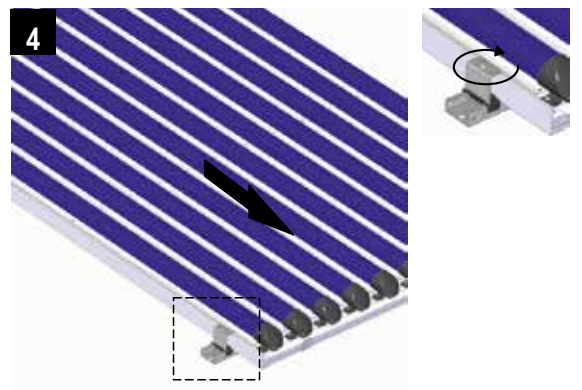
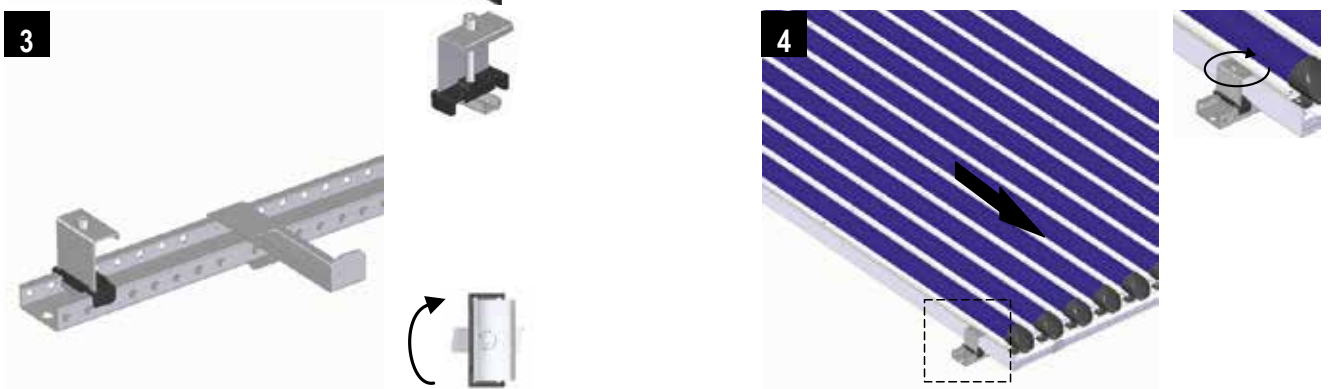
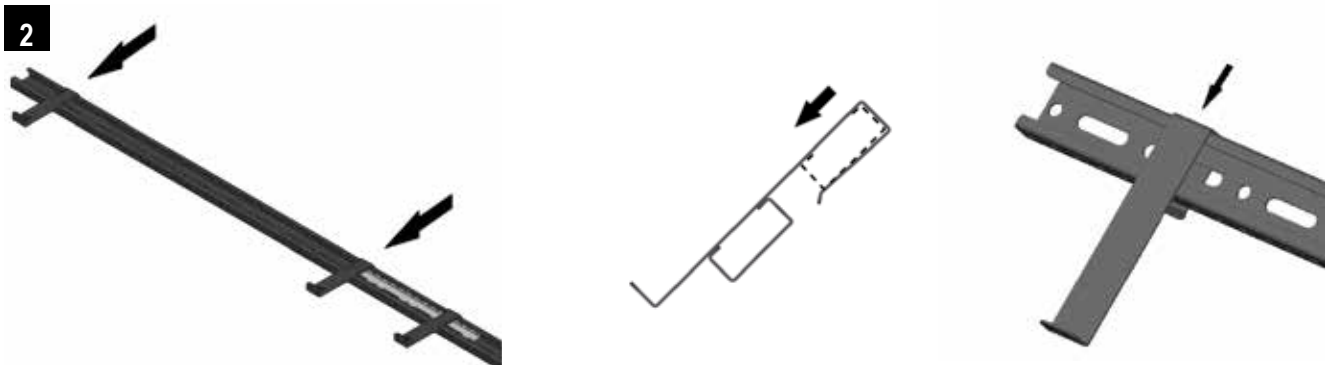
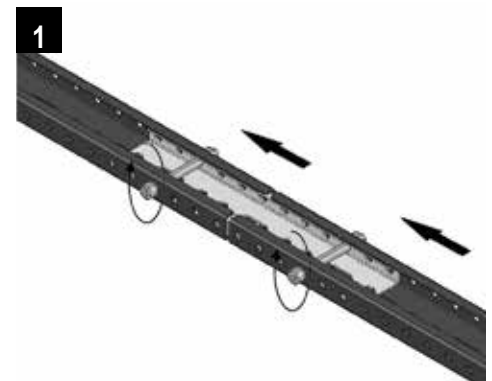
COMPLETING BRACKET SYSTEM

Once the roof fixing system is installed, whatever the type chosen, it is necessary to complete the installation with the appropriate parallel profiles (shown below). The assembly of the parallel profiles will be used to install the solar collectors.

	Material supplied for each fixing system
	X 4
	X 2
	depending on the model chosen
	X 4 - TCEI M8 X 75
	X 2 - 55x20x295 mm

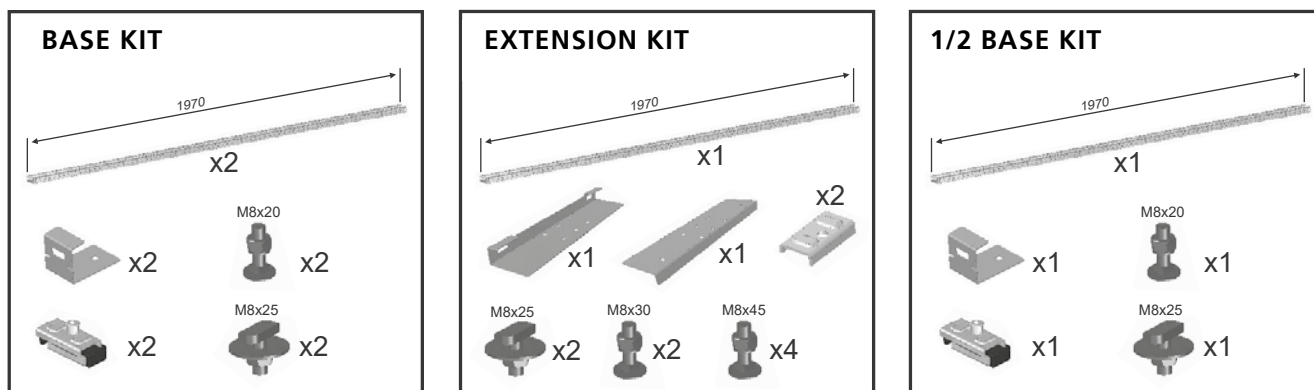


ASSEMBLY SEQUENCE



EASY SYSTEM (VERTICAL)

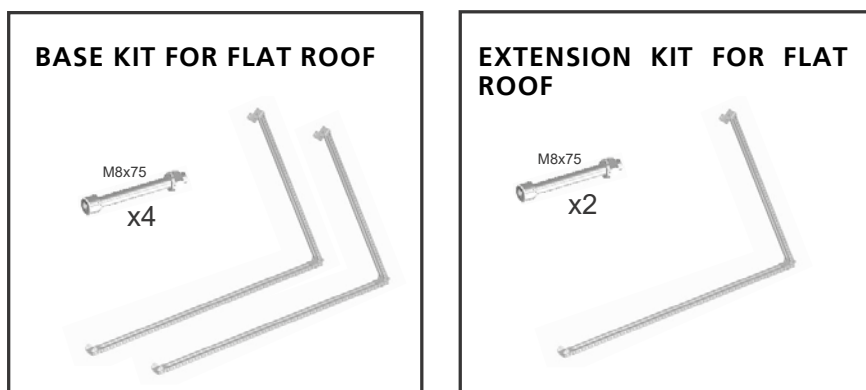
With the EASY system the following components are supplied, depending on the number of panels to be installed:



In addition, depending on the type of roof and the choice, the following are provided:

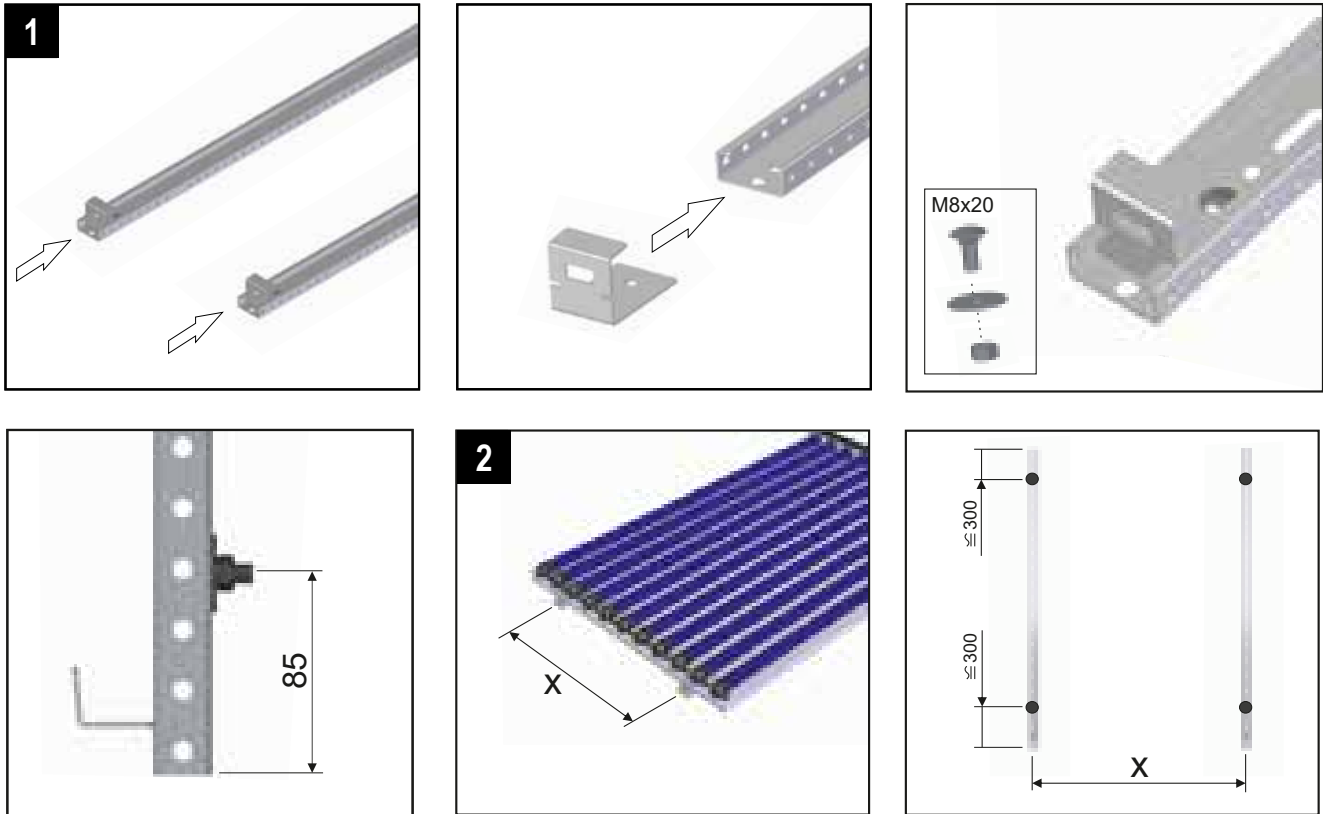


Or:



SLOPING ROOF SCREW FASTENING SYSTEM

ASSEMBLY SEQUENCE FOR INSTALLATION OF BASE KIT:



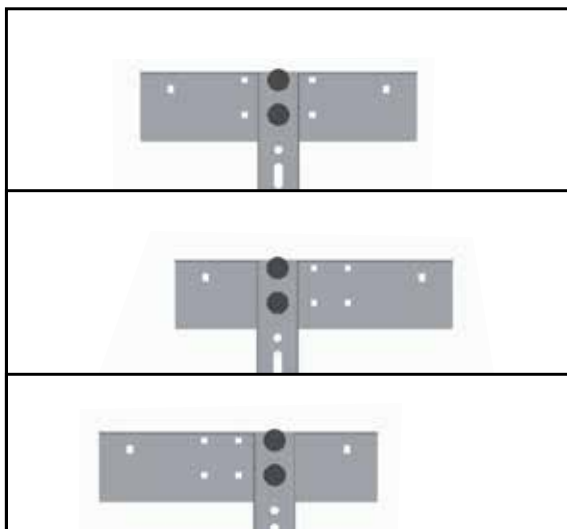
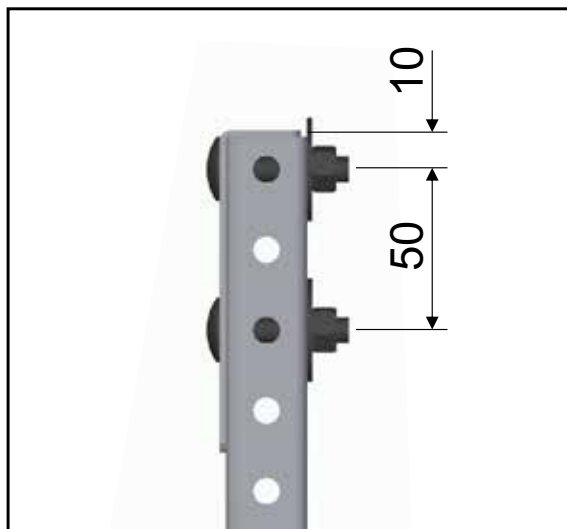
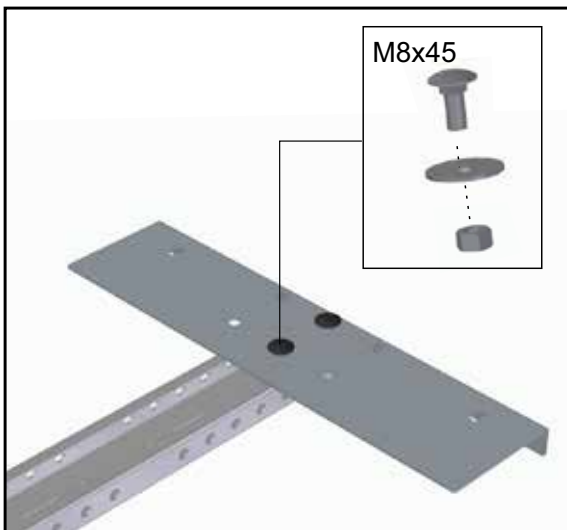
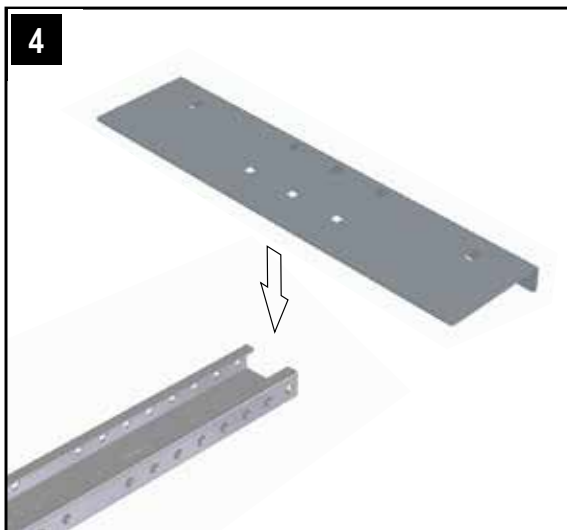
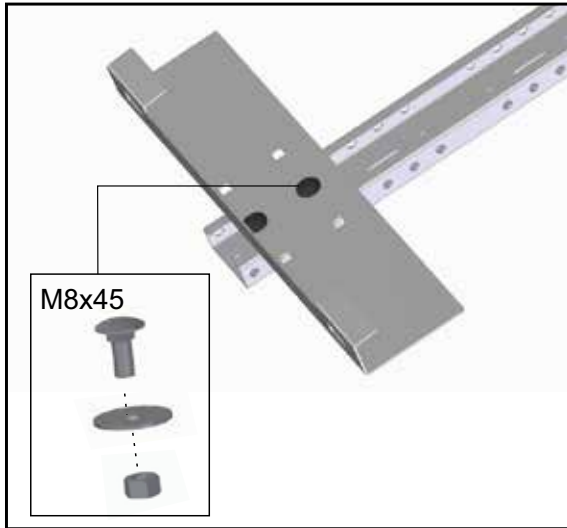
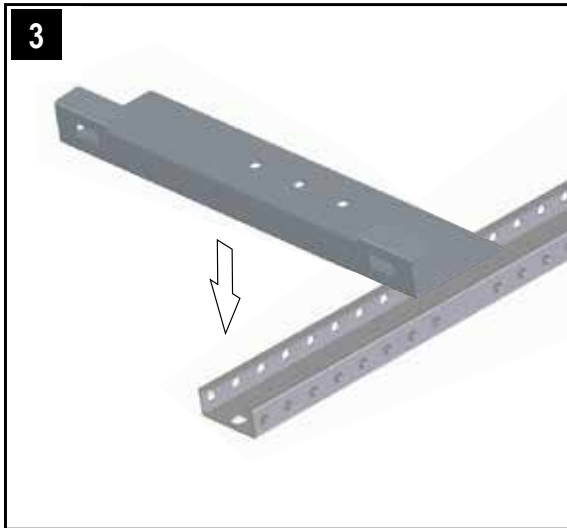
TYPES OF ANCHORAGE



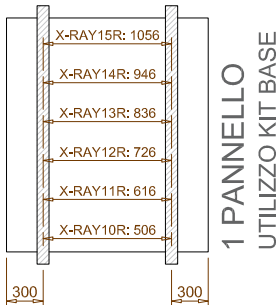
NB: For distance between anchorage points see page 27.

On completion of **4** point proceed with instructions on page 31.

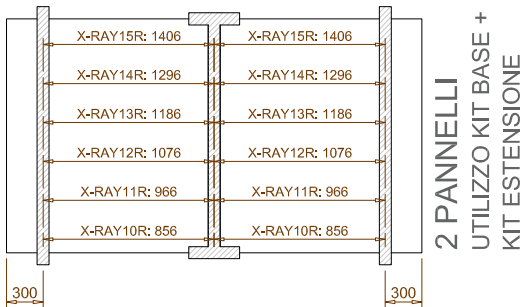
ASSEMBLY SEQUENCE FOR INSTALLATION OF EXTENSION KIT:



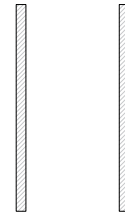
DISTANCE BETWEEN ANCHORAGE POINTS



X-RAY 10 R
X-RAY 11 R
X-RAY 12 R
X-RAY 13 R
X-RAY 14 R
X-RAY 15 R

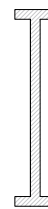


BASE KIT

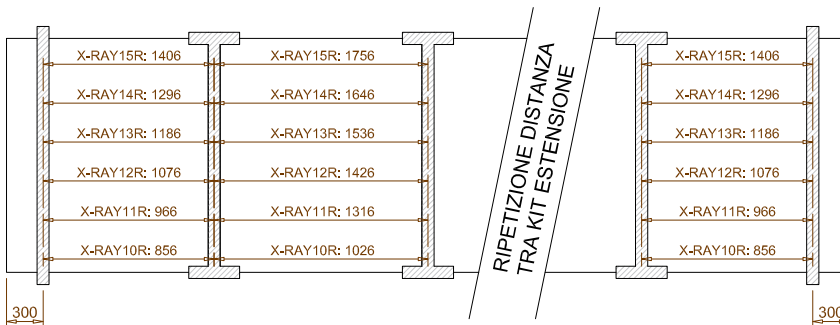
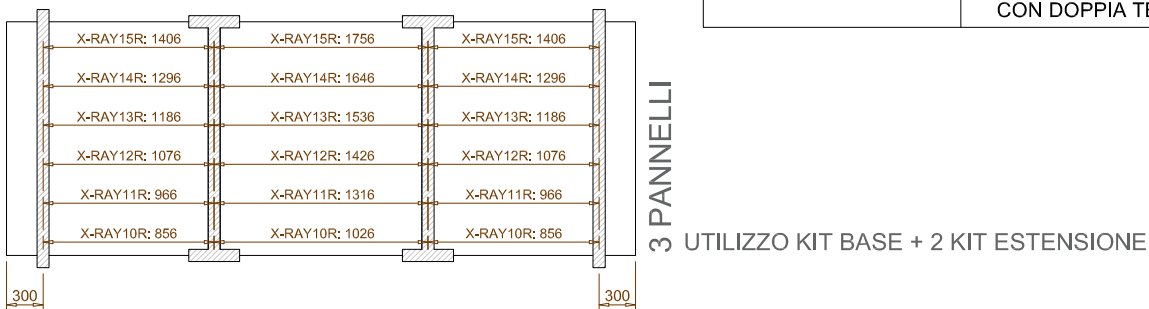


FORMATO DA NUMERO
2 BARRE VERTICALI

EXTENSION KIT

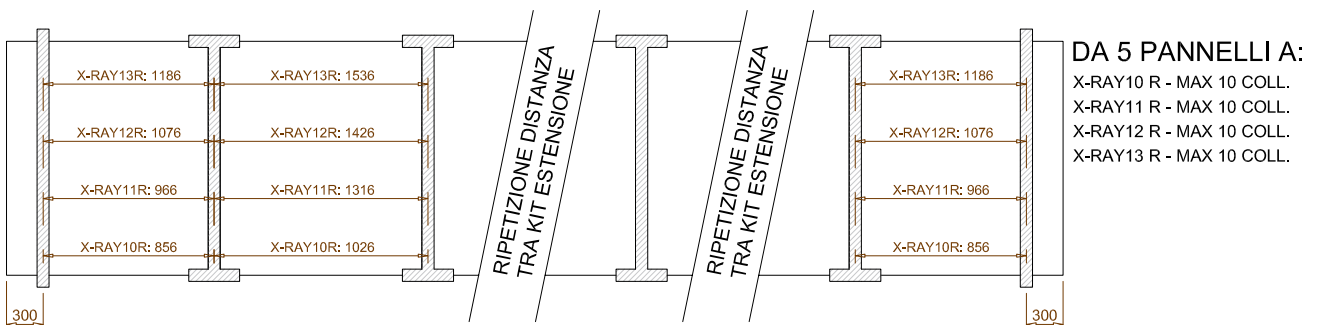


FORMATO DA NUMERO
1 BARRA VERTICALE
CON DOPPIA TESTATA



DA 4 PANNELLI A:

X-RAY10 R - MAX 10 COLLETTORI
X-RAY11 R - MAX 10 COLLETTORI
X-RAY12 R - MAX 10 COLLETTORI
X-RAY13 R - MAX 10 COLLETTORI
X-RAY14 R - MAX 6 COLLETTORI
X-RAY15 R - MAX 6 COLLETTORI

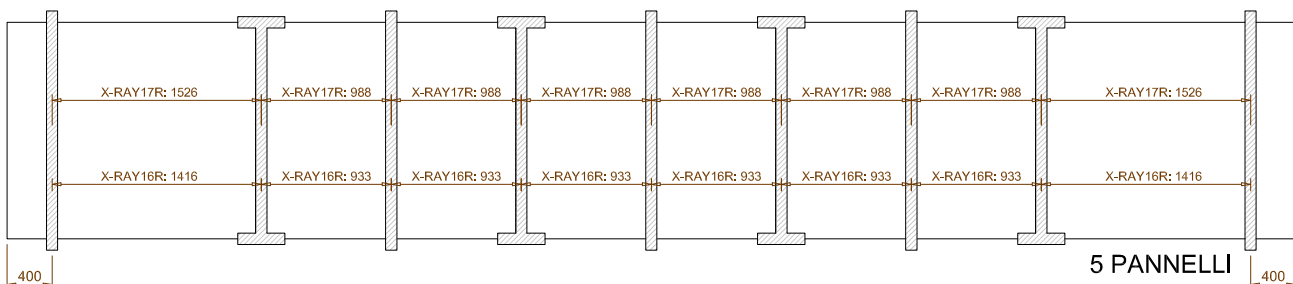
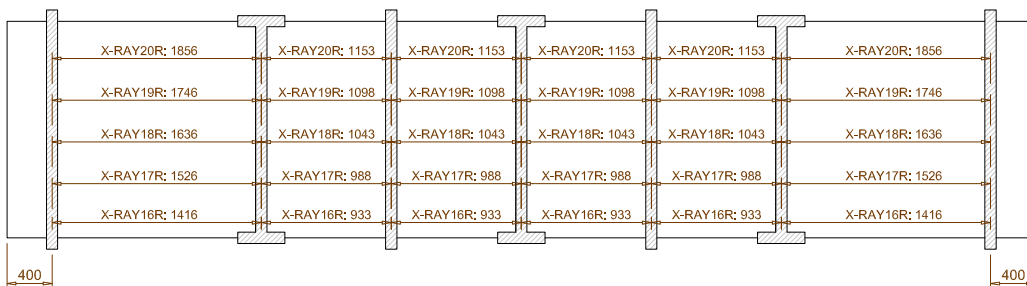
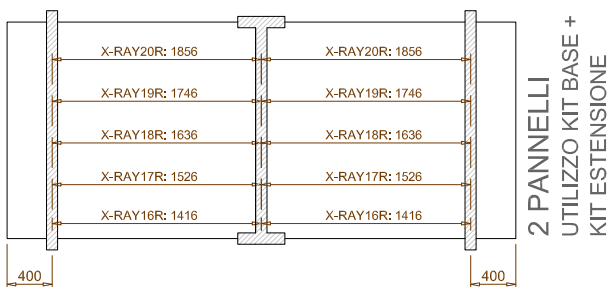
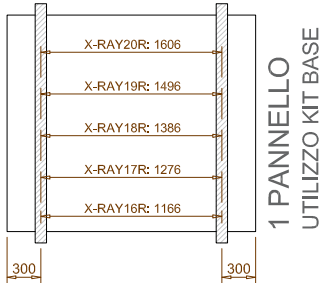


DA 5 PANNELLI A:

X-RAY10 R - MAX 10 COLL.
X-RAY11 R - MAX 10 COLL.
X-RAY12 R - MAX 10 COLL.
X-RAY13 R - MAX 10 COLL.

VALID FOR COLLECTORS:

X-RAY 16 R
X-RAY 17 R
X-RAY 18 R
X-RAY 19 R
X-RAY 20 R

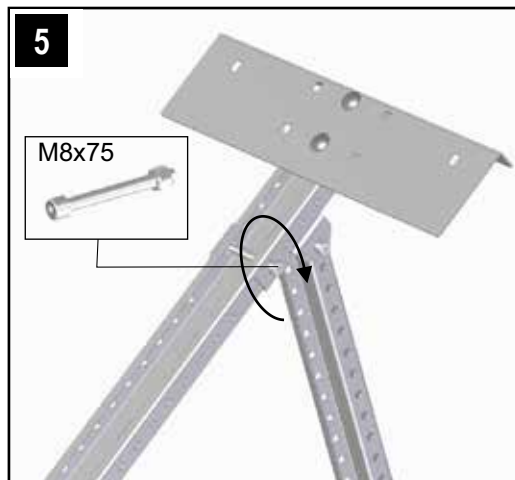
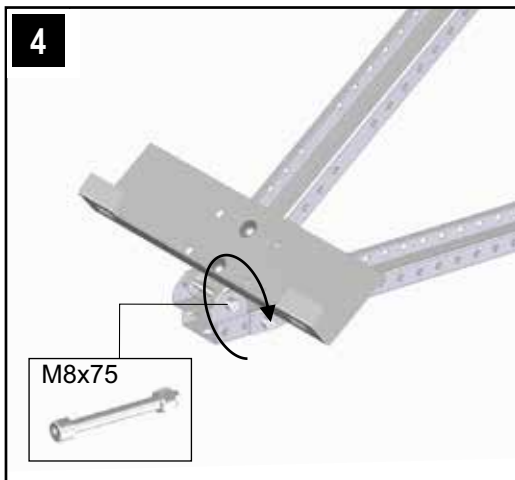
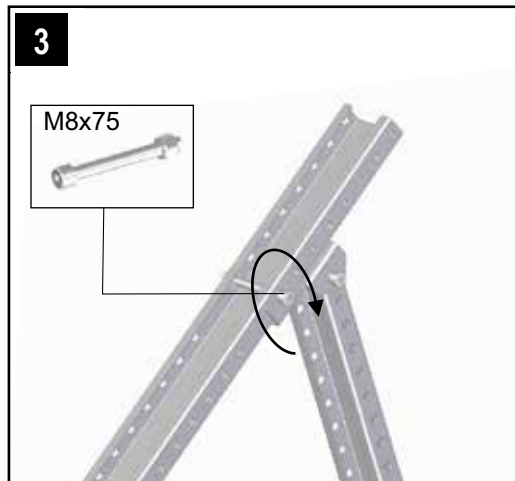
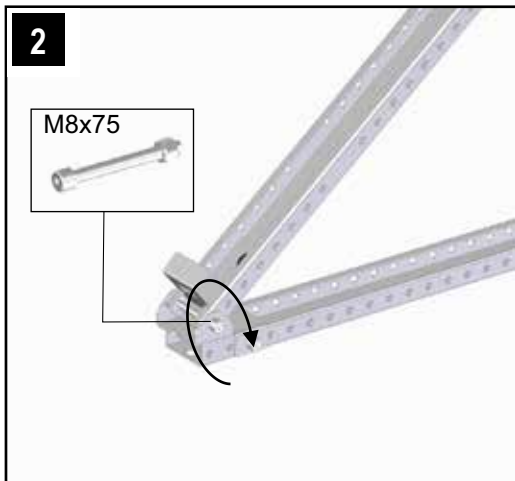
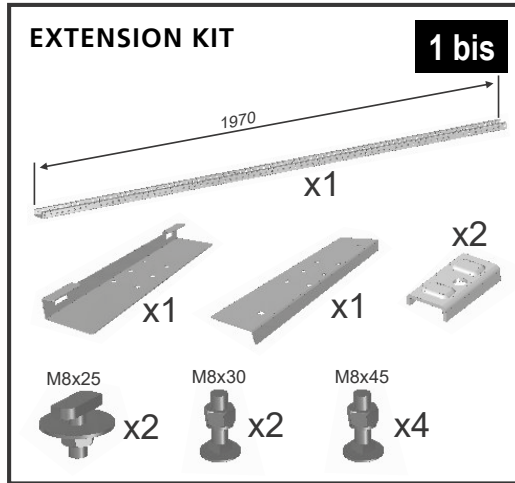
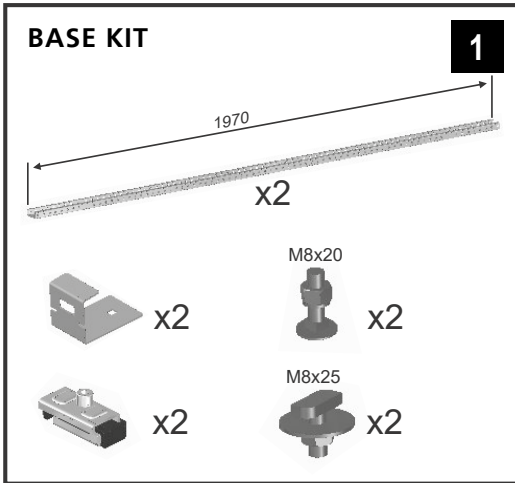


KIT BASE	KIT ESTENSIONE
<p>FORMATO DA NUMERO 2 BARRE VERTICALI</p>	<p>FORMATO DA NUMERO 1 BARRA VERTICALE CON DOPPIA TESTATA</p>
	<p>1/2 KIT BASE</p> <p>FORMATO DA NUMERO 1 BARRA VERTICALE</p>

DA 4 PANNELLI A:

X-RAY16 R - MAX 5 COLLETTORI
X-RAY17 R - MAX 5 COLLETTORI
X-RAY18 R - MAX 4 COLLETTORI
X-RAY19 R - MAX 4 COLLETTORI
X-RAY20 R - MAX 4 COLLETTORI

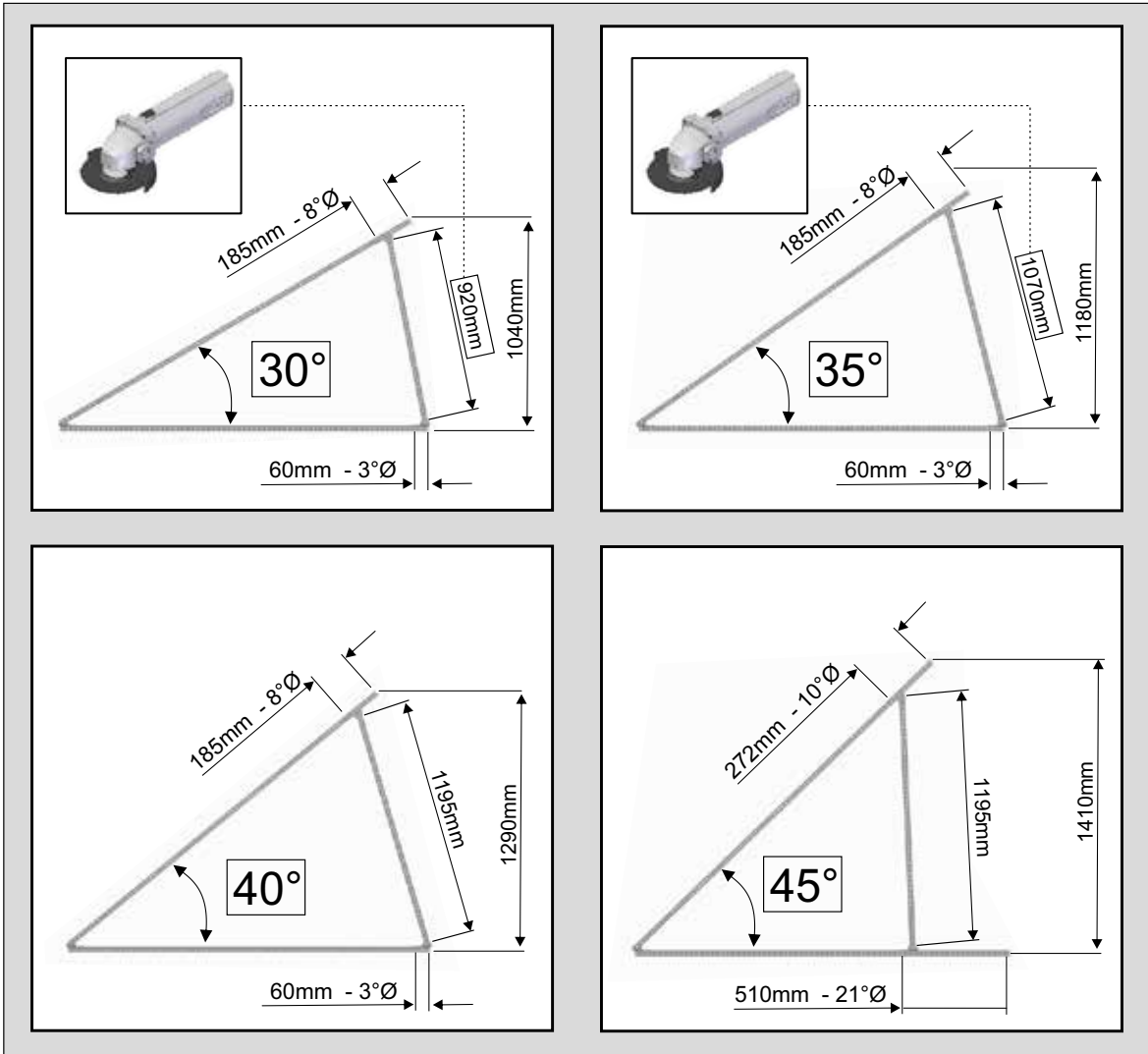
FLAT ROOF EASY SYSTEM



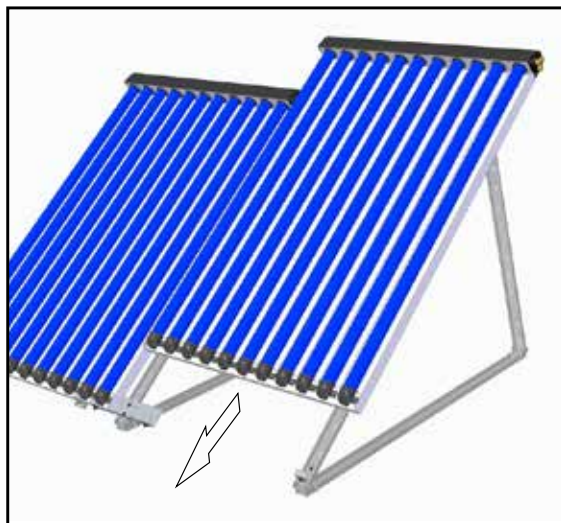
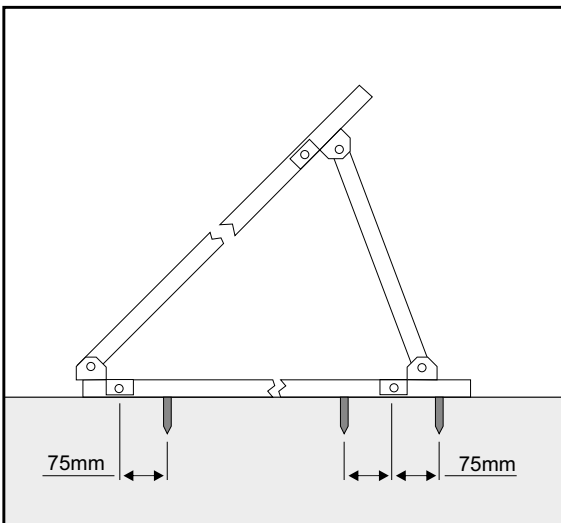
NB: For distance between anchorage points see page 27.

On completion of **4** point proceed with instructions on page 31.

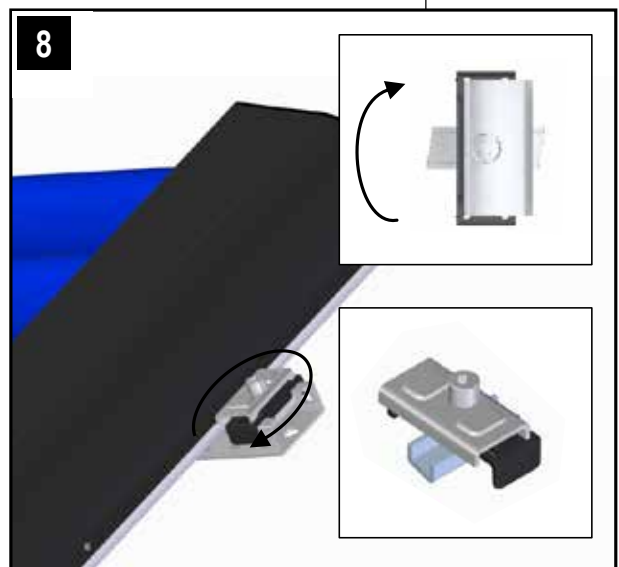
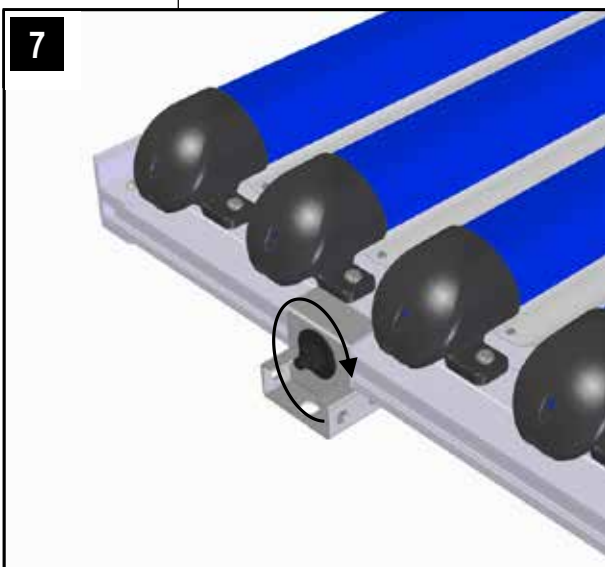
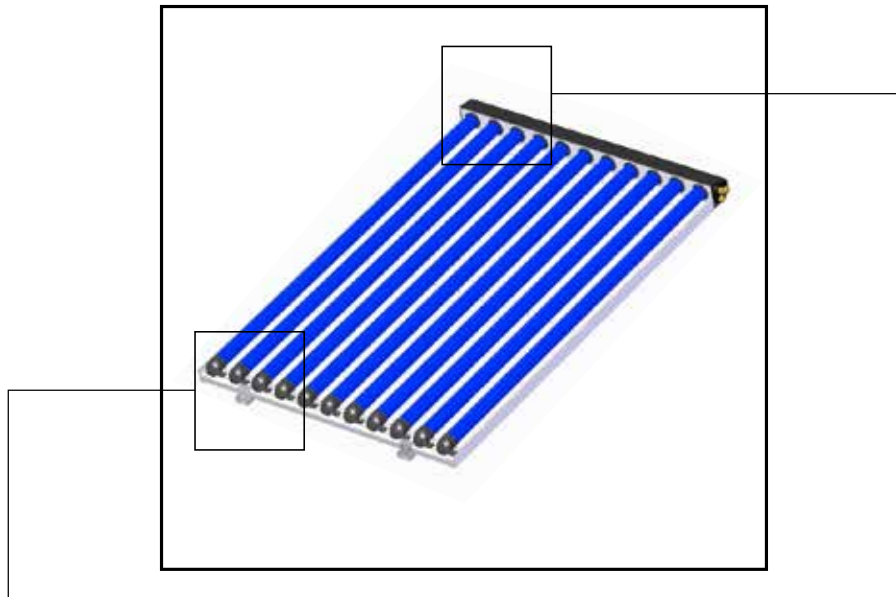
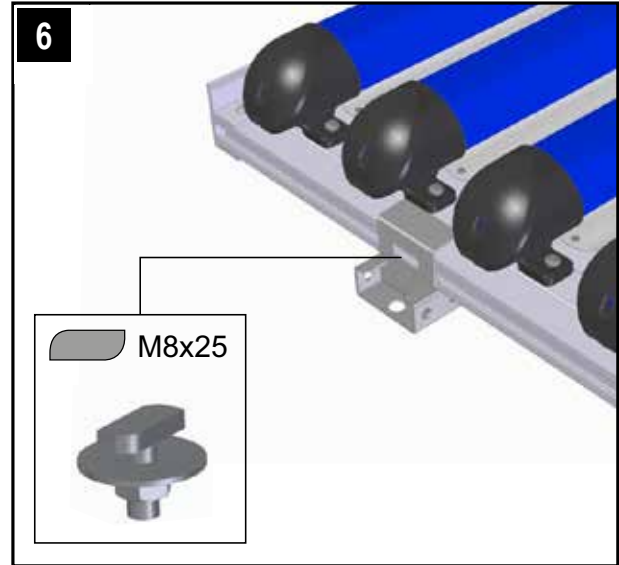
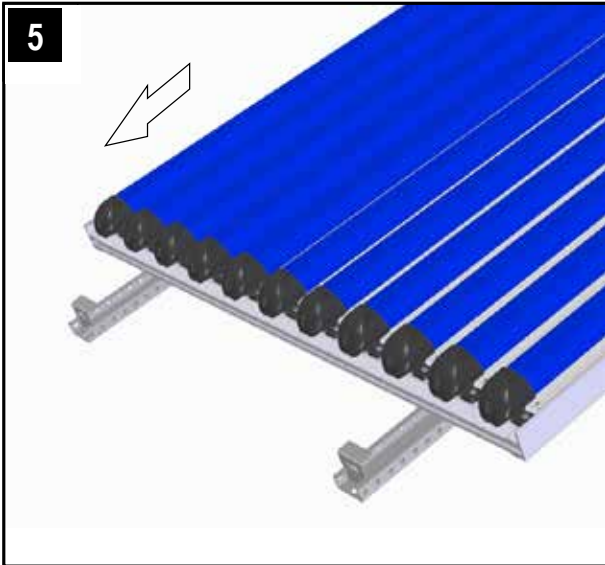
MODIFICATION OF INCLINAZIONE FLAT ROOF BRACKET

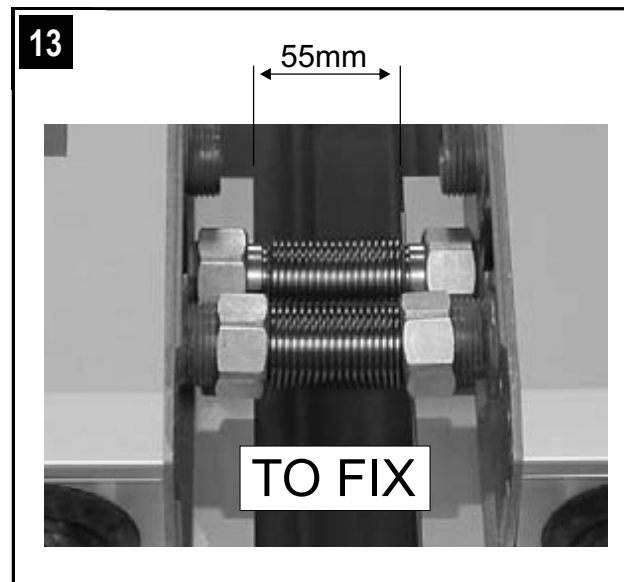
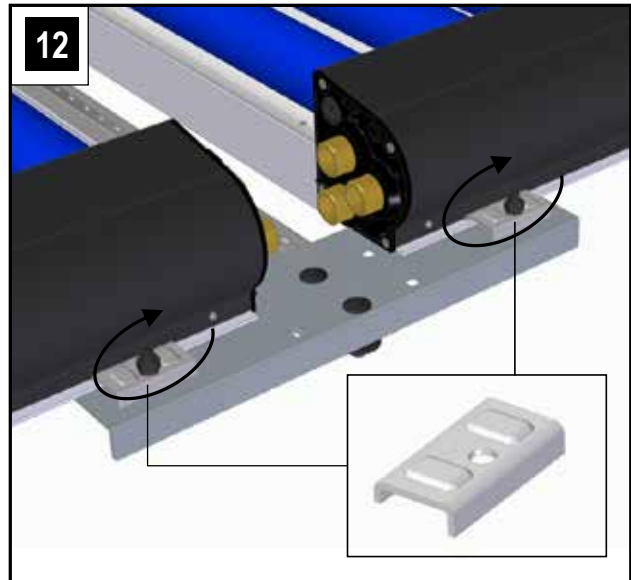
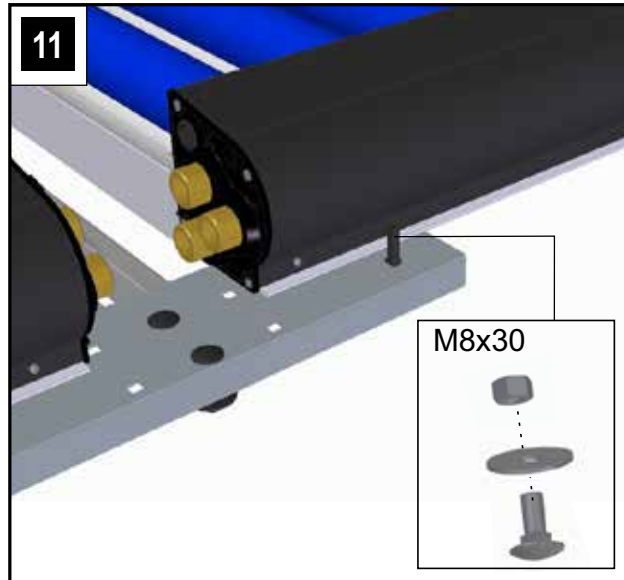
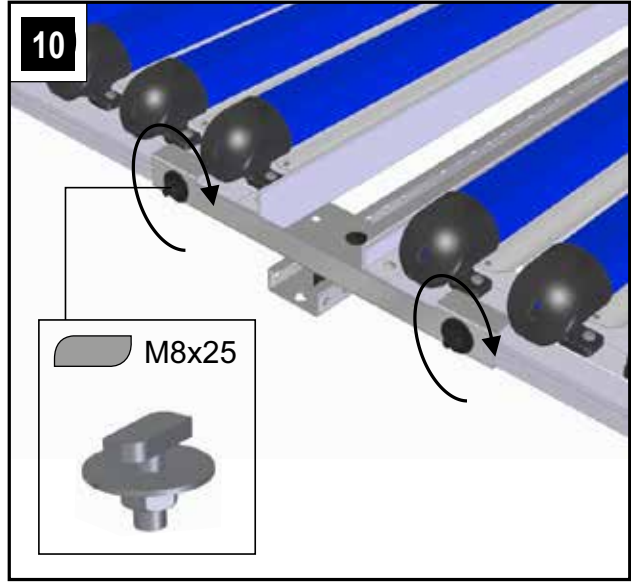
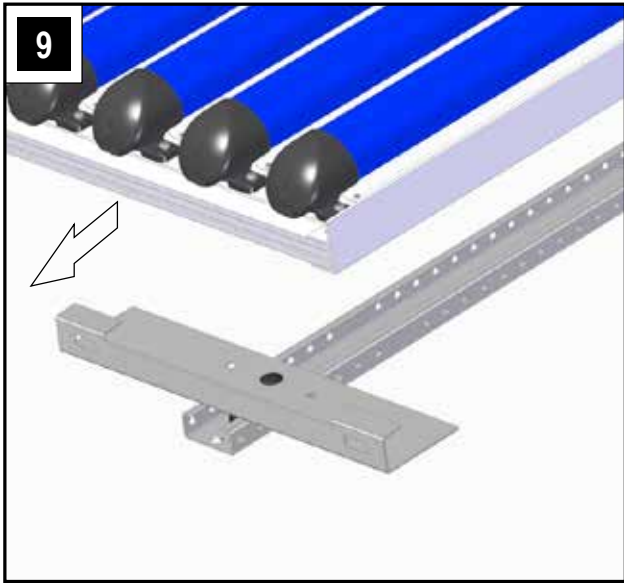


COMPLETING BRACKET SYSTEM



COMPLETING BRACKET SYSTEM



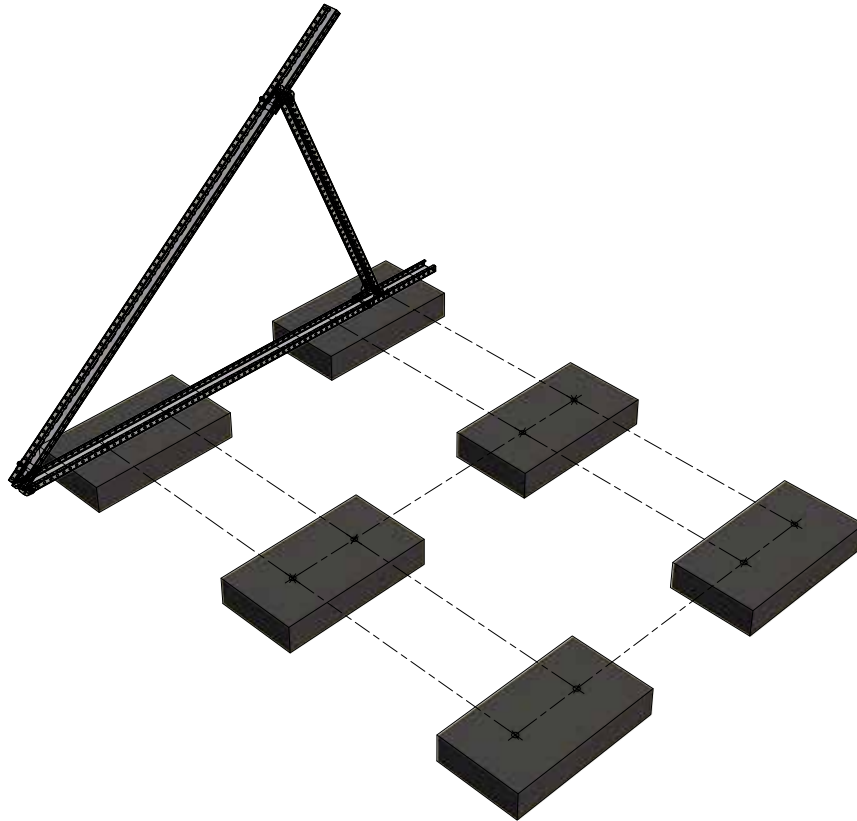


INSTALLATION ON FLAT ROOF WITH BALLAST

If it is not possible to fix the flat roof brackets onto the surface chosen for installation, anchorage can be achieved by the use of cement slabs (each corner 2 must be anchored to said slabs which must weigh at least 75 kg each, with dimensions of 30x20x55 cm).

This indication holds firm for buildings up to 8 metres in height which are not in an exposed position.

The corners of the panels must be fixed to the cement slabs at the distances indicated in the figure below.



NB: The above is indicative and does not have the validity of a project.

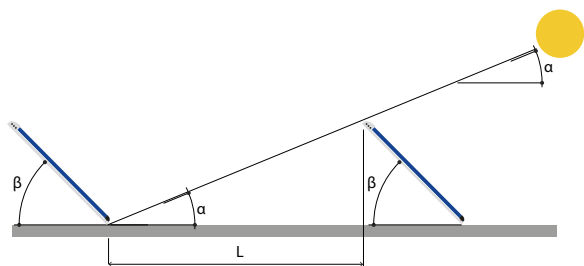
The weight of the ballast must be calculated correctly by a studied project/qualified structural engineer, and the exact weight necessary to prevent the shifting of the panels due to wind will depend on the conditions and the environment of the installation position.

The sizing of the ballast and the number of anchorage points on the roof will be influenced by the following factors:

- The location of the system
- The altitude (meters above sea level)
- The height of the building
- The distance from the coast
- The roughness factor
- The dimension of the panel
- The inclination of the panel
- The types of brackets
- The structure and weight of the brackets
- Ecc...

OVERALL DIMENSIONS

In the case of positioning in a row, the minimum distance is visible in the following images:



Inclinazione raggi solari α [°]	Inclinazione collettore solare β [°]		
	35°	45°	50°
15	4,1 m	5,1 m	5,5 m
25	2,3 m	2,8 m	3 m
35	1,5 m	2 m	2,2 m

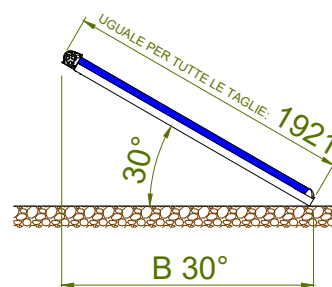
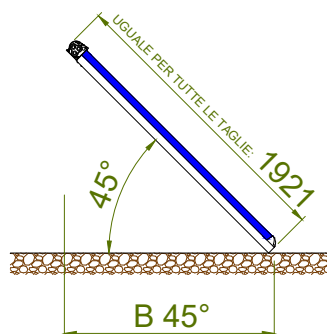
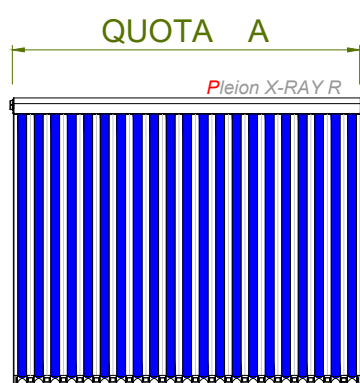


Tabella quota a - misure espresse in millimetri

NUMERO PANNELLI	X-RAY 10 R	X-RAY 11 R	X-RAY 12 R	X-RAY 13 R	X-RAY 14 R	X-RAY 15 R
1	1106	1216	1326	1436	1546	1656
2	2312	2532	2752	2972	3192	3412
3	3518	3848	4178	4508	4838	5168
4	4724	5164	5604	6044	6484	6924
5	5930	6480	7030	7580	8130	8680
6	7136	7796	8456	9116	9776	10436
7	8342	9112	9882	10652	-	-
8	9548	10428	11308	12188	-	-
9	10754	11744	12734	13724	-	-
10	11960	13060	14160	15260	-	-

Quota massima di ingombro compressiva di raccordi tichelman

NUMERO PANNELLI	X-RAY 16 R	X-RAY 17 R	X-RAY 18 R	X-RAY 19 R	X-RAY 20 R	X-RAY 21 R
1	1766	1876	1986	2096	2206	2316
2	3632	3852	4072	4292	4512	4732
3	5498	5828	6158	6488	6818	7148
4	7364	7804	8244	8684	9124	9564
5	9230	9780	-	-	-	-

HYDRAULIC CONNECTION

COLLECTORS CONNECTION

The next chapter gives indicative information for the sizing of the water pipes to be connected to the panels. However, the correct sizing must always be calculated by the engineer appointed to plan the specific system in question. Metallic tubes that are suitable for contact with glycol solutions and high temperatures must be used. Similarly, the hydraulic seals must also be suitable for contact with glycol solutions and high temperatures.

RECOMMENDED DIAMETER OF THE PIPES FOR THE INDICATED NOMINAL INPUT FLOW

NB: Total number of panels of the system, also positioned in several parallel rows. For the maximum number of panels possible in each row, see page 20.

Num. pannelli		1	2	3	4	5	6	7	8	9	10
X-RAY 10 R	Gross Area	2,12	4,24	6,36	8,48	10,60	12,72	14,84	16,96	19,08	21,20
	Flow	1,50	3,00	4,50	6,00	7,50	9,00	10,50	12,00	13,50	15,00
	COPPER Diameter	Ø 16/14	Ø 16/14	Ø 18/16	Ø 18/16	Ø 22/20	Ø 22/20	Ø 28/25	Ø 28/25	Ø 28/25	Ø 28/25
X-RAY 11 R	Gross Area	2,34	4,68	7,02	9,36	11,70	14,04	16,38	18,72	21,06	23,40
	Flow	1,65	3,30	4,95	6,60	8,25	9,90	11,55	13,20	14,85	16,50
	COPPER Diameter	Ø 16/14	Ø 18/16	Ø 18/16	Ø 22/20	Ø 22/20	Ø 22/20	Ø 28/25	Ø 28/25	Ø 28/25	Ø 28/25
X-RAY 12 R	Gross Area	2,55	5,10	7,65	10,20	12,75	15,30	17,85	20,40	22,95	25,50
	Flow	1,80	3,60	5,40	7,20	9,00	10,80	12,60	14,40	16,20	18,00
	COPPER Diameter	Ø 16/14	Ø 18/16	Ø 18/16	Ø 22/20	Ø 22/20	Ø 28/25	Ø 28/25	Ø 28/25	Ø 28/25	Ø 28/25
X-RAY 13 R	Gross Area	2,76	5,52	8,28	11,04	13,80	16,56	19,32	22,08	24,84	27,60
	Flow	1,95	3,90	5,85	7,80	9,75	11,70	13,65	15,60	17,55	19,50
	COPPER Diameter	Ø 16/14	Ø 18/16	Ø 18/16	Ø 22/20	Ø 22/20	Ø 28/25	Ø 28/25	Ø 28/25	Ø 28/25	Ø 28/25
X-RAY 14 R	Gross Area	2,97	5,94	8,91	11,88	14,85	17,82	20,79	23,76	26,73	29,70
	Flow	2,10	4,20	6,30	8,40	10,50	12,60	14,70	16,80	18,90	21,00
	COPPER Diameter	Ø 16/14	Ø 18/16	Ø 22/20	Ø 22/20	Ø 28/25	Ø 28/25	Ø 28/25	Ø 28/25	Ø 28/25	Ø 28/25
X-RAY 15 R	Gross Area	3,18	6,36	9,54	12,72	15,90	19,08	22,26	25,44	28,62	31,80
	Flow	2,25	4,50	6,75	9,00	11,25	13,50	15,75	18,00	20,25	22,50
	COPPER Diameter	Ø 16/14	Ø 18/16	Ø 22/20	Ø 22/20	Ø 28/25	Ø 28/25	Ø 28/25	Ø 28/25	Ø 28/25	Ø 35/32
X-RAY 16 R	Gross Area	3,39	6,78	10,17	13,56	16,95	20,34	23,73	27,12	30,51	33,90
	Flow	2,40	4,80	7,20	9,60	12,00	14,40	16,80	19,20	21,60	24,00
	COPPER Diameter	Ø 16/14	Ø 18/16	Ø 22/20	Ø 22/20	Ø 28/25	Ø 28/25	Ø 28/25	Ø 28/25	Ø 35/32	Ø 35/32
X-RAY 17 R	Gross Area	3,60	7,20	10,80	14,40	18,00	21,60	25,20	28,80	32,40	36,00
	Flow	2,55	5,10	7,65	10,20	12,75	15,30	17,85	20,40	22,95	25,50
	COPPER Diameter	Ø 16/14	Ø 18/16	Ø 22/20	Ø 28/25	Ø 28/25	Ø 28/25	Ø 28/25	Ø 28/25	Ø 35/32	Ø 35/32
X-RAY 18 R	Gross Area	3,82	7,64	11,46	15,28	19,10	22,92	26,74	30,56	34,38	38,20
	Flow	2,70	5,40	8,10	10,80	13,50	16,20	18,90	21,60	24,30	27,00
	COPPER Diameter	Ø 16/14	Ø 18/16	Ø 22/20	Ø 28/25	Ø 28/25	Ø 28/25	Ø 28/25	Ø 35/32	Ø 35/32	Ø 35/32
X-RAY 19 R	Gross Area	4,03	8,06	12,09	16,12	20,15	24,18	28,21	32,24	36,27	40,30
	Flow	2,85	5,70	8,55	11,40	14,25	17,10	19,95	22,80	25,65	28,50
	COPPER Diameter	Ø 16/14	Ø 18/16	Ø 22/20	Ø 28/25	Ø 28/25	Ø 28/25	Ø 28/25	Ø 35/32	Ø 35/32	Ø 35/32
X-RAY 20 R	Gross Area	4,24	8,48	12,72	16,96	21,20	25,44	29,68	33,92	38,16	42,40
	Flow	3,00	6,00	9,00	12,00	15,00	18,00	21,00	24,00	27,00	30,00
	COPPER Diameter	Ø 16/14	Ø 18/16	Ø 22/20	Ø 28/25	Ø 28/25	Ø 28/25	Ø 28/25	Ø 35/32	Ø 35/32	Ø 35/32
X-RAY 21 R	Gross Area	4,45	8,90	13,35	17,80	22,25	26,70	31,15	35,60	40,05	44,50
	Flow	3,15	6,30	9,45	12,60	15,75	18,90	22,05	25,20	28,35	31,50
	COPPER Diameter	Ø 18/16	Ø 22/20	Ø 22/20	Ø 28/25	Ø 28/25	Ø 28/25	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32

COLLECTORS POSITIONED ON MULTIPLE STRINGS

Num. pannelli		11	12	13	14	15	16	17	18	19	20
X-RAY 10 R	Gross Area	23,32	25,44	27,56	29,68	31,80	33,92	36,04	38,16	40,28	42,40
	Flow	16,50	18,00	19,50	21,00	22,50	24,00	25,50	27,00	28,50	30,00
	COPPER Diameter	Ø 28/25	Ø 28/25	Ø 28/25	Ø 28/25	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32
X-RAY 11 R	Gross Area	25,74	28,08	30,42	32,76	35,10	37,44	39,78	42,12	44,46	46,80
	Flow	18,15	19,80	21,45	23,10	24,75	26,40	28,05	29,70	31,35	33,00
	COPPER Diameter	Ø 28/25	Ø 28/25	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32
X-RAY 12 R	Gross Area	28,05	30,60	33,15	35,70	38,25	40,80	43,35	45,90	48,45	51,00
	Flow	19,80	21,60	23,40	25,20	27,00	28,80	30,60	32,40	34,20	36,00
	COPPER Diameter	Ø 28/25	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32
X-RAY 13 R	Gross Area	30,36	33,12	35,88	38,64	41,40	44,16	46,92	49,68	52,44	55,20
	Flow	21,45	23,40	25,35	27,30	29,25	31,20	33,15	35,10	37,05	39,00
	COPPER Diameter	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32
X-RAY 14 R	Gross Area	32,67	35,64	38,61	41,58	44,55	47,52	50,49	53,46	56,43	59,40
	Flow	23,10	25,20	27,30	29,40	31,50	33,60	35,70	37,80	39,90	42,00
	COPPER Diameter	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 42/39
X-RAY 15 R	Gross Area	34,98	38,16	41,34	44,52	47,70	50,88	54,06	57,24	60,42	63,60
	Flow	24,75	27,00	29,25	31,50	33,75	36,00	38,25	40,50	42,75	45,00
	COPPER Diameter	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 42/39	Ø 42/39	Ø 42/39
X-RAY 16 R	Gross Area	37,29	40,68	44,07	47,46	50,85	54,24	57,63	61,02	64,41	67,80
	Flow	26,40	28,80	31,20	33,60	36,00	38,40	40,80	43,20	45,60	48,00
	COPPER Diameter	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 42/39	Ø 42/39	Ø 42/39	Ø 42/39
X-RAY 17 R	Gross Area	39,60	43,20	46,80	50,40	54,00	57,60	61,20	64,80	68,40	72,00
	Flow	28,05	30,60	33,15	35,70	38,25	40,80	43,35	45,90	48,45	51,00
	COPPER Diameter	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 42/39	Ø 42/39	Ø 42/39	Ø 42/39	Ø 42/39
X-RAY 18 R	Gross Area	42,02	45,84	49,66	53,48	57,30	61,12	64,94	68,76	72,58	76,40
	Flow	29,70	32,40	35,10	37,80	40,50	43,20	45,90	48,60	51,30	54,00
	COPPER Diameter	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 42/39	Ø 42/39	Ø 42/39	Ø 42/39	Ø 42/39	Ø 42/39
X-RAY 19 R	Gross Area	44,33	48,36	52,39	56,42	60,45	64,48	68,51	72,54	76,57	80,60
	Flow	31,35	34,20	37,05	39,90	42,75	45,60	48,45	51,30	54,15	57,00
	COPPER Diameter	Ø 35/32	Ø 35/32	Ø 35/32	Ø 35/32	Ø 42/39	Ø 42/39	Ø 42/39	Ø 42/39	Ø 42/39	Ø 42/39
X-RAY 20 R	Gross Area	46,64	50,88	55,12	59,36	63,60	67,84	72,08	76,32	80,56	84,80
	Flow	33,00	36,00	39,00	42,00	45,00	48,00	51,00	54,00	57,00	60,00
	COPPER Diameter	Ø 35/32	Ø 35/32	Ø 35/32	Ø 42/39	Ø 42/39	Ø 42/39	Ø 42/39	Ø 42/39	Ø 42/39	Ø 42/39
X-RAY 21 R	Gross Area	48,95	53,40	57,85	62,30	66,75	71,20	75,65	80,10	84,55	89,00
	Flow	34,65	37,80	40,95	44,10	47,25	50,40	53,55	56,70	59,85	63,00
	COPPER Diameter	Ø 35/32	Ø 35/32	Ø 35/32	Ø 42/39	Ø 42/39	Ø 42/39	Ø 42/39	Ø 42/39	Ø 42/39	Ø 42/39

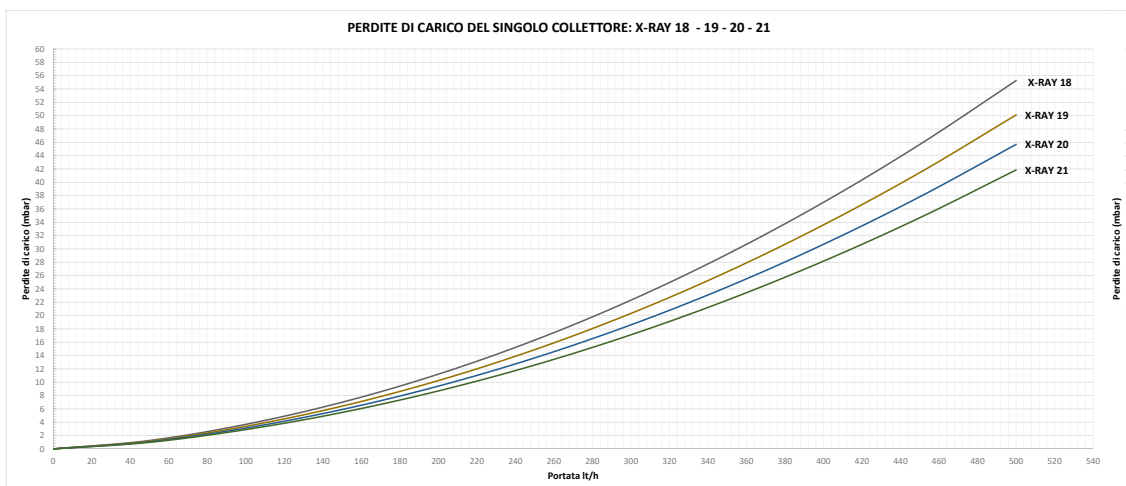
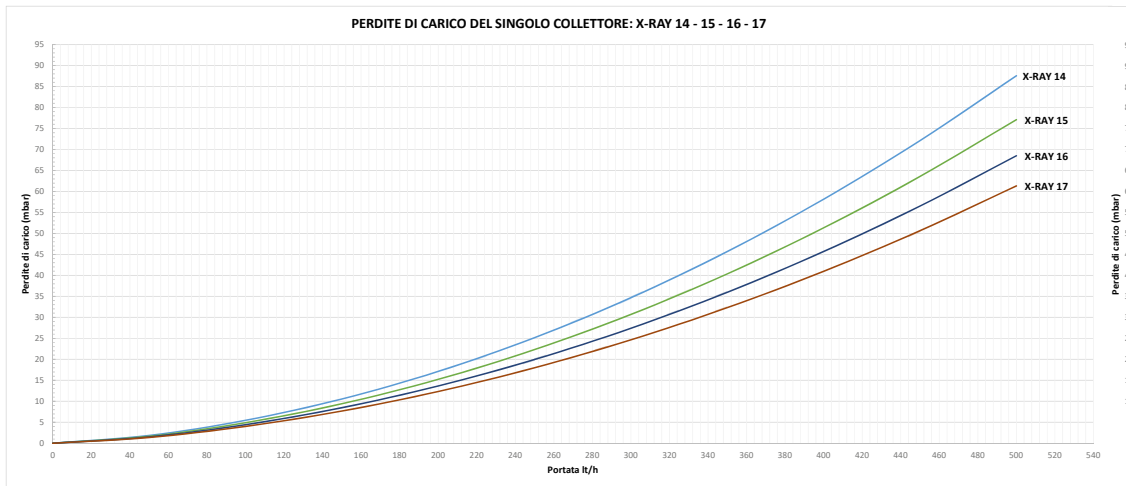
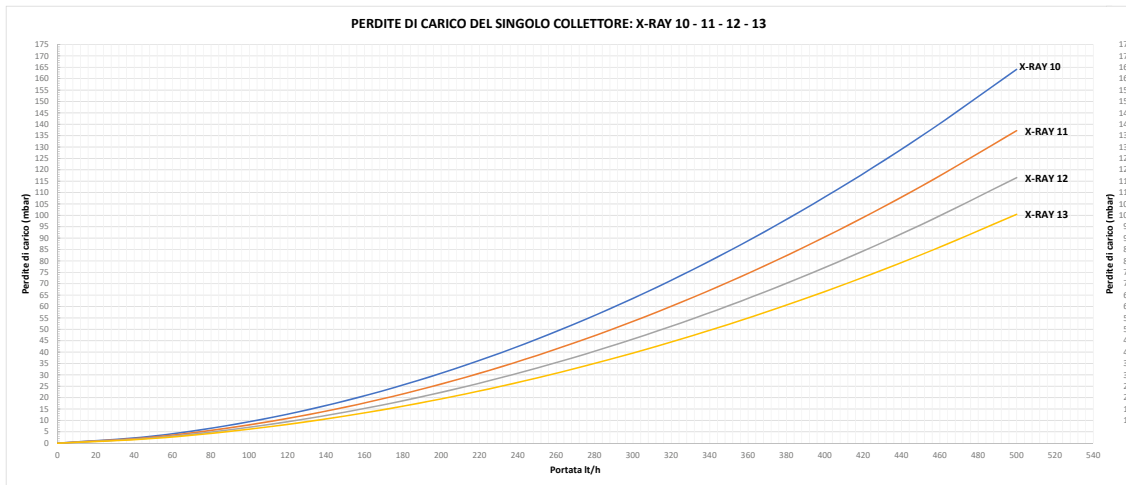
FLOW RATE OF THE HEAT TRANSFER FLUID

To guarantee the correct operation of the solar system, a specific nominal flow rate of the heat transfer fluid must be guaranteed of 9 l/h m² per pipe installed. Example:

- For 1 collector X-RAY10 R, with 10 pipes, the nominal flow rate is 90 lt/h, equal to 1,5 lt/min.
- For 1 collectors X-RAY17 R, with 17 pipes, the nominal flow rate is 153 lt/h, equal to 2,55 lt/min.
- For 5 collectors X-RAY10 R, with a total of 50 pipes, the nominal flow rate is 450 lt/h, equal to 7,5 lt/min tot.
- For 4 collectors X-RAY21 R, with a total of 84 pipes, the nominal flow rate is 756 lt/h, equal to 12,6 lt/min tot

PRESSURE DROP

The following diagram shows the pressure drop curve of the single collector. (N.B. measured data)



PUMBLING CONNECTIONS

The special feature of the X-RAY R collectors is that they can have a third integrated tube. This allows for choosing the basic standard model of the system. The head of an X-RAY R collector has hydraulic connections on each side, marked by dots in relief (see the figure on the right).

The connections marked by one or two dots indicate the primary circuit.

The connections marked by three dots are those of the "third integrated tube" (if this is the chosen standard option). For the water connections of the solar tubing (input and return), refer to the figures given in this paragraph.

- CIRCUIT •

- CIRCUIT • •

- THIERD TUBE • • •



Prescriptions

Permanently cover the collectors from solar radiation starting from the first phases of the installation. Uncover the manifolds only when loaded with glycol.

Do not fill the system with direct sunlight, possible jet of steam!
(See paragraph "Covering the collectors").

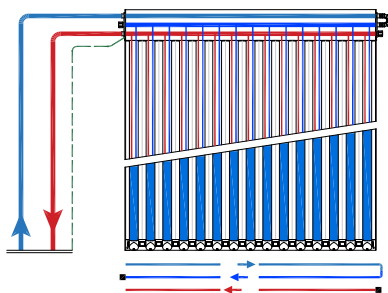
COLLECTOR X-RAY R

THIRD TUBE AND DISTRIBUTION IN PARALLEL

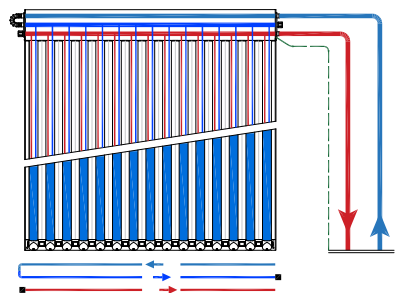
The X-RAY R solar collector comes with a fully integrated third pipe in the manifold and 3 plumbing connections to ensure equal flow distribution in each collector in the series.

Each collector has a sensor pocket on both sides so that external pipes can be connected on the right or left. Connections regardless of number of collectors must be carried out as below:

LEFT HAND CONNECTION



RIGHT HAND CONNECTION

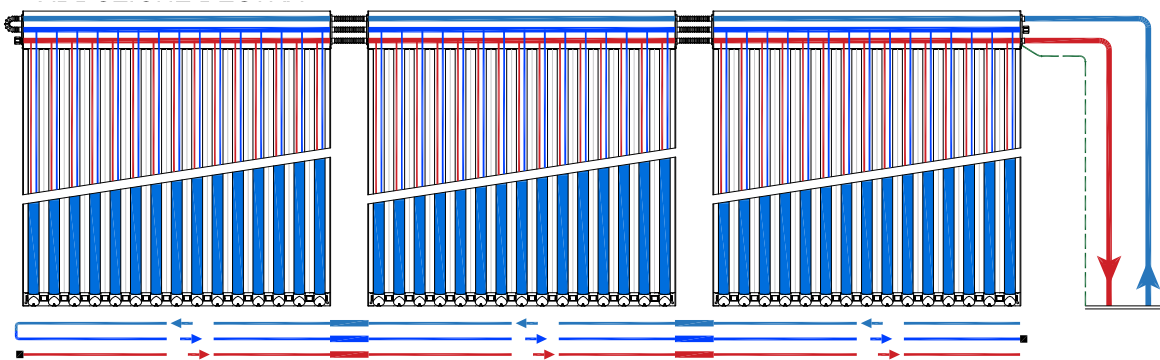


NB The cold pipe return must be connected to upper pipe fitting and the hot pipe flow to the lower fitting. Temperature probe must be fitted on the same side as connections.

Reversal of connections makes temperature control impossible so system works incorrectly.

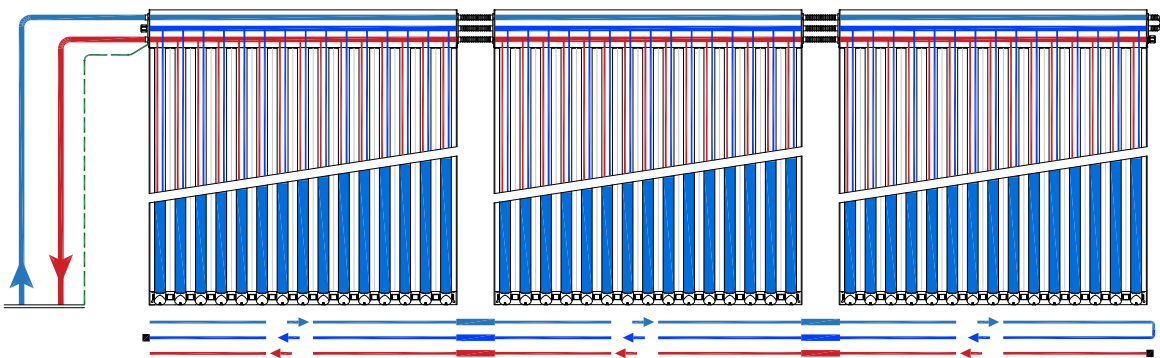
RIGHT SIDE CONNECTION

Connect the pipes from the boiler room on the right side of the collector series. Connect the return pipes (cold side) to the upper pipe connector on first collector (first/highest on the right). Blank the central pipe connector and connect the delivery pipe (hot side) to the lowest pipe connector. Connect the 180° bent pipe between the first and second (middle) on the last collector of the series. Place the temperature sensor in the sensor pocket on the first collector (first on the right).



LEFT SIDE CONNECTION

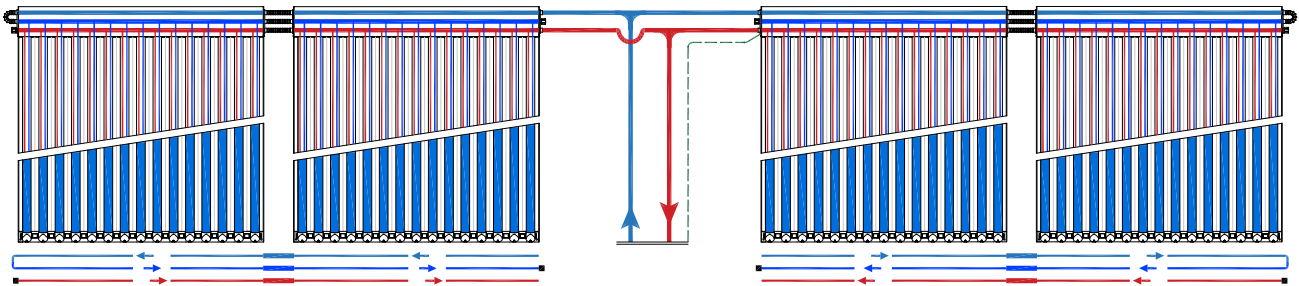
Connect the pipes from the boiler room on the left side of the collector series. Connect the return pipes (cold side) to the upper pipe connector on first collector (first/highest on the left). Blank the central pipe connector and connect the delivery pipe (hot side) to the lowest pipe connector. Connect the 180° bent pipe between the first and second (middle) on the last collector of the series. Place the temperature sensor in the sensor pocket on the first collector (first on the left).



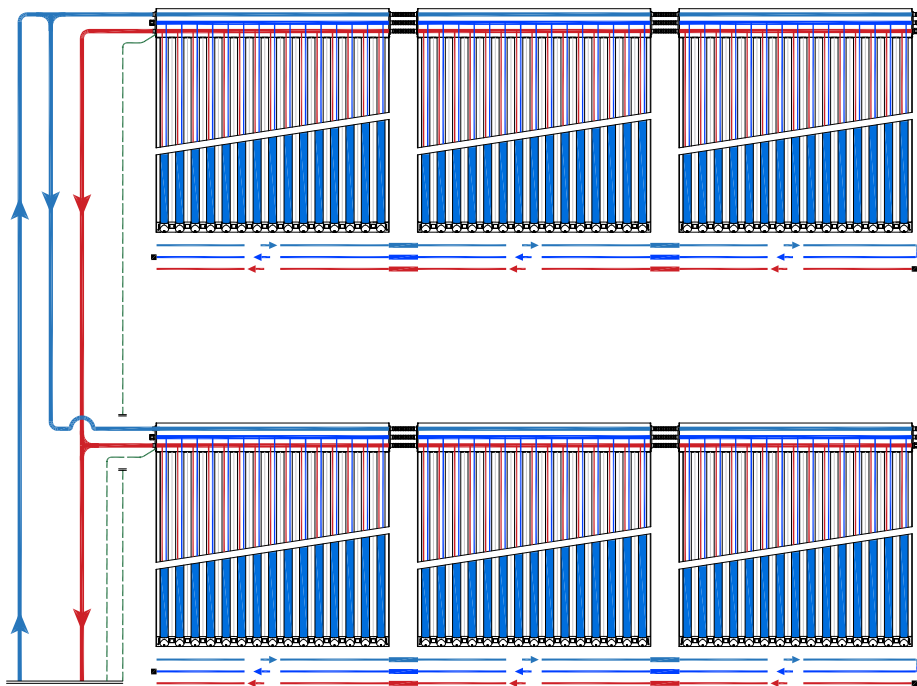
LARGE SYSTEM

For larger systems with for example more than 6 X-RAY 15 collectors, they can be arranged in two rows. Care must be taken to balance the system by making a connection between the two series.

Attention: both rows must have the same number of collectors (see diagram).

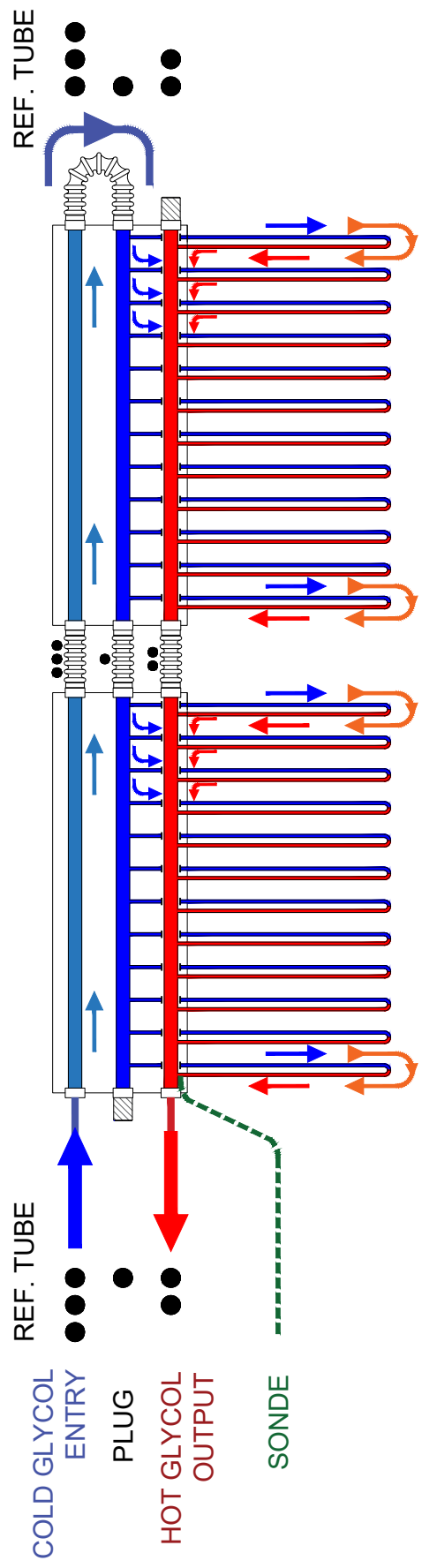


Alternatively, connect the collectors to several parallel rows, making the hydraulic connections in a balanced manner, as shown below.



➤ It is advisable to provide for the arrangement of several probes, on the respective collector strings, in order to interchange them in the event of a fault and to be able to verify the correct balancing of the circuit in operating conditions.

HYDRAULIC CONNECTION DETAIL - LEFT SIDE ADDUCTION

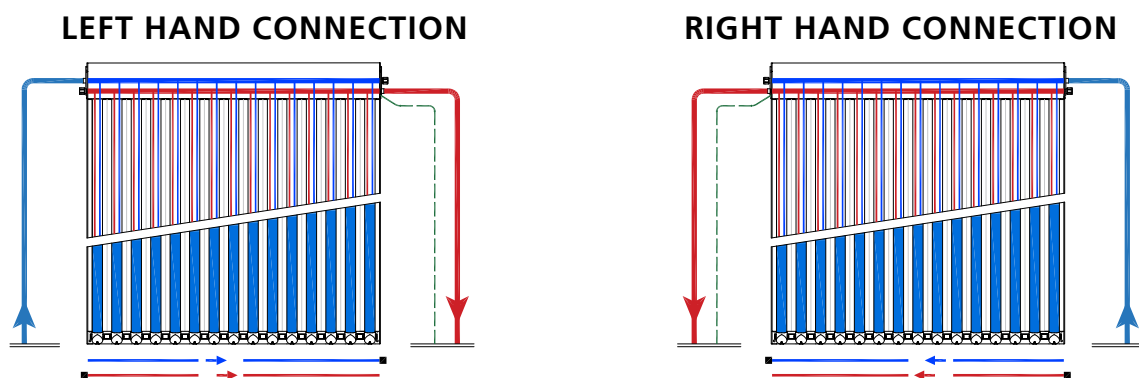


COLLECTOR X-RAY R // BASIC

WITHOUT THIRD INTEGRATED PIPE AND PARALLEL DISTRIBUTION

The X-RAY R solar collector has the third pipe completely integrated in the head and three lateral hydraulic connections that allow the hydraulic distribution in parallel on each module of the string.

The collector also has probe holders on both sides to make the connection of the external pipes reversible, both from the right and from the left. The adductions, regardless of the number of collectors, must be made as below:



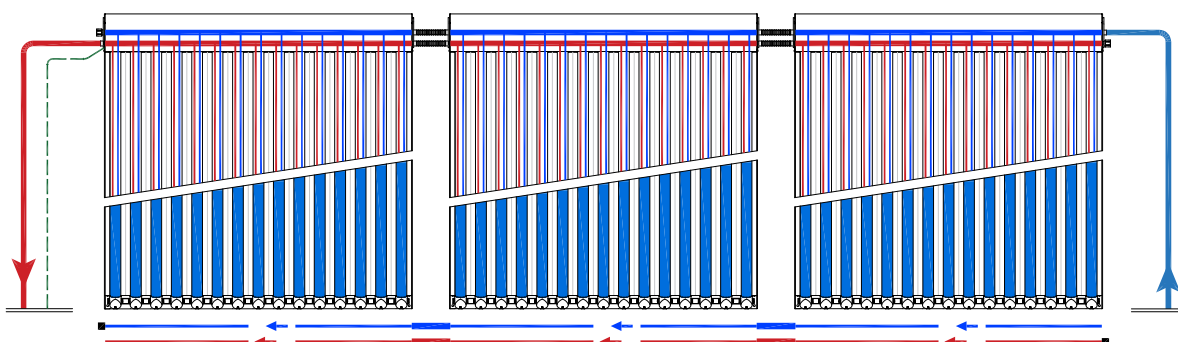
NB In particular, the cold pipe must be connected to the high connection and the hot pipe to the low connection; the temperature probe. It must be connected to the cockpit on the same side as the connections.

The inversion of the connections makes it impossible to correctly control the temperature and therefore the use of the solar field.

RIGHT SIDE CONNECTION

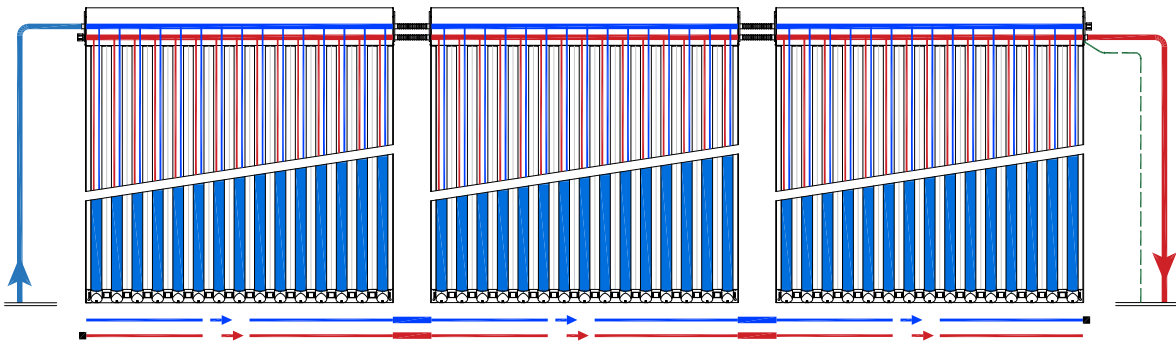
Connect the adduction pipe coming from the thermal plant on the right side of the collector battery. Connect the return pipe (cold side) to the top connection of the first manifold (the first from the right), plug the central connection and connect the delivery (hot side) to the low connection. On the last string collector connect the 180 ° curve between the first and the second fitting, plug the third (lower part).

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



LEFT SIDE CONNECTION

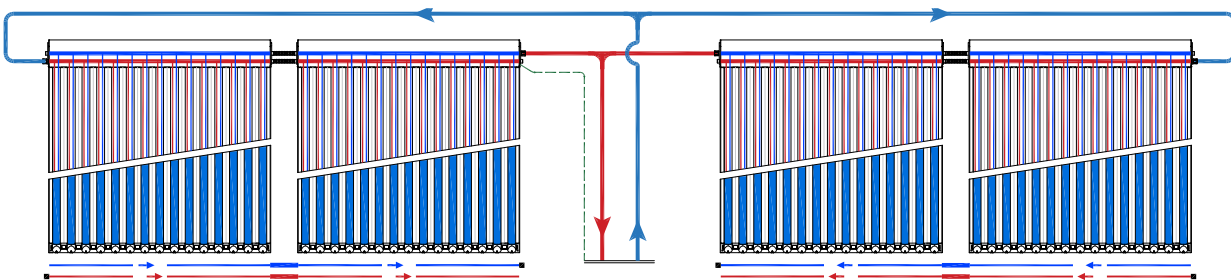
Connect the adduction pipe coming from the thermal plant on the left side of the collector battery. Connect the return pipe (cold side) to the top fitting of the first manifold (the first from the left), plug the central fitting and connect the delivery (hot side) to the low fitting. On the last string collector connect the 180 ° curve between the first and the second fitting, plug the third (lower part). Place the temperature probe in the probe holder of the first collector (the first from the left).



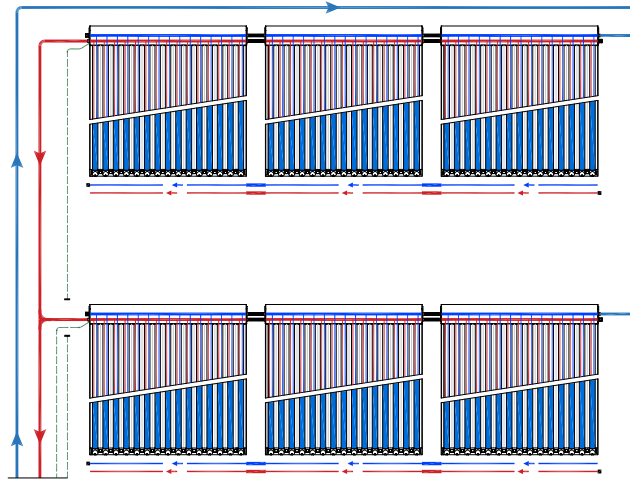
LARGE SYSTEM

For larger systems with for example more than 6 X-RAY 15 collectors, they can be arranged in two rows. Care must be taken to balance the system by making a connection between the two series.

Attention: both rows must have the same number of collectors (see diagram).



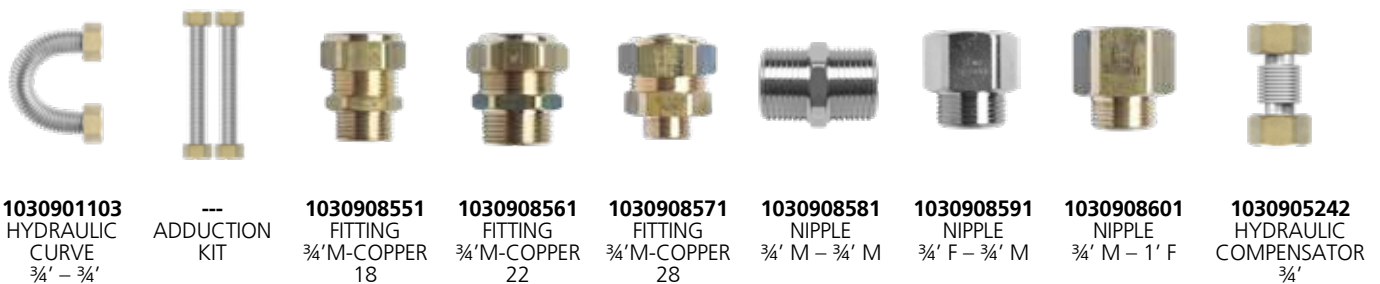
Alternatively, connect the collectors to several parallel rows, making the hydraulic connections in a balanced manner, as shown below.



It is advisable to provide for the arrangement of several probes, on the respective collector strings, in order to interchange them in the event of a fault and to be able to check the correct balancing of the circuit in conditions operational.

HYDRAULIC CONNECTIONS

The X-RAY R collectors must be connected to the input and return tubing by means of the flexible connection (input) kit. This holds firm for both sloping and flat roofs.



INSTALLATION OF CONNECTION KIT – SIDE CONNECTORS

The connection kit allows for the units of two collectors to be joined and, at the same time, to insulate and protect the joint. The kit comprises a protective aluminium profile and a thermal insulating band. After installing the collectors, assemble the connection kit according to the following steps.



SYSTEM USER'S INSTRUCTIONS

Normal functioning

After a solar XRAY R solar panel system has been started up by a specialised installer, the user does not need any special technical know-how. The system functions autonomously.

Functioning during a long absence and with strong sunlight

When the user is on holiday or absent for a long period for any other reason, the solar system continues to function autonomously; however, there is a risk of the overheating of the system. Therefore, it is advisable to cover the solar panels

(with fabric sheets or with a cover made from its cardboard packaging), firmly fixed to the solar panel with belts or bands. When the system has to be re-started after a long absence, it will only be necessary to remove the cover and the system will automatically start functioning again.

Added value and insurance

The installation of a solar system increases the value of a building. To avoid problems linked to damage caused by fire, water, hail, etc., we recommend informing your insurance company of this increased value.

GUARANTEE TERMS

Coverage: this guarantee covers only defects in the original materials and the construction of the X-RAY R forced circulation solar collector.

Duration of the guarantee: the guarantee is valid for:

- 5 years, for the solar collector;
- 2 years for the accessories

The guarantee takes effect as of the date of the original invoice. The guarantee is provided by the manufacturer which, depending on the objective feasibility of action and on the relative costs, will provide either for the repair or for the replacement of defective elements.

This guarantee excludes any work other than the above and excludes any claim for reimbursement or for compensation for damages consequent to original material or construction defects.

Guarantee exclusions: this guarantee does not cover damages and/or malfunctioning of components that are found to derive from the following causes:

- transport operations;
- normal wear and tear;
- malfunctioning and breakdowns failures for incorrect work on the system;
- failure to respect the warnings and the instructions provided by the manufacture and failure to respect good technical practice and correct installation;
- failure to observe, during installation and start-up, laws and regulations in force;

- failure of components due to incorrect use, their installation in damp and/or dusty places, incorrect sizing, and/or imperfect installation;
- the use of accessories and/or spare parts that are non-original or not authorised by the manufacturer;
- corrosion, encrustations or breakage caused by galvanic current, condensation, hard or acid water, improper descaling treatments, lack of water, calcareous deposits and/or mud;
- force majeure such as fire, theft, intense cold, overheating, hurricane, lightning, earthquake, landslide, vandalism and other events beyond anyone's control;
- with regard to other parts of the plumbing/heating system with which the solar system interacts, the inefficiency of such parts or their non-compliance with the standards in force;
- failure to respect safety rules, including those regarding the drainage of liquids, indicated by the manufacture and/or imposed by regulations in force.

The guarantee does not regard thermal or acoustic pollution limits. The guarantee does not regard problems deriving from the installation of the components which falls under the responsibility of the buyer/user and which is carried out by firms that are independent of the manufacturer.

The guarantee is not valid and shall be ineffective if the payment for the components does not take place according to the contract. The guarantee is not valid and shall be ineffective if the end buyer does not provide for the payment of the components.

SOLAR KEYMARK CERTIFICATION

The X-RAY R forced circulation solar collectors have Keymark certification, as testified by the test report issued by ENEA (the National Energy Efficiency Agency) and the certificate issued by Kiwa Cermet Italia.

REPAIRS

Replacement of single tubes

Materials and equipment required: 5 mm hexagonal Allen wrench, bucket and broom to collect residues, and replacement tubes.

Protective equipment

When defective or damaged tubes are replaced, always wear gloves and protective goggles.

How to recognise defective tubes

The tubes of the XRAY R collectors constantly contain a vacuum. If a tube is damaged or is no longer hermetically sealed, due to external circumstances, it must be replaced. A damaged tube cannot always be recognised directly by visible broken glass. However, a damaged tube can always be recognised by the appearance of a whitish film, which forms with oxidation, on the silver surface of the mirror at the foot of the tube.

Removal of the tubes

If the tube has sustained obvious damage, carefully remove the glass fragments without damaging the surface of the CPC mirror. Then, using the hexagonal 5 mm Allen wrench, unscrew the plastic support which holds the tube firm at the base of the collector. Slide out the tube, taking care not to damage the copper absorbers and circuit.

Installation of a single tube

Carefully check that the washer, on the head of the collector, is still in its correct position; otherwise replace the washer in its correct position. Slide in the vacuum tube, in the same manner as the damaged tube was removed, taking care to correctly align the absorbers and to avoid damaging the copper circuit. Slide in the tubing up to the washer on the head and check that the edges of the washer are not damaged. Screw on the plastic support with the 5 mm hexagonal Allen wrench.

ROUTINE MAINTENANCE AND SERVICING

Once a year, the solar system must be checked by a specialist firm, taking into consideration the functioning, the protection against corrosion, the operating pressure, the preloading pressure of the expansion tank, the thermal insulation and, if present, the protective anode of the boiler.

Resistance of the protection against corrosion

Once a year it is necessary to check, by means of a pH measuring stick, the protection against corrosion (the pH value) of the anti-freeze mixture. If the pH value is less than 7, all the FAST G28 antifreeze mixture must be immediately replaced.

Check the operating pressure of the system

Once a year the operating pressure of the system must be checked by a specialist firm; if the pressure has decreased and when the reason has been detected (leaks, loss from the safety valve), it must be returned to the nominal value.

Check the pre-loading pressure of the expansion tank

Once a year, after removing the pressure from the solar side of the tank, the pre-loading pressure of the expansion tank must be checked.

Visual inspection of the system

During the routine annual check, the entire solar system must be visually examined in order to detect possible damage, leaks or excessive dirt.

Check with particular attention the state of the vacuum of the tubes of the collector (see the paragraph "How to recognise damaged tubes").

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

Before replacing the glass tubes, cover the collectors concerned. In any case, make sure that the metal parts are not particularly hot. Attention: contact with the internal circuits can cause burns. Wear suitable protective gloves.

Air-bleeding

The air must be bled from the system with particular care:

- when the system is started up
- 4 weeks after start-up
- whenever necessary; for example, in the case of breakdown and/or routine maintenance.

Check the thermo-vector liquid

- Periodically (max. every 2 years) check the antifreeze properties and the pH value of the thermo-vector liquid.
- Check the efficiency of the anti-freeze mixture and replace it if necessary. Normal value: -20°C
- Check the pH value with a pH measuring instrument. Nominal value: pH 7.5
- Replace the thermo-vector liquid if the pH value falls below 7.

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www.pleion.it

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

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