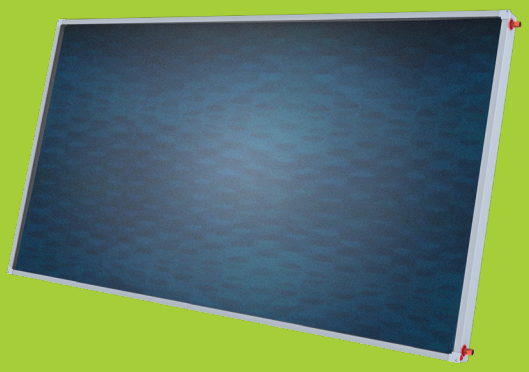
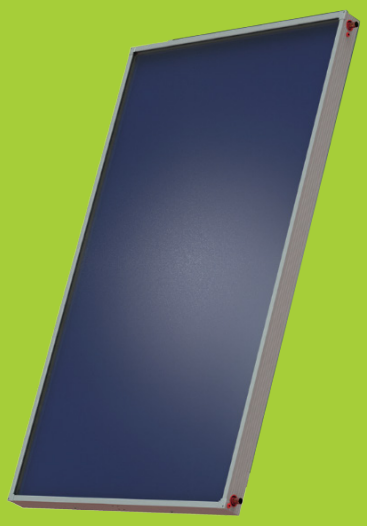
ELFOSun^3

FLAT SOLAR COLLECTORS





TECHNICAL BULLETIN, INSTALLATION, OPERATION AND MAINTENANCE MANUAL

M0S300002-00/BT23B082GB-00
03-2023

Dear Customer,

We congratulate you on choosing these product

Clivet has been working for years to offer systems able to assure the maximum comfort for a long time with highly-reliable, efficient, high-quality and safe solutions.

The target of the company is to offer advanced systems, that assure the best comfort and reduce energy consumption as well as the installation and maintenance costs for the entire life-cycle of the system.

With this manual, we want to give you information that are useful for all phases: from reception, installation and use to disposal - so that such an advanced system can provide the best performances during installation and use.

Best regards and have a good read.

CLIVET Spa

The original instructions are written in Italian.

All other languages are translations of the original instructions.

Summary

1. Introduction and general operation

The system with Clivet thermal solar collectors must be professionally installed by qualified installers in full compliance with the hydraulic and wiring diagrams.

⚠ **For correct operation of the system, the instructions enclosed with each individual element supplied (e.g. solar collector, brackets, controller, boiler, solar unit, etc.) must be followed and adhered to.**

We recommend checking the material for any damage (if necessary, proceed as outlined under “General conditions” in the current price list).

1.1 General operation

The solar collector is designed to convert solar energy into heat as efficiently as possible.

The light radiation passes through the transparent cover (tempered anti-reflective glass) and reaches the absorber (absorbing plate) where it is converted into heat. The shell and tube system extracts the captured energy from the absorbing plate through a heat transfer fluid.

Given the time lag between the presence of solar radiation and the consumption of energy, it is necessary to store the solar energy during daylight hours so that it is available as and when required: for example, at night, using specific storage tanks for solar systems.

To transfer the energy from the solar collectors to the storage tank (if located, for example, lower than the solar park area), a pump is required in the solar water circuit to circulate a heat transfer fluid (water and antifreeze). As the heat transfer fluid heats up inside the solar collectors, it transfers heat to the storage tank by means of a heat exchanger (required to separate the water and glycol mixture in the primary circuit from the domestic hot water in the storage tank). The circulation pump is controlled by an electronic controller.

Forced circulation systems can be used not only for the production of domestic hot water alone, but also for integration of the system into low-temperature radiant panel heating.

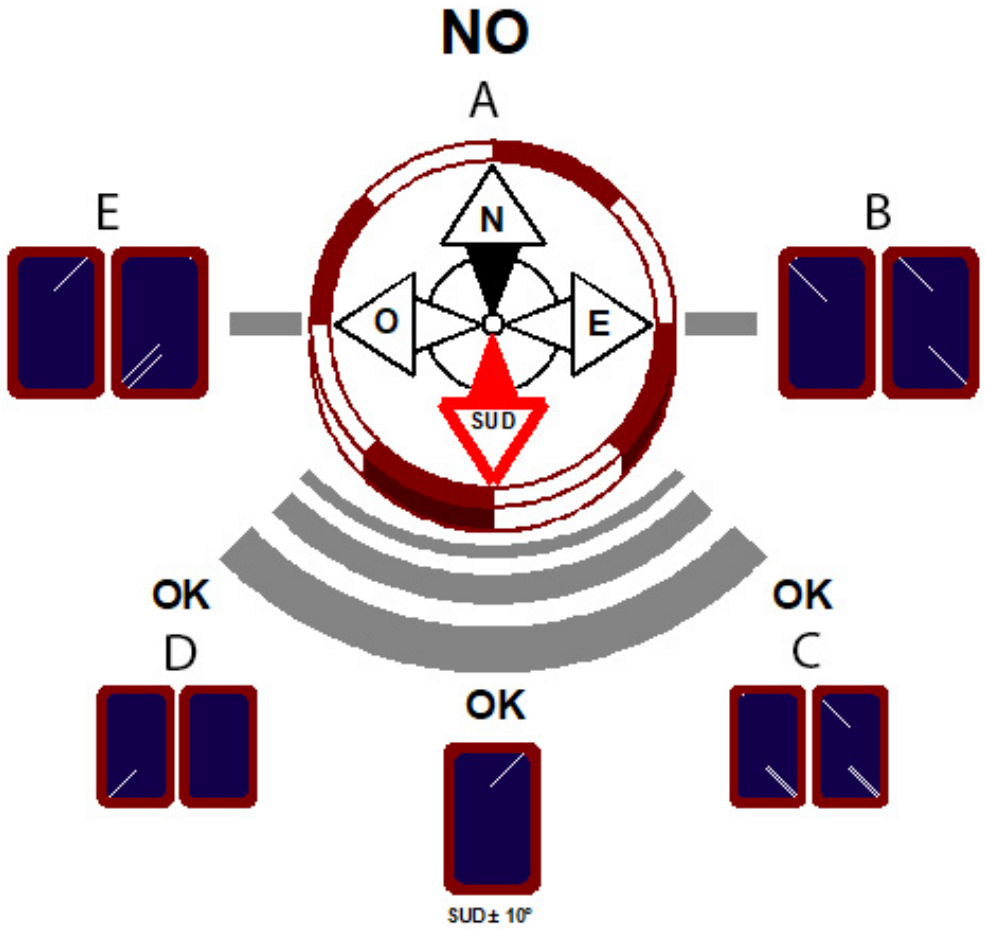
All solar systems must be integrated with a traditional system that provides electricity on days when there is no sunlight.

2. Requirements and pre-installation

2.1 Orientation of collectors

For optimal performance, the solar collector must face SOUTH.

A deviation of 15-20° is acceptable; deviations over 20° require compensation by increasing the surface area of the solar park.



A Collectors do not catch the sun's rays

B Surface area almost doubled compared to south-facing

C Increasing the surface area

D Increasing the surface area

E Surface area almost doubled compared to south-facing

2.2 Angle of collectors

The optimal angle of the collector for the best performance should be equal to the latitude where the system is installed.

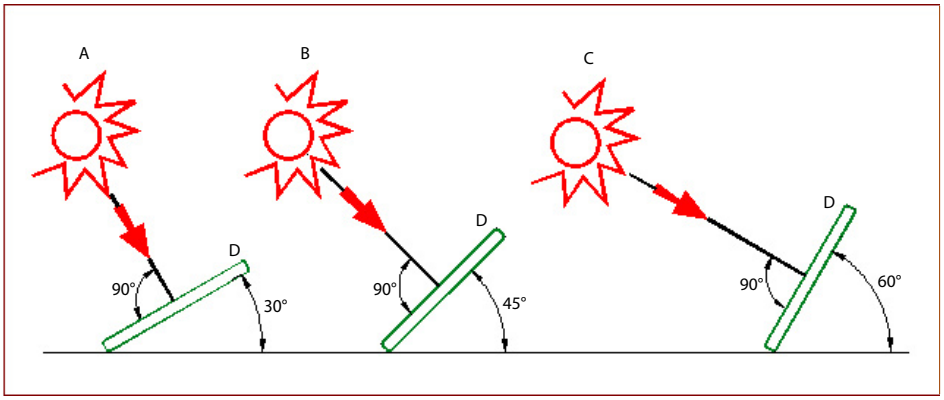
Use the truss angle closest to this angle.

For year-round use, a truss angled at 45° is used in Italy (e.g. for residential housing).

To increase the performance in summer against the performance in winter, the angle should be lowered by about 15°, so for predominantly summer use (e.g. campsites, beach facilities, etc.) a 30° angle is used.

On the other hand, if you want to optimise the system mainly for winter use, for heating integration systems, you should use a truss angled at 60° because the height of the sun during the winter is lower.

The large angle reduces production in the summer months, however, the energy absorbed by collectors sized for winter will in any case be greater than the energy requirements for the production of domestic hot water alone.



A Summer

B Mid-season (excellent compromise)

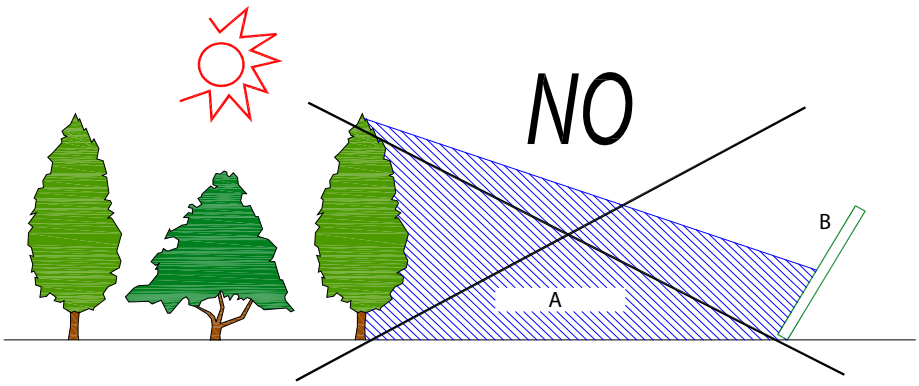
C Winter

D Solar panel

2.3 Positioning of collectors

Solar collectors can be installed in various positions on the roof or around the house and in different configurations, following the instructions in the previous chapters.

It is important to ensure that the collector receives the sun's rays without interference from neighbouring trees and buildings even in the worst conditions (winter), otherwise the lack of sunlight will have to be compensated for by increasing the surface area of the collectors. The same principle applies to solar collectors on sites in valleys surrounded by mountains, where exposure to the sun is greatly restricted.

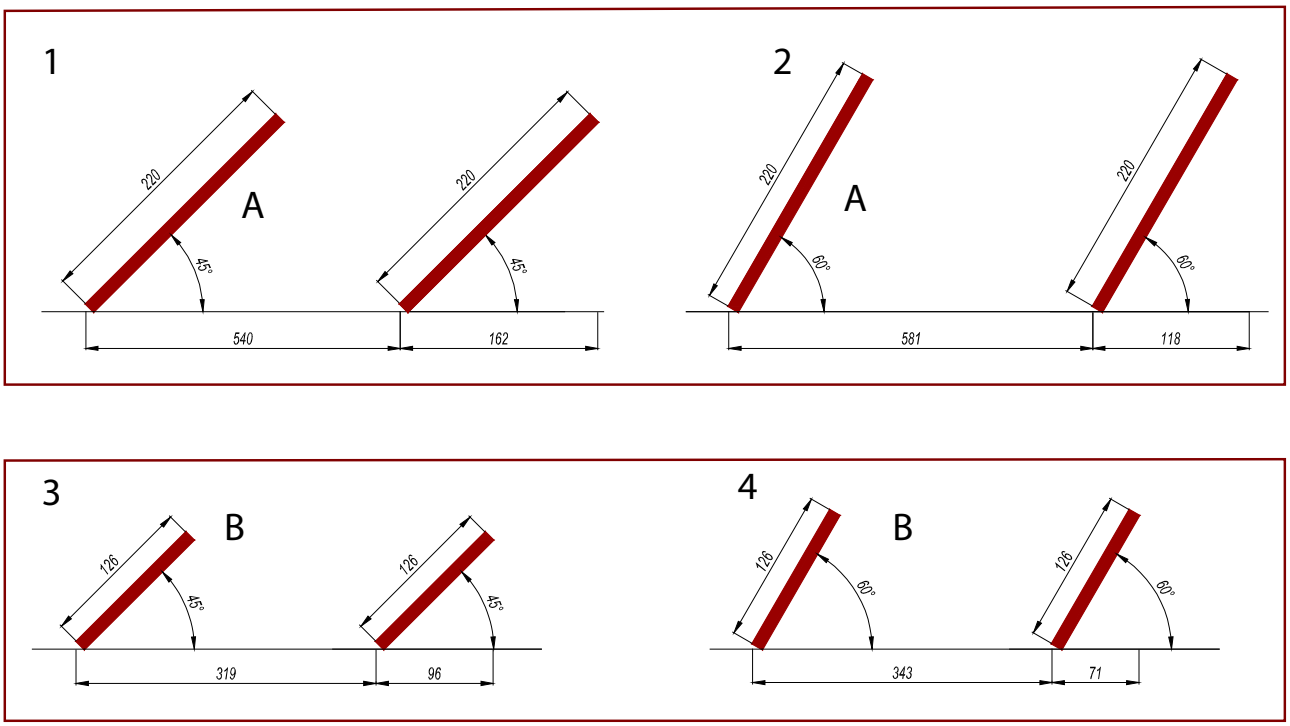


A Shaded area

B Solar panel

If there are several rows of solar collectors, make sure they do not shade each other and follow the design guidelines (see example below).

Examples:



1 Shade between rows with cr 120 mod. Vertical panel installed at 45°
(calculation referring to the city of verona)

2 Shade between rows with cr 120 mod. Vertical panel installed at 60°
(calculation referring to the city of verona)

3 Shade between rows with cr 120 h mod. Horizontal panel installed at 45°
(calculation referring to the city of verona)

4 Shade between rows with cr 120 h mod. Horizontal panel installed at 60°
(calculation referring to the city of verona)

A Vertical solar panel

B Horizontal solar panel

Before making any decision on the location, it is important to know the regulations issued by local authorities; in Italy, unless there are landscape or monumental restrictions, it is sufficient to simply notify the competent technical offices.

2.4 Sizing of the system

The system size is based on hot water consumption and on the square metres heated by the low-temperature system (for combined systems only).

The choice depends on the people in the household, the installation area, the angle and orientation of the collectors, any obstacles shading the solar park, the length of the pipes, and whether there is recirculation or not; these will determine the size of the tank and collectors.

See standard system sizes in the price list.

2.5 Description of kits

Code	Option description	Kit composition
F-L	ELFOSun^3 - 2m^2 vertical solar collector	1 x 2 m^2 high-efficiency selective flat solar panel, F-L model, vertical version with harp circuit and selective Titanium Oxide treatment (F-L)
F-XL	ELFOSun^3 - 2.4m^2 vertical solar collector	1 x 2.37 m^2 high-efficiency selective flat solar panel, F-XL model, vertical version with harp circuit and selective Titanium Oxide treatment (F-XL)
FH-XL	ELFOSun^3 - 2.4 m^2 horizontal solar collector	1 x 2.37 m^2 high-efficiency selective flat solar panel, FH-XL model, horizontal version with harp circuit and selective Titanium Oxide treatment (FH-XL)
KFSX	Flat or sloping roof fixing kit for 1 vertical collector (for F-L / F-XL)	1 x universal frame kit for 1 F-L/F-XL flat vertical solar collector 1 x fittings kit for each collector string
KFDX	Flat or sloping roof fixing kit for 2 vertical collectors (for F-L / F-XL)	1 x universal frame kit for 1 F-L/F-XL flat vertical solar collector 1 x fittings kit for each collector string 1 x fittings kit for each additional collector
KFPX	Flat roof fixing kit for 1 horizontal collector (for FH-XL)	1 x base frame for 1 FH-XL flat horizontal solar collector 2 x 30-55° triangles 1 x fittings kit for each collector string
KFP2X	Flat roof fixing kit for 2 horizontal collectors (for FH-XL)	2 x base frame for 2 FH-XL flat horizontal solar collectors 4 x 30-55° triangles 1 x fittings kit for each collector string 1 x fittings kit for each additional collector
KFIX	Sloping roof fixing kit for 1 horizontal collector (for FH-XL)	1 x pitched roof bracket for 1 FH-XL flat horizontal solar collector 2 x stainless steel tape kits 1 x fittings kit for each collector string
KFI2X	Sloping roof fixing kit for 2 horizontal collectors (for FH-XL)	2 x pitched roof bracket for 2 FH-XL flat horizontal solar collectors4 stainless steel tape kits 4 x stainless steel tape kits 1 x fittings kit for each collector string 1 x fittings kit for each additional collector
KFIN1X	Uncased fixing kit for 1 vertical collector (for F-L / F-XL)	1 x universal uncased kit for 1 F-L/F-XL flat vertical solar collector 1 x fittings kit for each collector string
KFIN2X	Uncased fixing kit for 2 vertical collectors (for F-L / F-XL)	1 x universal uncased kit for 1 F-L/F-XL flat vertical solar collector 1 x universal uncased kit for 1 F-L/F-XL additional flat vertical solar collector 1 x fittings kit for each collector string 1 x fittings kit for each additional collector
KCIX	Fittings kit for intermediate connection between solar collectors	1 x fittings kit for each additional collector
KCCX	Kit for single-column circulation, solar controller and 3/4” non return valve	1 x GS1 12 single-column solar unit 1 x Solar 1 solar controller 1 x 3/4" non return valve
KCCBX	Kit for single-column circulation, solar controller and 3/4” non return valve	1 x GS1 12 single-column solar unit 1 x Solar 1 solar controller 1 x 3/4" non return valve
VE18X	18-litre expansion tank	1 x solar expansion tank - 18 litres 1 x expansion tank mounting bracket

VE25X	25-litre expansion tank	1 x solar expansion tank - 25 litres 1 x expansion tank mounting bracket
VE40X	40-litre expansion tank	1 x solar expansion tank - 40 litres 1 x expansion tank mounting bracket
VMTX	3/4" thermostatic mixing valve	1 x Burn-proof mixing valve kit
GP10X	10-litre concentrated propylene glycol tank	1 x 10-litre tank of pure antifreeze liquid to be diluted

3. Matchings

				ELFOSun³						
Unit	Series	Boiler DHW [l]	Unit accessory required for connection	recommended no. of collectors					Circulation kit	Expansion tank
				F-L	F-XL FH-XL	Flat roofs	Sloping roofs	Uncased		
SPHERA EVO 2.0	SQKN-YEE 1 TC + MiSAN-YEE 1 S	190 / 250	SOLX SOLX (solar exchanger)	2	2	KFSX / KFDX / KFPX / KFP2X	KFSX / KFDX / KFIX / KFI2X	KFIN1X / KFIN2X	KCCX/ KCCBX	VE18X/ VE25X/ VE40X
	SQKN-YEE 1 TC + MiSAN-YEE 1 S + ACSA250X	190 / 250 + 250	SOLX SOLX (solar exchanger)	4	3	KFSX / KFDX / KFPX / KFP2X	KFSX / KFDX / KFIX / KFI2X	KFIN1X / KFIN2X	KCCX/ KCCBX	VE18X/ VE25X/ VE40X
SPHERA EVO 2.0 Invisible (Full electric)	SQKN-YEE 1 IC + MiSAN-YEE 1 S	150	KCVEX (circulation kit and expansion tank)	2	1	KFSX / KFDX / KFPX / KFP2X	KFSX / KFDX / KFIX / KFI2X	KFIN1X / KFIN2X	-	-
	SQKN-YEE 1 IC + MiSAN-YEE 1 S + ACSA150X	150 + 150	KCVEX (circulation kit and expansion tank)	3	2	KFSX / KFDX / KFPX / KFP2X	KFSX / KFDX / KFIX / KFI2X	KFIN1X / KFIN2X	-	-
SPHERA EVO 2.0 Invisible (Hybrid)	SQKN-YEE 1 IH + MiSAN-YEE 1 S	150	KCVEX (circulation kit and expansion tank) ADI50X (installation cabinet)	2	1	KFSX / KFDX / KFPX / KFP2X	KFSX / KFDX / KFIX / KFI2X	KFIN1X / KFIN2X	-	-
SPHERA EVO 2.0 Box	SQKN-YEE 1 BC + MiSAN-YEE 1 S	*	-	-	-	-	-	-	-	-
Edge EVO 2.0	WiSAN-YME 1 S	*	-	-	-	-	-	-	-	-
AQUA Plus	SWAN 2 190S	190	-	2	2	KFSX / KFDX / KFPX / KFP2X	KFSX / KFDX / KFIX / KFI2X	KFIN1X / KFIN2X	KCCX/ KCCBX	VE18X/ VE25X/ VE40X
	SWAN 2 300S	300	-	3	2	KFSX / KFDX / KFPX / KFP2X	KFSX / KFDX / KFIX / KFI2X	KFIN1X / KFIN2X	KCCX/ KCCBX	VE18X/ VE25X/ VE40X
*External solar boilers	ACS200X + SC08X	200	-	2	2	KFSX / KFDX / KFPX / KFP2X	KFSX / KFDX / KFIX / KFI2X	KFIN1X / KFIN2X	KCCX/ KCCBX	VE18X/ VE25X/ VE40X
	ACS300X + SC08X	300	-	3	2	KFSX / KFDX / KFPX / KFP2X	KFSX / KFDX / KFIX / KFI2X	KFIN1X / KFIN2X	KCCX/ KCCBX	VE18X/ VE25X/ VE40X
	ACS500X + SC12X	500	-	4	3	KFSX / KFDX / KFPX / KFP2X	KFSX / KFDX / KFIX / KFI2X	KFIN1X / KFIN2X	FCCX/ KCCBX	VE18X/ VE25X/ VE40X
	ACS10SX	1000	-	8	6	KFSX / KFDX / KFPX / KFP2X	KFSX / KFDX / KFIX / KFI2X	KFIN1X / KFIN2X	FCCX/ KCCBX	VE18X/ VE25X/ VE40X

4. Vertical flat solar collector

F Series

Description

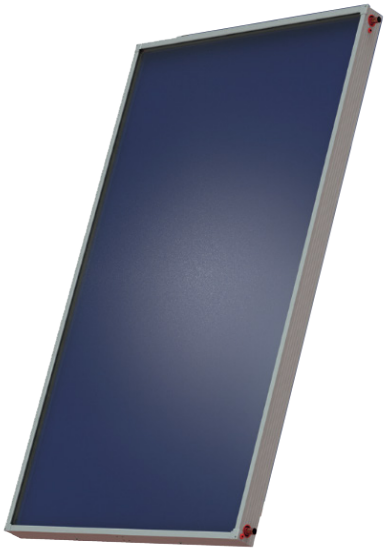
High-efficiency selective solar collector F-L / F-XL models.

Flat collector with harp circuit available in sizes (L, XL), vertical version

Performance is ensured by the aluminium absorber with selective Titanium Oxide treatment (Sputtering) laser-welded on the shell and tube.

The insulation is 40 mm thick high-density rock wool. The cover is made of 3.2 mm low iron tempered glass with a high resistance to hail and a prismatic surface finish for reduced reflection.

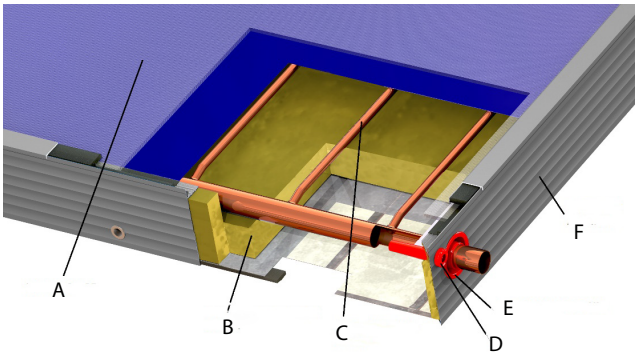
Grey aluminium profile casing.



Harp collectors internally comprise a circuit of interconnected copper pipes, within which the heat transfer fluid flows to convey the energy to the required place of use.

This circuit consists respectively of 9 (F-L) and 11 (F- XL) vertical pipes connected to 2 transverse copper pipes, the ends of which form the 4 connections for connecting to the outside of the collector.

The ensuing low pressure drop also makes it suitable for natural circulation. The 4 connections allow easy connection of the collectors to the coil and to the water circuit.



A Solar glass
B Rock wool insulation
C Harp absorber
D Ventilation hole protection
E Soft gaskets
F Aluminium profile

Avantage

- **High development of thermal count 2.0**
- Collector with highly-selective absorber (sputtering)
- High efficiency all year round
- Powder-coated aluminium profile
- Low iron tempered prismatic glass
- En 12975 certification and Solar Keymark
- 5-year warranty

Directions for use

Flat selective solar collector used in forced circulation when high output is required even in areas with low solar radiation.

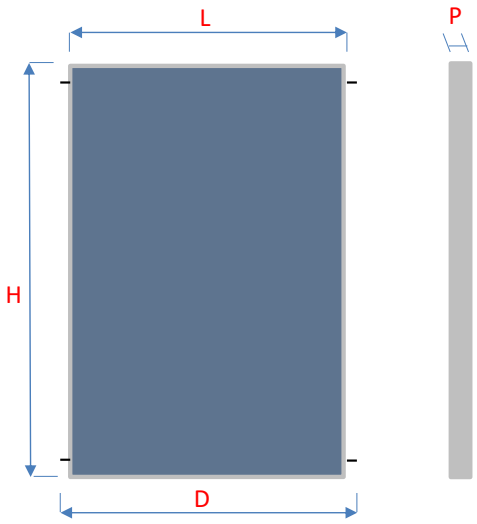
- Domestic hot water production and heating integration in residential, commercial and industrial environments
- Process heat production in industrial environments

Harp collector technology

Model		F-L	F-XL
Dimensions and weights			
Dimensions	(hxlxp) mm	1980x1010x86	1930x1230x86
Gross surface area	M^2	2,00	2,37
Absorbing surface area	M^2	1,89	2,23
Unladen weight	Kg	38	43
Fluid content	Litres	1,36	1,7
Technical specifications			
Casing profile		Powder-coated aluminium	
Type of absorber		Arpa	
No. Of rises		9	11
Diameter of the rises	mm	8	
Absorber material		0.4 mm aluminium	
Selective treatment		Titanium oxide (α = 95%, ε = 4%)	
Absorbing factor	%	≥ 95	
Emission factor	%	≤ 4	
Connections		4 connections, copper ø 22	
Thermal insulation		40 mm mineral wool	
Maximum operating pressure	bar	10	
Recommended flow-rate	l/min m^2	1,6-2	2-2,7
Technical specifications [values referring to the gross surface area, en iso 9806:2013]			
Optical performance H_0	%	76,1	76,1
Thermal loss a_1	W/m^2 K	3,6	3,6
Thermal loss a_2	W/m^2 K^2	0,014	0,014
Iam angular correction factor (K_θ at 50°)		0,96	
Stagnation temperature	°C	190	
Peak capacity	W	1.522	1.804
Qcol value	kWh_t	976	1.157
Certifications		UNI EN 12975-KEYMARK	

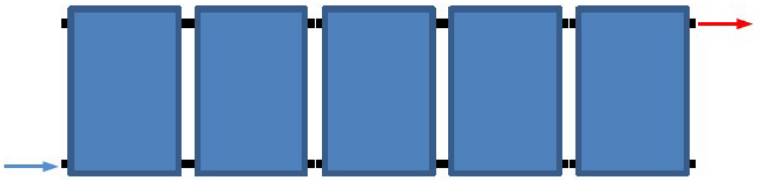
Dimensions and overall dimensions

Model	L [mm]	H [mm]	P [mm]	D [mm]
F-L	1010	1980	86	1070
F-XL	1230	1930	86	1290

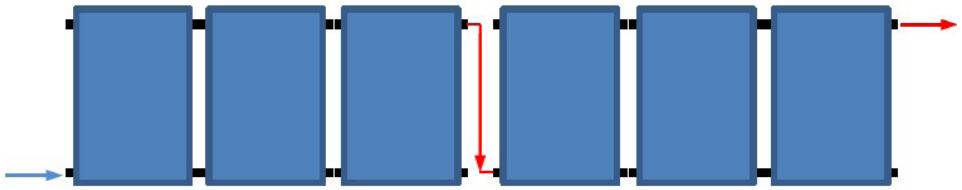


4.1 Collection examples

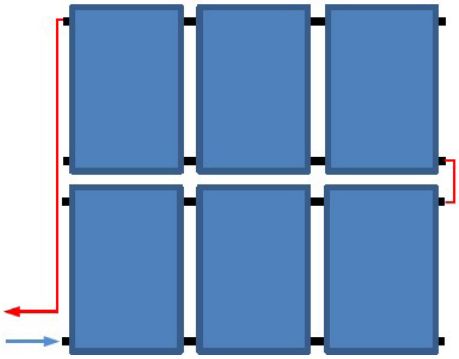
Connection in parallel max 5 units for F-L/F-XL



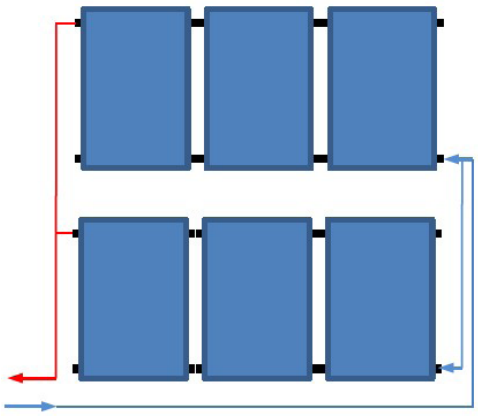
Connection in series/parallel



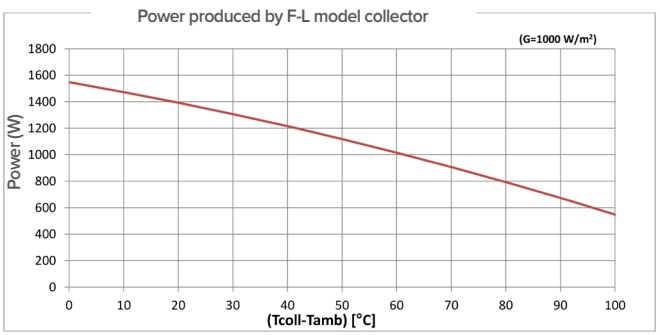
Connection in series/parallel

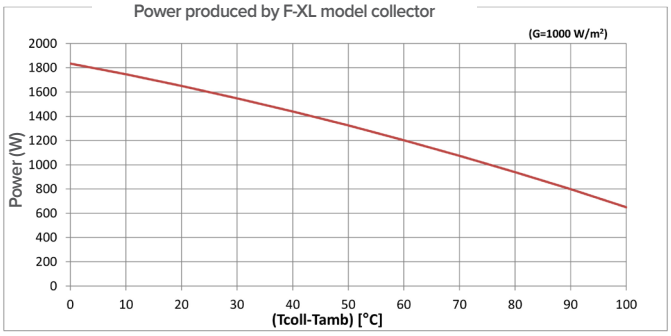


Connection in parallel on multiple rows

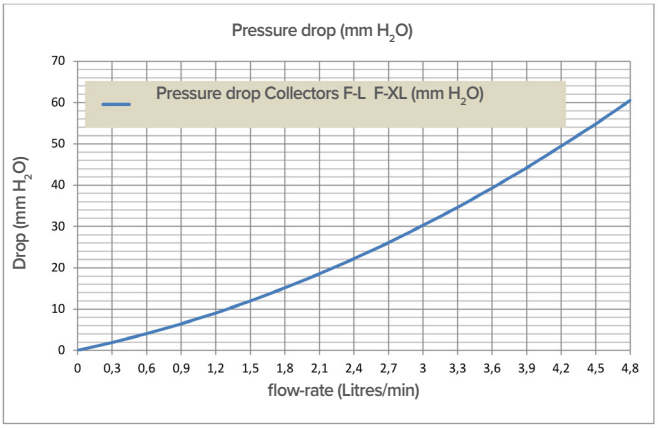


Performance curves





Pressure drops (water T=20 °C)



Collectors

Series name	Model
ELFOSun³ F-L	F-L model
ELFOSun³ F-XL	F-XL model

Connections kit

Description	
Fittings kit for intermediate connection	

4.2 Installation

It is advisable to keep the collectors covered until the system is put into operation so as to avoid possible damage to the insulation due to the high temperatures that can be reached (up to 200°C). To cover the solar panels, we recommend using the collector packaging boxes or garden shading covers.

When tightening the fittings to the solar collector, always use two spanners to avoid twisting the head of the panel's shell and tube; we strongly recommend lubricating the brass ogives to prevent seizing during tightening.

⚠ **Any breakage due to twisting the shell and tube is not covered by the warranty**

The panels must be placed with the side bearing the words "THIS SIDE UP" or "QUESTO LATO IN ALTO" facing upwards, with a 1% slope towards the outlet hole (panel supply) to stop air pockets from forming.

It is advisable to run water (from top to bottom) inside the collectors before installing them to wash away any processing residues.

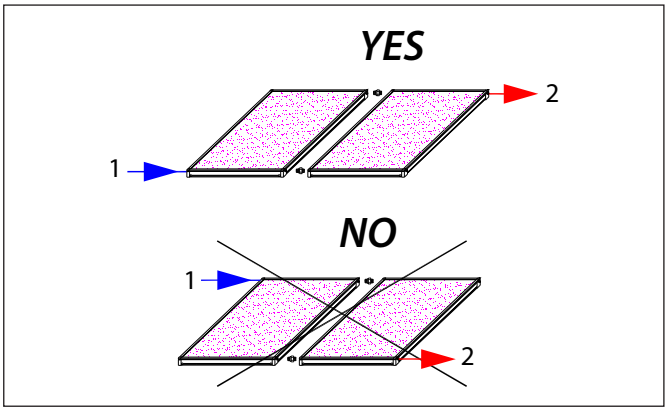
Connection fittings

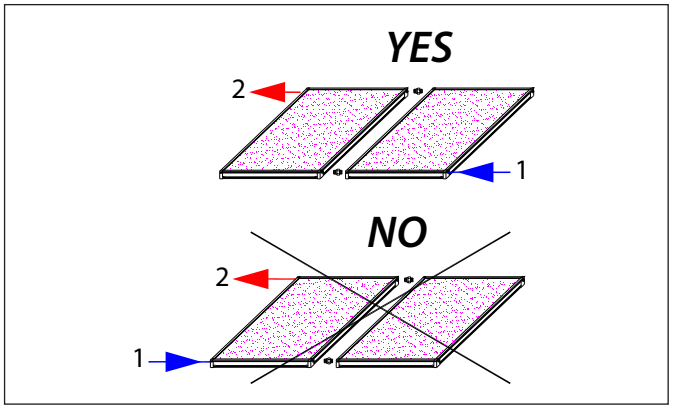
The connections of the primary circuit copper pipes must be made by braze welding or using mechanical brass fittings with a metal ogive seal. Do not use fittings with O-ring seal because this material can get damaged at high temperatures (unless special O-rings for solar systems are used).

The connections of the stainless steel pipes must be made by flaring using the fittings and high-temperature gaskets provided in the kit.

Use bronze or brass fittings in contact with the panel to avoid corrosion problems due to galvanic currents.

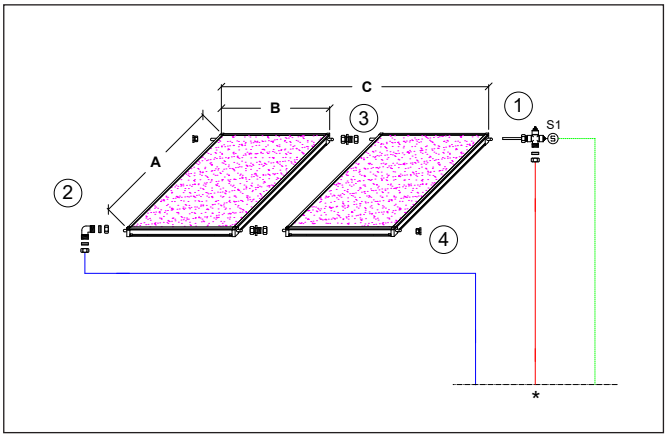
⚠ **The cold inlet of the solar collectors must be at the BOTTOM on the right or at the BOTTOM on the left of the collector coil; the hot outlet must be at the TOP on the opposite side, i.e. if the inlet is at the bottom on the left, the outlet must be at the top on the right, and vice versa.**





1 Cold inlet
2 Hot outlet

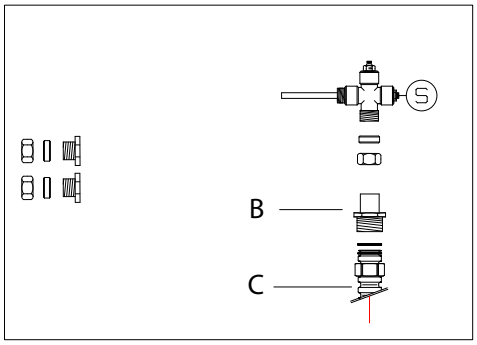
4.3 Solar collector fittings for F-L / F-XL



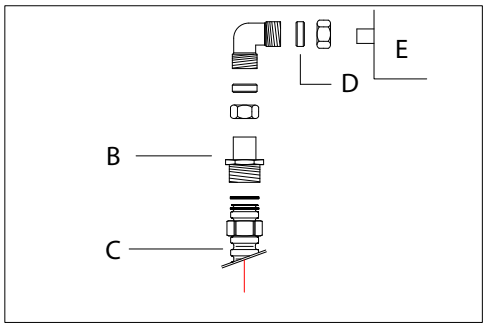
* To the central heating plant

Model	A [mm]	B [mm]	C [mm]
F-L	1980	1010	2100
F-XL	1930	1230	2540

If a stainless steel corrugated pipe is used:
Solution for "1"



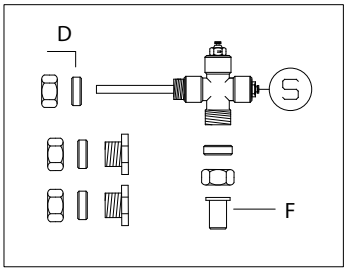
Solution for "2"



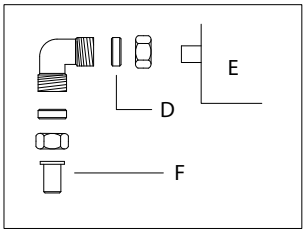
B Fitting
– male flat seat
– smooth pipe for ogive Cu ø
C Stainless steel corrugated pipe
D Ogive ø 18
E Solar panel
F Reinforcement bushing ø 18-22

If a copper pipe is used:

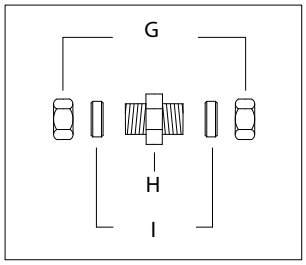
Solution for "1"



Solution for "2"

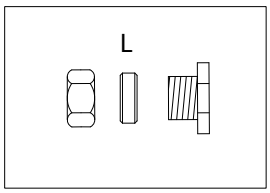


3 Intermediate fittings kit already installed on the panel



G Nut
H Nipple
I Ogive ø 18

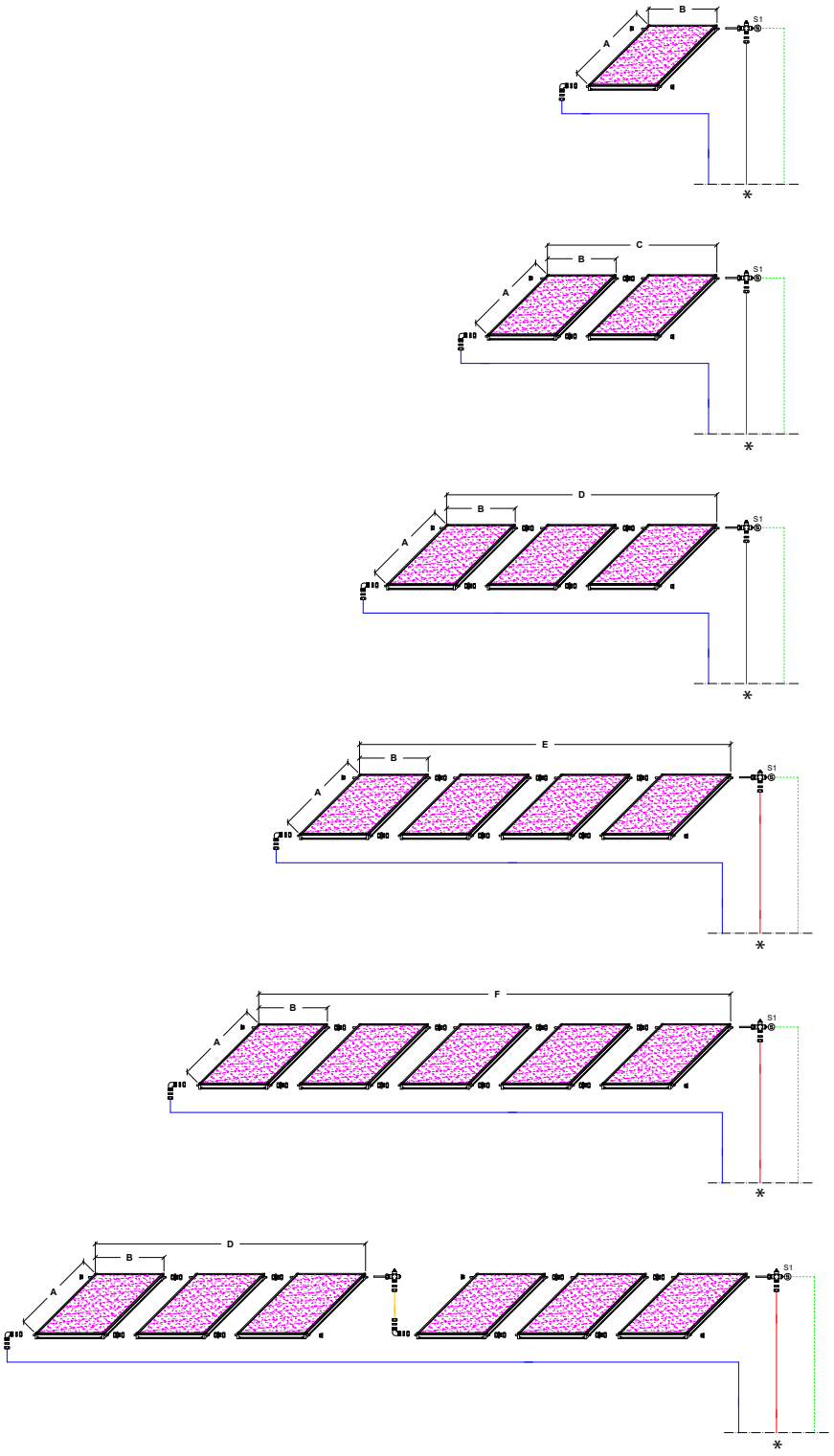
4 Cap



Solar collector fittings for F-L / F-XL

Dimensions

Model	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
F-L	1980	1010	2100	3190	4280	5370
F-XL	1930	1230	2540	3850	5160	6470



* To the central heating plant

5. Flat horizontal solar collector

FH Series

Description

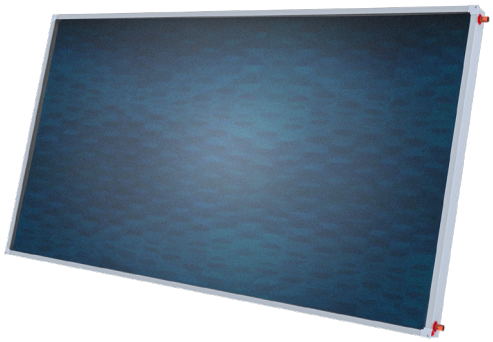
Flat collector with harp circuit available in sizes (XL), horizontal version.

Performance is ensured by the aluminium absorber with selective Titanium Oxide treatment (Sputtering) laser-welded on the shell and tube.

The insulation is 40 mm thick high-density rock wool.

The cover is made of 3.2 mm low iron tempered glass with a high resistance to hail and a prismatic surface finish for reduced reflection.

Grey aluminium profile casing.

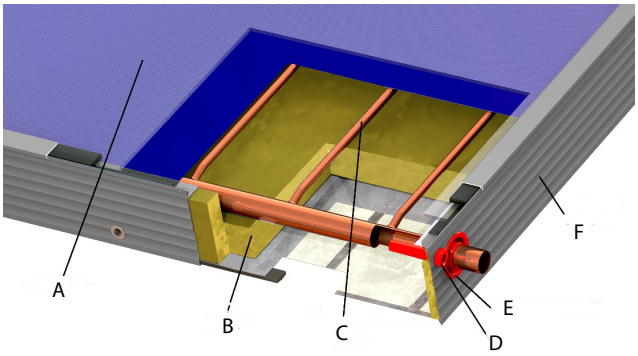


Harp collectors internally comprise a circuit of interconnected copper pipes, within which the heat transfer fluid flows to convey the energy to the required place of use.

This circuit consists respectively of 18 vertical pipes connected to 2 transverse copper pipes, the ends of which form the 4 connections for connecting to the outside of the collector.

The ensuing low pressure drop also makes it suitable for natural circulation.

The 4 connections allow easy connection of the collectors to the coil and to the water circuit.



A Solar glass
B Rock wool insulation
C Harp absorber
D Ventilation hole protection
E Soft gaskets
F Aluminium profile

Avantage

- **High development of thermal count 2.0**
- Collector with highly-selective absorber (sputtering)
- High efficiency all year round
- Powder-coated aluminium profile
- Low iron tempered prismatic glass
- En 12975 certification and Solar Keymark
- 5-year thermal warranty 2.0

Directions for use

Flat selective solar collector used in forced circulation when high output is required even in areas with low solar radiation.

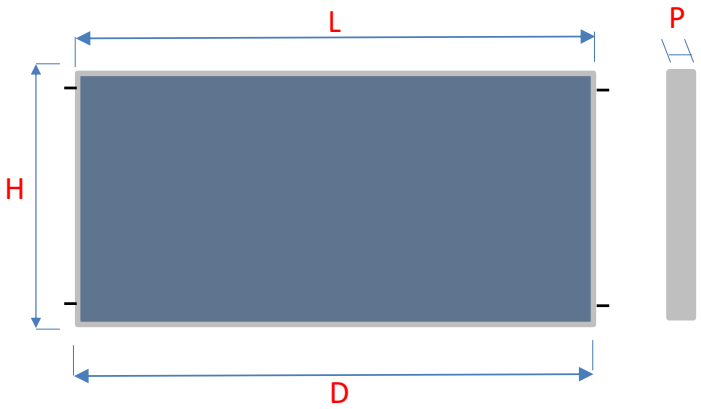
- Domestic hot water production and heating integration in residential, commercial and industrial environments
- Process heat production in industrial environments
- Indicated, in this horizontal version, when the height clearance must be limited

Harp collector technology

Model		FH-XL
Dimensions and weights		
Dimensions	(hxlxp) mm	1930x1230x86
Gross surface area	M^2	2,37
Absorbing surface area	M^2	2,23
Unladen weight	Kg	43
Fluid content	Litres	2.16
Technical specifications		
Casing profile		Powder-coated aluminium
Type of absorber		Arpa
No. Of rises		18
Diameter of the rises	mm	8
Absorber material		0.4 mm aluminium
Selective treatment		Titanium oxide (α = 95%, ε = 4%)
Absorbing factor	%	≥ 95
Emission factor	%	≤ 4
Connections		4 connections, copper ø 22
Thermal insulation		40 mm mineral wool
Maximum operating pressure	bar	10
Recommended flow-rate	l/min m^2	2-2,27
Technical specifications [values referring to the gross surface area, en iso 9806:2013]		
Optical performance H_0	%	76,1
Thermal loss a_1	W/m^2 K	3,6
Thermal loss a_2	W/m^2 K^2	0,014
Iam angular correction factor (K_θ at 50°)		0,96
Stagnation temperature	°C	190
Peak capacity	W	1.804
Qcol value	kWh_t	1.157
Certifications		UNI EN 12975-KEYMARK

Dimensions and overall dimensions

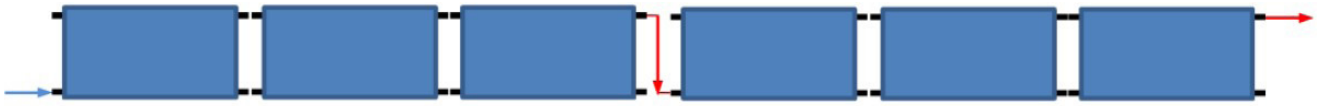
Model	L [mm]	H [mm]	P [mm]	D [mm]
FH-XL	1930	1230	86	1990



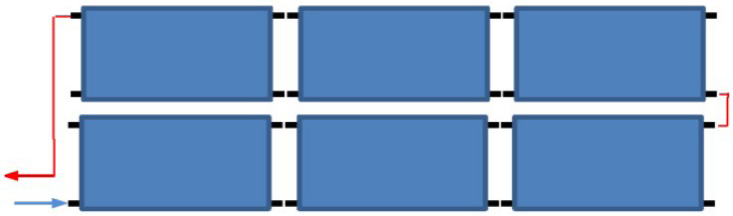
5.1 Collection examples

Connection in parallel max 3 units

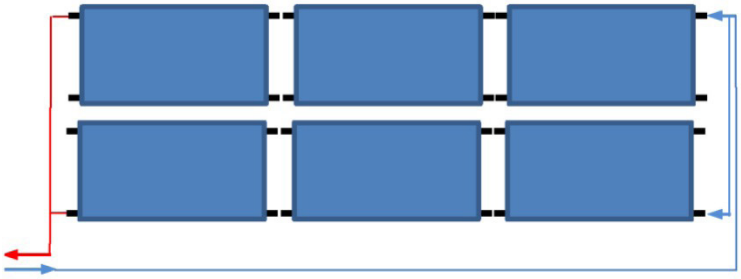
Connection in series/parallel



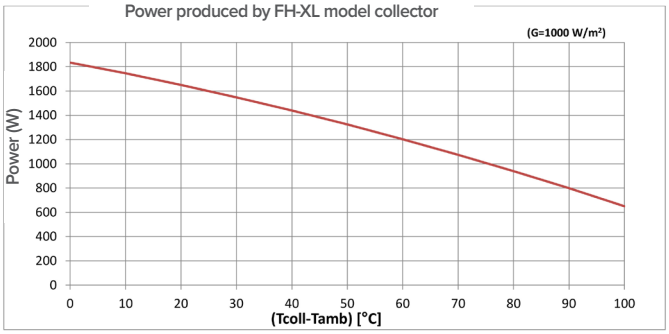
Connection in series/parallel



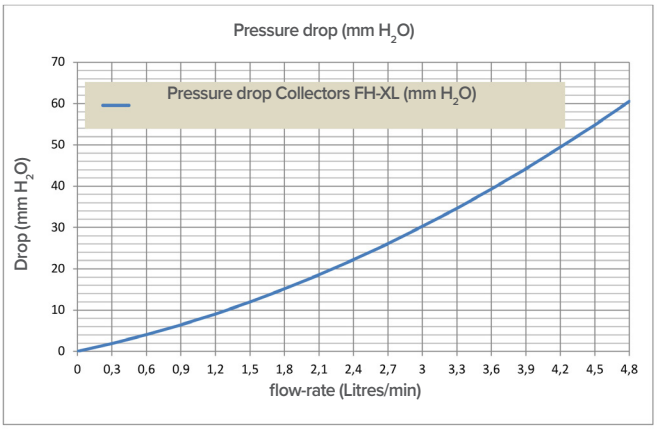
Connection in parallel on multiple rows



Performance curves



Pressure drops (water T=20 °C)



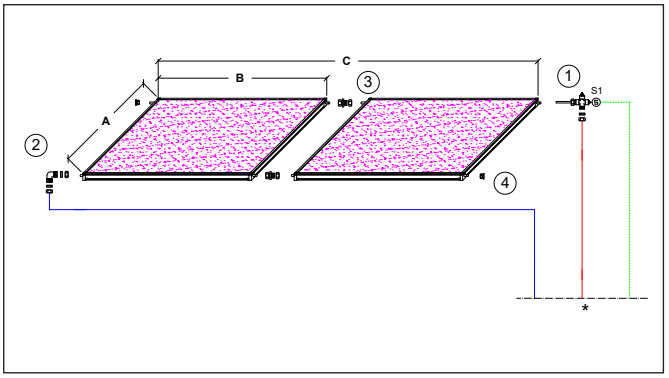
Collectors

Series name	Model
ELFOSun³ FH-XL	F-XL model

Connections kit

Description	
Fittings kit for intermediate connection	

5.2 Solar collector fittings for FH-XL

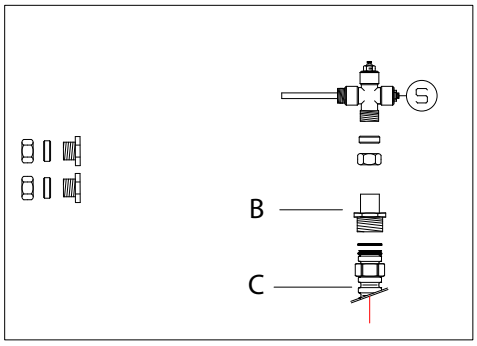


* To the central heating plant

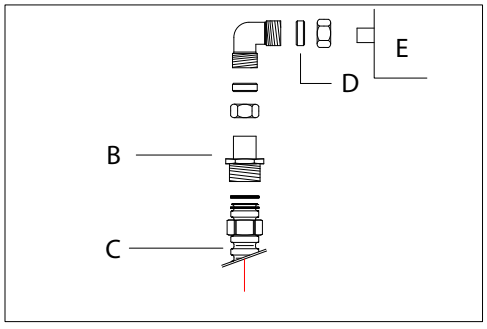
Model	A [mm]	B [mm]	C [mm]	D [mm]
FH-XL	1230	1930	3930	5930

If a stainless steel corrugated pipe is used:

Solution for "1"



Solution for "2"



B Fitting
– male flat seat
– smooth pipe for ogive Cu ø

C Stainless steel corrugated pipe

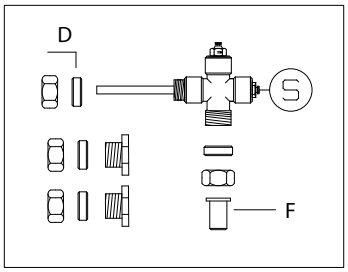
D Ogive ø 18

E Solar panel

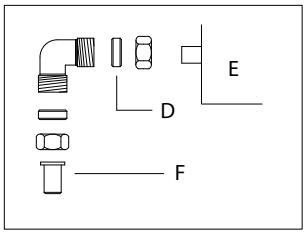
F Reinforcement bushing ø 18-22

If a copper pipe is used:

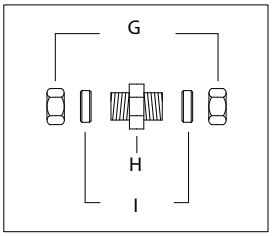
Solution for "1"



Solution for "2"



3 Intermediate fittings kit already installed on the panel

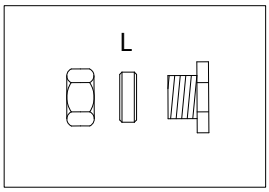


G Nut

H Nipple

I Ogive ø 18

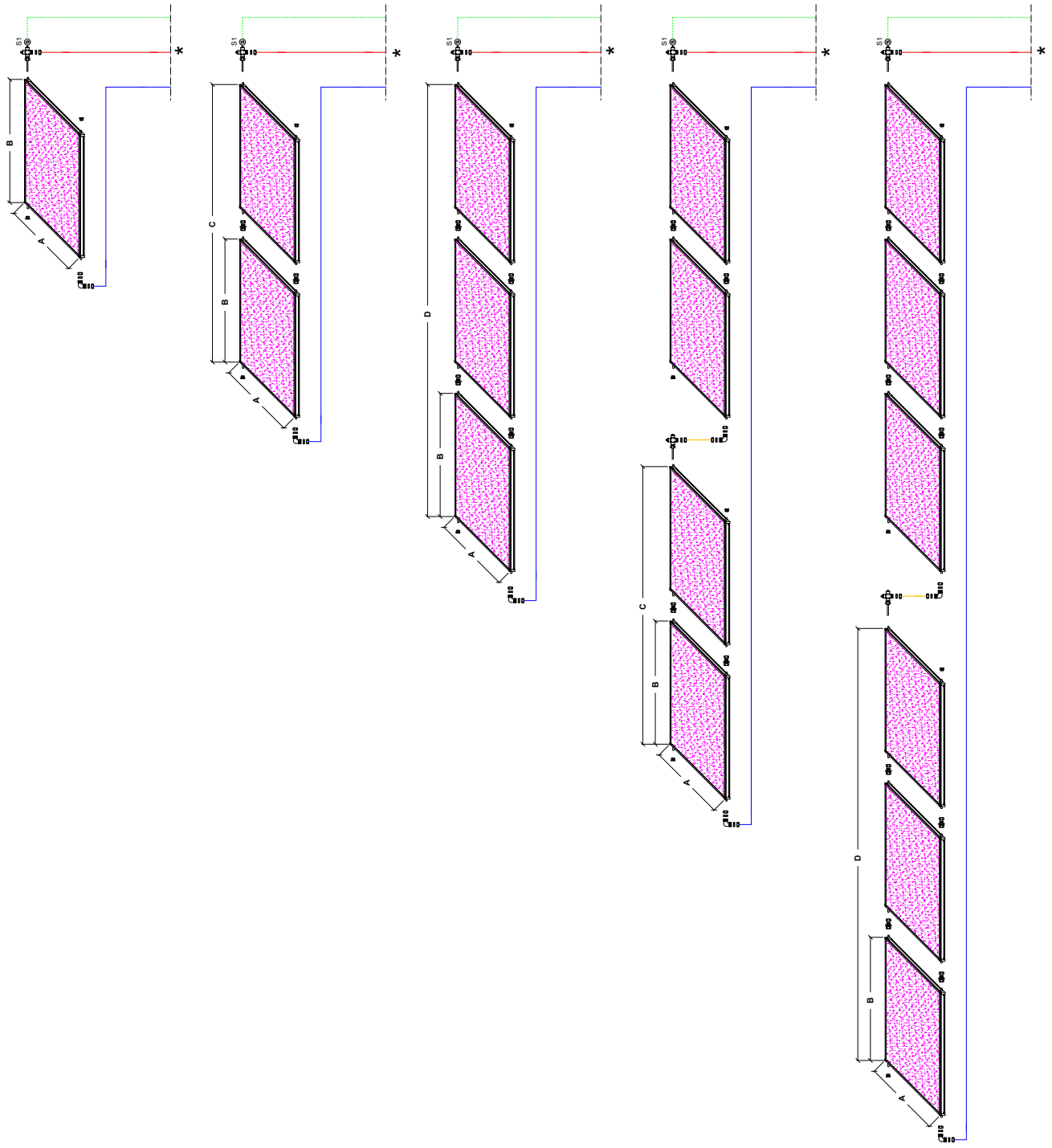
4 Cap



Solar collector fittings for FH-XL

Dimensions

Model	A [mm]	B [mm]	C [mm]	D [mm]
FH-XL	1230	1930	3930	5930

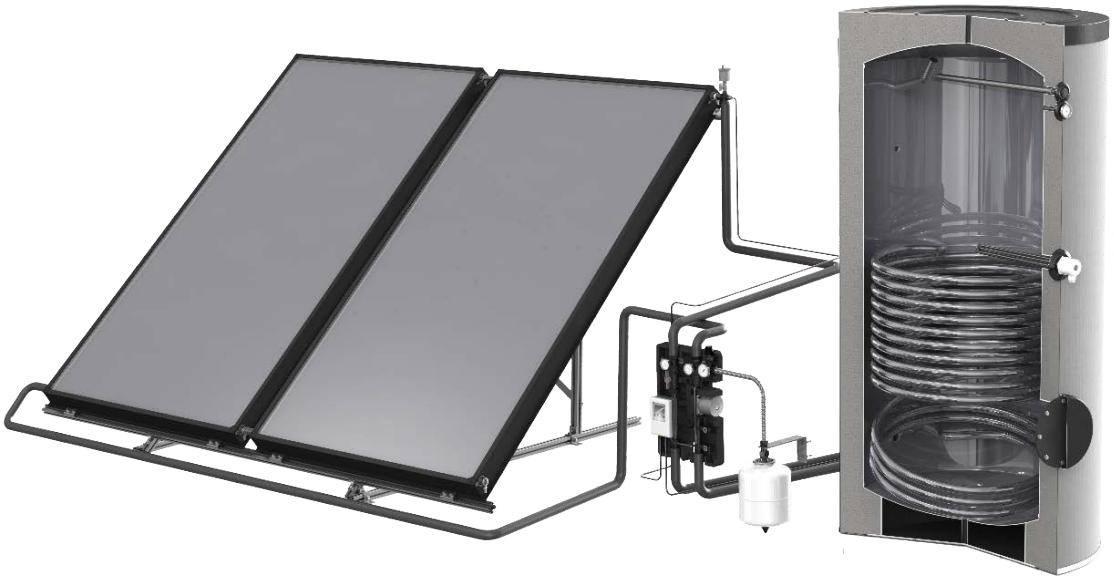


* To the central heating plant

6. Assembly guide

Universal collector mounts for forced circulation systems

Valid for F-L, F-XL and FH-XL collectors



6.1 Validity

This chapter describes how to assemble and install the galvanised steel supporting structures used to hold the 2.00 / 2.37 / 2.72 m². collectors. The brackets described below can be used either for mounting on a horizontal surface with a 45° inclination or for mounting on a sloping surface.

6.2 Safety standards

⚠ **Failure to comply with the safety instructions can cause serious injury, risk and even death to people, as well as material and environmental damage.**

⚠ **This section explains how these assembly and maintenance instructions are organised and provides general safety precautions to ensure safe and efficient use. Specific operating and safety instructions are given in the assembly drawings.**

⚠ **Read the safety instructions before starting assembly.**

⚠ **The various assembly sets must be used for the specific purposes for which they are intended.**

⚠ **Improper use of the various components will not guarantee the minimum safety requirements.**

⚠ **Check with the building's builder that the roof can withstand the weight of the water-filled collectors and ask for written confirmation. Check this with the technical authorities as well, if necessary.**

⚠ **The roof structure must be able to withstand wind and snow loads (Note: 1 m² of powder snow ≈ 60 kg / 1 m² wet snow ≈ 200 kg). Local conditions for snow and wind loads must be taken into account. Please contact your local dealer for further information.**

⚠ When using ladders, ensure they are not damaged and stand them on safe surfaces with an inclination ≈ 70°. For maximum protection of the installer, it is advisable to use safety belts.

⚠ The installer is advised to wear protective gloves, safety shoes and hard hat. Furthermore, safety glasses are required in some cases.

⚠ If the installation site is close to electrical cables, keep a safe distance (minimum 5 metres) and take extreme care when handling long supporting structure parts or installation tools.

Important safety instructions	
	Wear the right shoes to avoid slipping on the roof
	Pay attention to unprotected electrical cables on the roof and mains power cables that are close to the roof
	Use all the necessary safety equipment and follow the regulations.
	Always wear a hard hat.
	Wear protective gloves during installation.
	Be careful near the edges of the roof to avoid the risk of falling.
	Use fall arrest equipment.
	Always wear safety glasses.

6.3 Installation standards

⚠ Failure to comply with the installation regulations can cause serious injury, risk and even death to people, as well as material and environmental damage.

⚠ Our collectors are tested in compliance with EN 12975-2. According to the mechanical load tests in EN 12975-2, our collectors withstood the maximum pressure charge of 1000Pa. The collectors can withstand a snow load of up to 500 Pa without failure. These collector systems may only be installed in locations with a possible snow load of less than 1000 Pa.

⚠ Based on the characteristics of their support frame and ENV 1991, these support systems cannot be installed in locations where the maximum average wind speed exceeds 55 m/s (value for islands exposed to high winds).

⚠ Before installing the solar water heater, it is extremely important for the customer and installer to agree on all details regarding the correct and safe installation of the device, such as the location, positioning point, static resistance and control of the surface on which the device will be placed, pipes and wiring, etc.

⚠ The location chosen for installation of the solar water heater must not be shaded by any obstacles (trees, buildings, etc.) throughout all seasons of the year.

⚠ Installation must be carried out according to the electrical and plumbing regulations applicable in your area.

⚠ The roof surface, where the installation will take place, must be normal and flat for the correct operation and safe installation of the solar system.

⚠ The static resistance of the roof must be adequate to ensure stability and safe installation of the solar system.

⚠ To avoid problems of humidity or water infiltration on the roof, pipes entering the roof must be sealed properly. Pipes should enter the building through ventilation devices. The building engineer should provide precise guidelines based on the type of roof construction.

⚠ All connecting pipes must be very well insulated to prevent freezing or destruction caused by UV rays. The correct insulation material must be chosen according to the local weather conditions. Contact your local dealer for further information.

⚠ The solar collectors should be as close as possible to the hot water tank.

⚠ The collector's installation area should have easy and safe access for maintenance purposes.

⚠ When installing our system on a flat roof, we suggest that you do not screw it directly onto the roof to avoid possible water infiltrations or damage to the roof insulation. It must be screwed onto concrete slabs. If concrete slabs cannot be used, all fixing points of the supporting structure on the roof must be perfectly sealed with suitable sealing materials (silicones, polyurethane sealants or other). If concrete slabs are used, they must be laid on the roof, under the support frame. The plate thickness should be at least 10 cm. The complete weight of the whole solar system with the plates (if existing) should be:

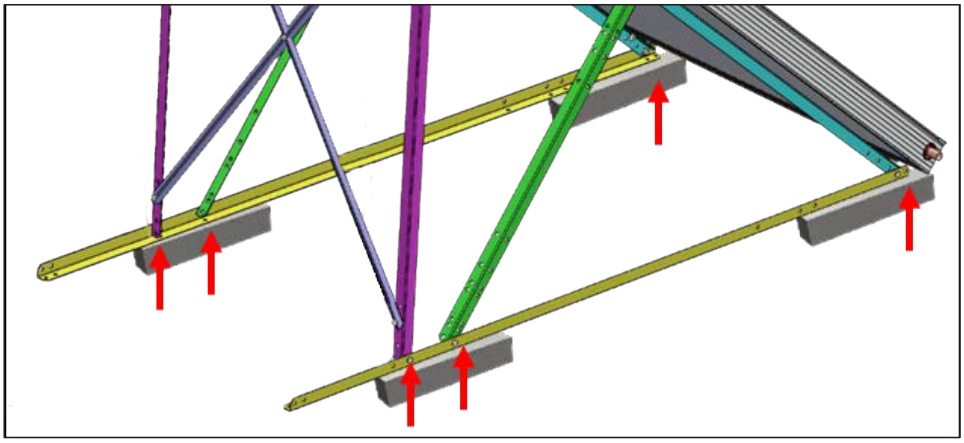
290 kg per m² of collectors for an installation height of up to 20 m and a maximum average wind speed of 43 m/sec.

490 kg per m² of collectors for an installation height of up to 20 m and a maximum average wind speed of 55 m/sec.

IMPORTANT NOTICE

- According to ENV 1991, these values apply under the following conditions:
- The system must be installed on a roof covering a closed volume.
- The roof area must be at least 5 m2.
- The system must not be installed on the extreme sides of the roof.
- A static calculation of the roof must be carried out by a civil engineer to ensure that the roof can withstand the aforementioned loads.

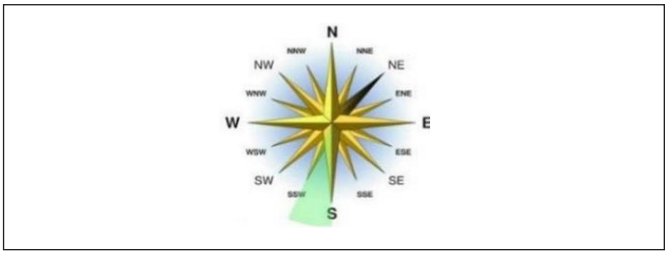
The 2 yellow horizontal beams must be mounted in full contact on a rigid horizontal plane and anchored preferably at the points indicated by the red arrows, or if mounting on slabs is required, these plates must be in full contact with the yellow horizontal beams or they must be positioned at the points shown in the figure on the left and anchored only at the points shown with the red arrows.



7. Orientation and spacing

7.1 Orientation of collectors

For the Northern Hemisphere, the ideal orientation is the geographic south. In many cases, especially for the production of domestic hot water, orientation is often preferred facing south-south-west (green band), as the energy is more useful for peak loads during the day. Outside this range, efficiency would decrease accordingly and significantly. In the event of 2 fields, the preferred arrangement is one field facing east and the other facing west. Moving closer to the equator, it seems best to face west-south-west and for the Southern Hemisphere, starting from the equator, face west-north-west and then north.

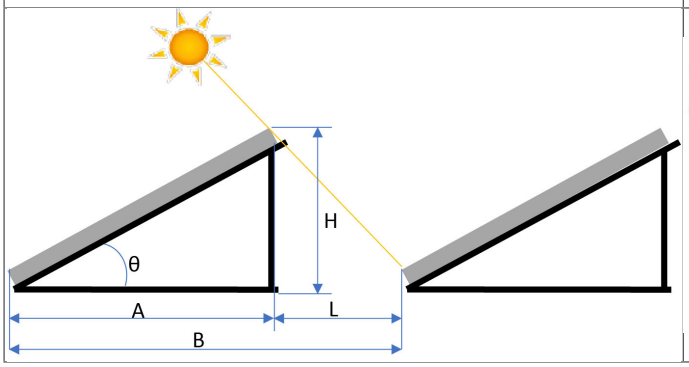
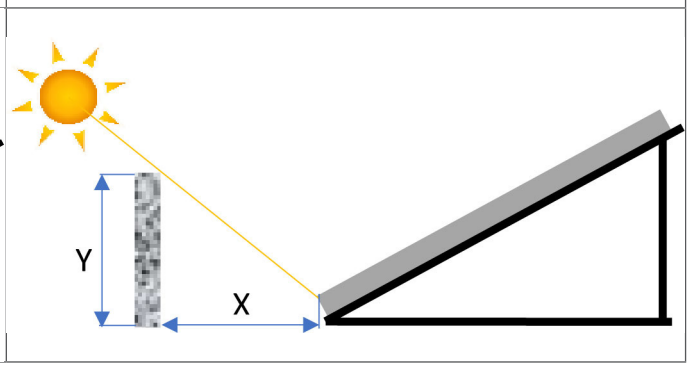


7.2 Shading of collectors

Reciprocal shading between collectors and shading of obstacles must be avoided. For 28° -35° -45° inclination (standard inclinations of the mounts provided) of the collector, read the following tables. 2 different options are shown, i) the minimum space (Lmin) between 2 rows of collectors to obtain at least 4 hours of unshaded exposure and ii) the optimal space (Lopt) between 2 rows of collectors to obtain minimal shading throughout the year with a total field loss of less than 5%. A similar approach to the shading of obstacles is also shown.

Minimum and optimised row spacing for multi-row collection fields

		Col.	L_{min} [m]	L_{opt} [m]			Col.	L_{min} [m]	L_{opt} [m]			Col.	L_{min} [m]	L_{opt} [m]
Mount inclination 28°	Latitude 25°-35°	F-L	1.40	1.65	Mount inclination 35°	Latitude 25°-35°	F-L	1.70	2.00	Mount inclination 45°	Latitude 25°-35°	F-L	2.10	2.65
		F-XL	1.35	1.60			F-XL	1.65	1.95			F-XL	2.05	2.60
		FH-XL	0.85	1.05			FH-XL	1.05	1.30			FH-XL	1.30	1.70
	Latitude 36°-45°	F-L	1.85	2.15		Latitude 36°-45°	F-L	2.25	2.70		Latitude 36°-45°	F-L	2.80	3.50
		F-XL	1.80	2.10			F-XL	2.20	2.65			F-XL	2.75	3.45
		FH-XL	1.15	1.45			FH-XL	1.40	1.70			FH-XL	1.75	2.25
	Latitude 46°-50°	F-L	2.10	-		Latitude 46°-50°	F-L	2.80	-		Latitude 46°-50°	F-L	3.50	5.05
		F-XL	2.05	-			F-XL	2.75	-			F-XL	3.40	5.00
		FH-XL	1.30	-			FH-XL	1.75	-			FH-XL	2.15	3.20

Reciprocal shading	Shading from an obstacle
	

θ Mount inclination (°)

L Minimum/optimal spacing (m)

A Projection of the collector over the horizontal plane (m)

H Collector height (m)

B Minimum row spacing (m)

Minimum spacing

Lat. 25°-35° : X ≥ 1.50Y

Lat. 36°-45° : X ≥ 2.00Y

Lat. 46-°50° : X ≥ 2.50Y

Optimal spacing

Lat. 25°-35° : X= 1.75Y

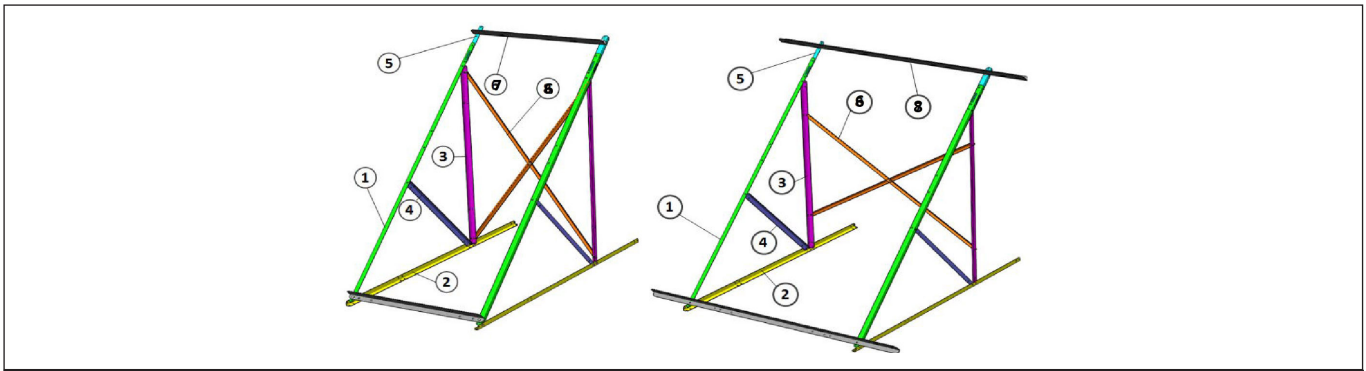
Lat. 36°-45° : X= 2.30Y

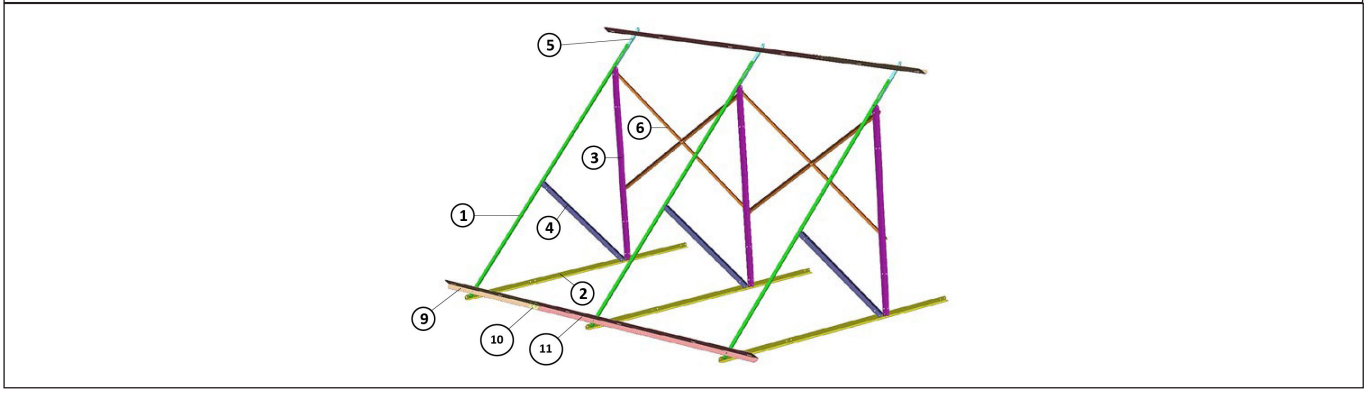
Lat. 46-°50° : X= 3.60Y

Usable dimensions			
	Col.	A (m)	H (m)
Mount inclination 28°	F-L	1.75	0.93
	F-XL	1.70	0.91
	FH-XL	1.09	0.58
Mount inclination 35°	F-L	1.62	1.14
	F-XL	1.58	1.11
	FH-XL	1.01	0.71
Mount inclination 45°	F-L	1.40	1.40
	F-XL	1.36	1.36
	FH-XL	0.87	0.87

8. Flat roof assembly

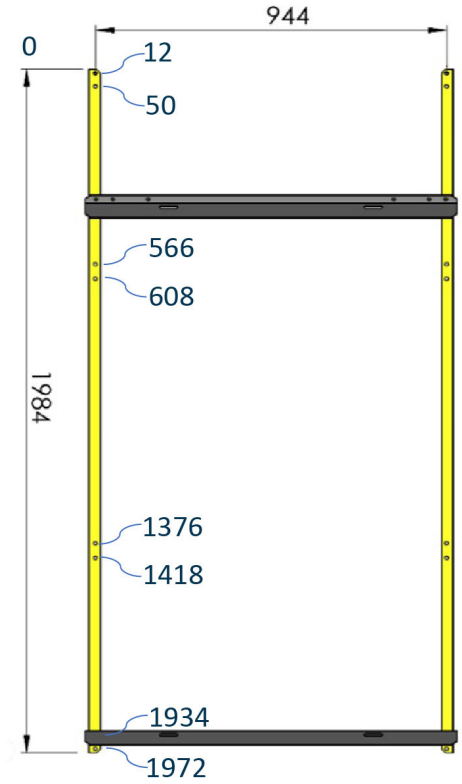
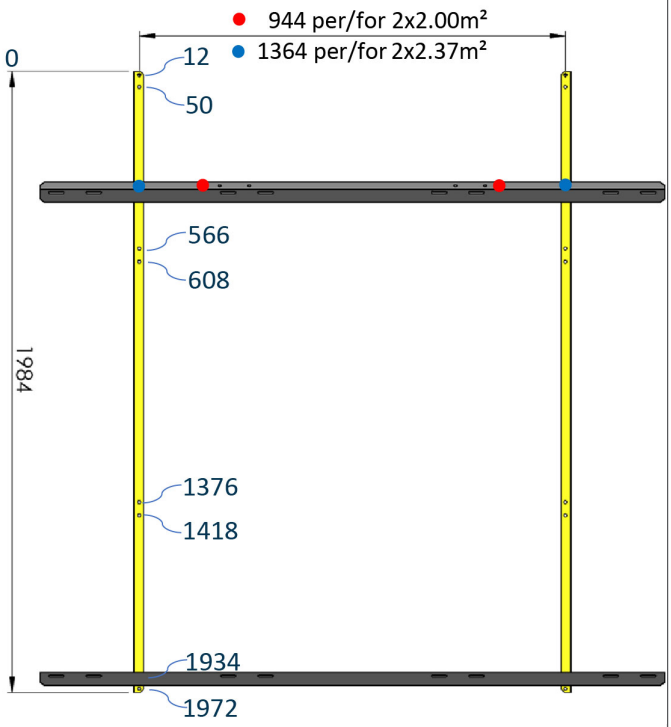
8.1 Flat roof 45° inclination





Parts			
a/a	Description	1x 2.00-2.37	2x 2.00-2.37
1	2140mm L-shaped bar profile	2	2
2	1984mm L-shaped bar profile	2	2
3	1380mm L-shaped bar profile	2	2
4	960mm L-shaped bar profile	2	2
5	325mm L-shaped bar profile	0	0
6	1620mm crossbars	2	2
7	1000mm L-shaped bar profile	2	0
8	2000mm L-shaped bar profile	0	2
9a	960mm split L-shaped bar profile	0	0
9b	1000mm split L-shaped bar profile	0	0
9c	1015mm split L-shaped bar profile	0	0
10	100mm L-shaped bar profile	0	0
11a	2000mm split L-shaped bar profile	0	0
11b	2300mm split L-shaped bar profile	0	0
11c	2345mm split L-shaped bar profile	0	0
12	DIN933 M8x20 bolts	23	27
13	DIN933 M8x30 bolts	0	0
14	DIN6923 8mm nuts	19	19
15	DIN9021 8.5mm washers	4	8
16	DIN574 8x60mm anchor bolts	4	4
17	10x60mm plastic anchors	4	4

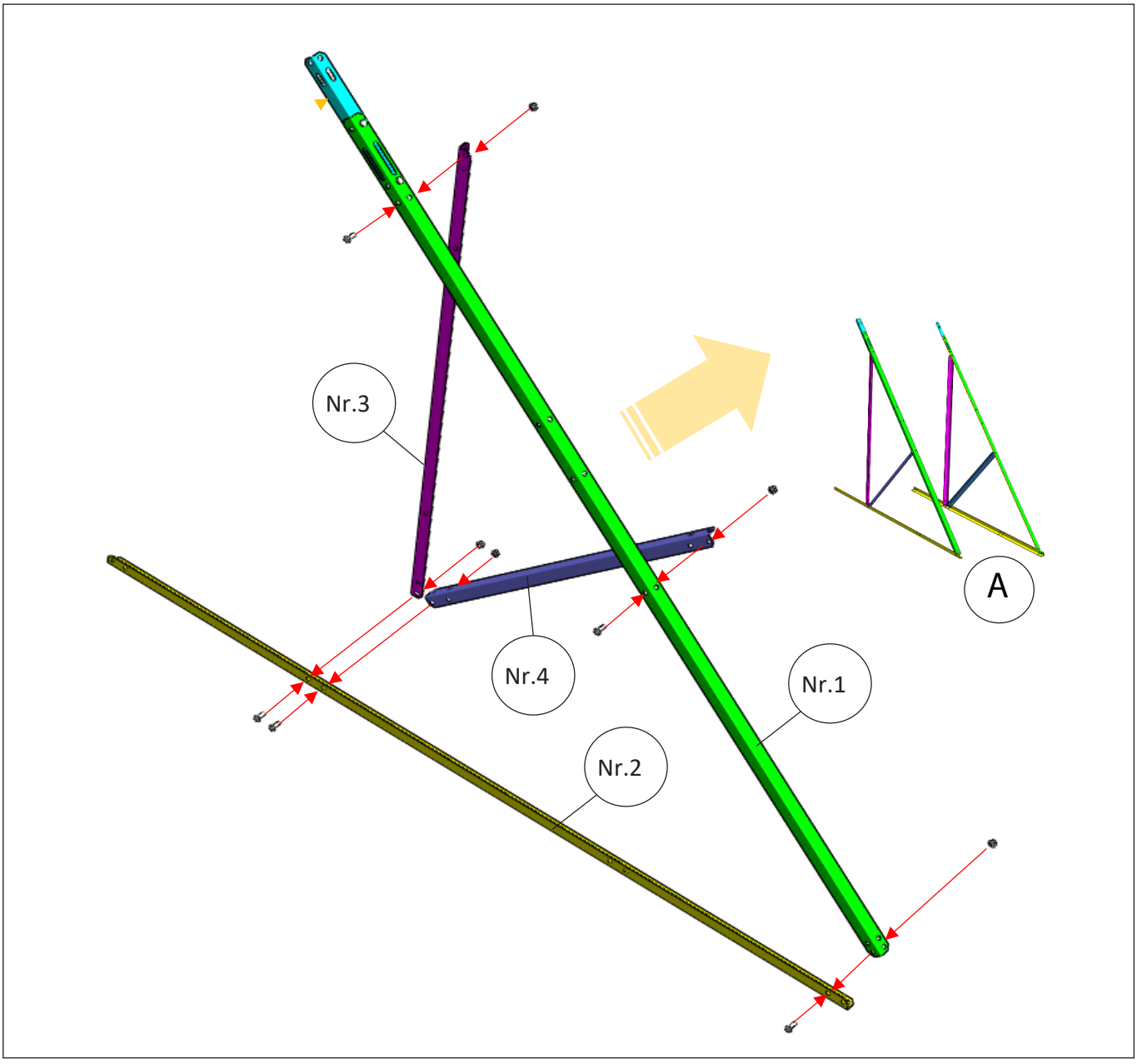
8.2 Important dimensions of beams No.2

1x collector View from above View from above	2x collector View from above View from above
	

8.3 Mount assembly

8.3.1 PHASE A: Support frame

Valid for all configurations



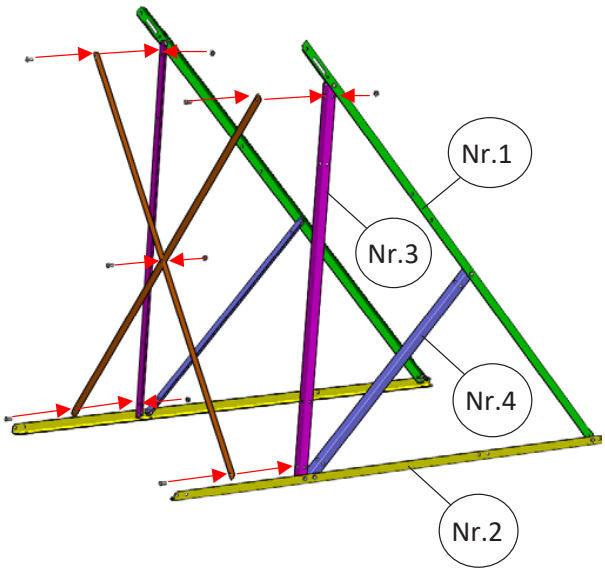
A 2 support frames for 1 or 2 collectors

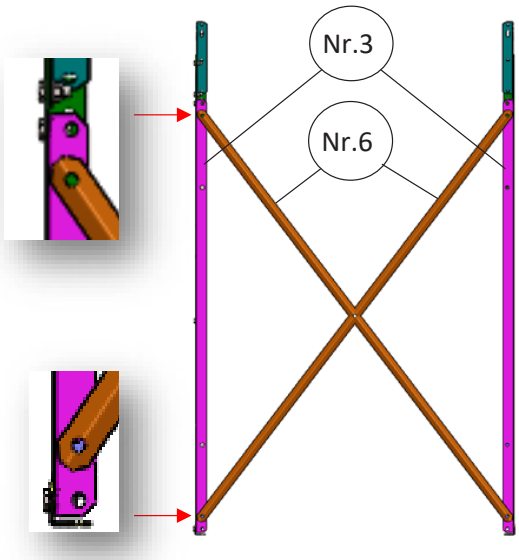
For all connections described under point B, use bolts No.12 (M8x20) and relative flanged nuts No.14 (8mm).
The beams in phase A are:
Nr.1: 2140mm
Nr.2: 1984mm
Nr.3: 1384mm
Nr.4: 960mm

Assemble 2 side frames for 1 or 2 collectors

8.3.2 PHASE B: Crossbars

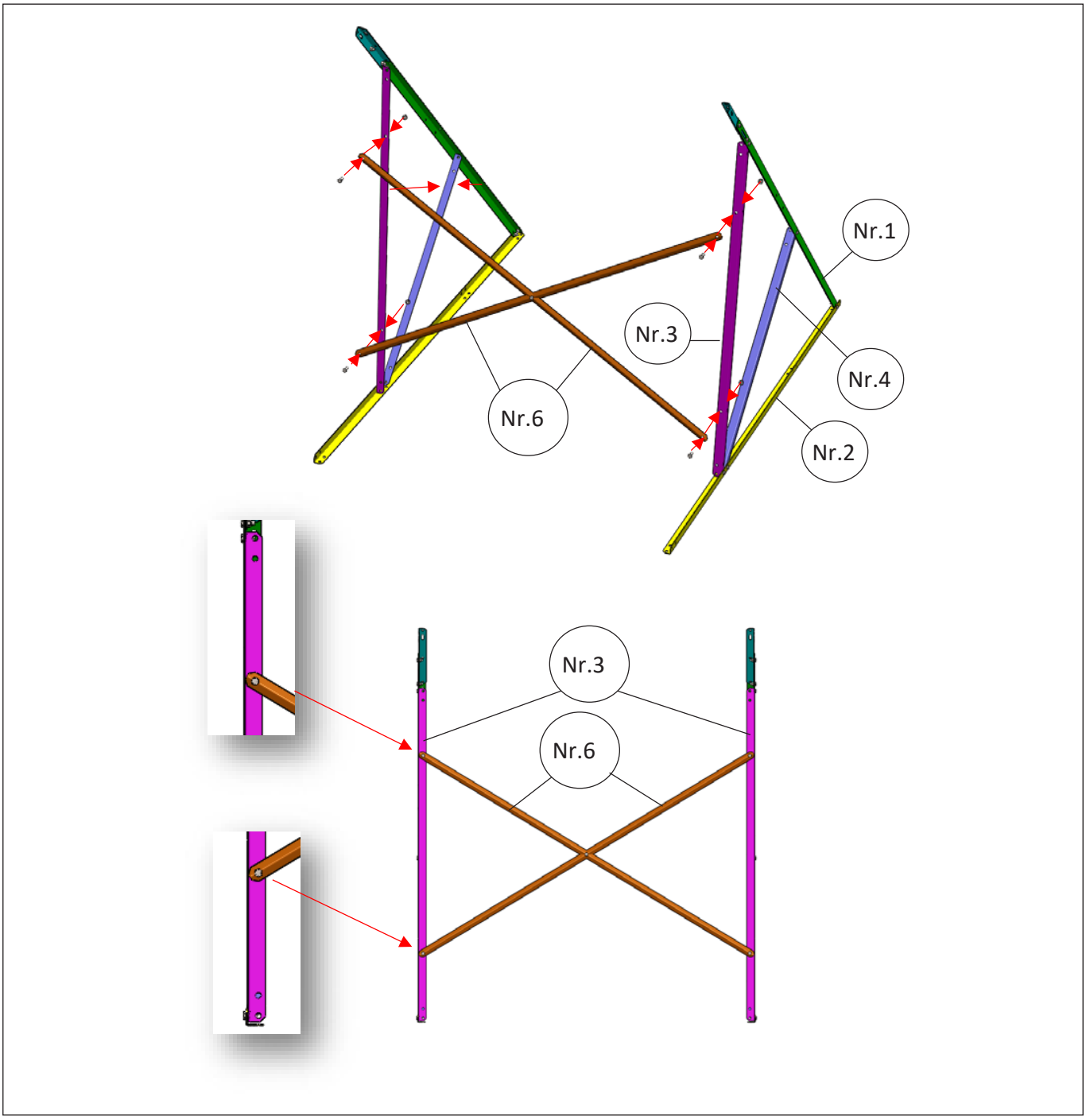
Valid for 1x collector or 2x2.00m² collectors





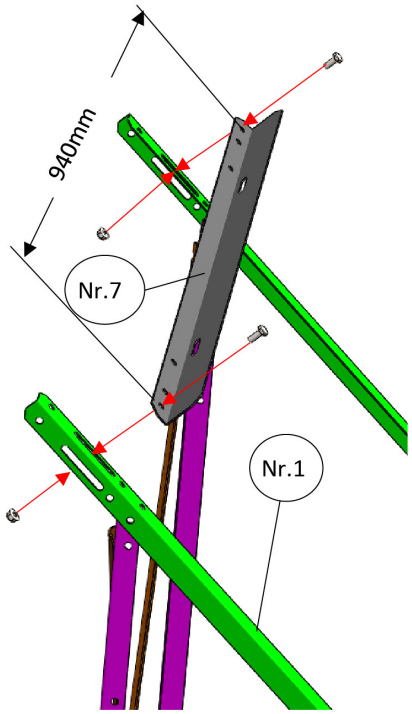
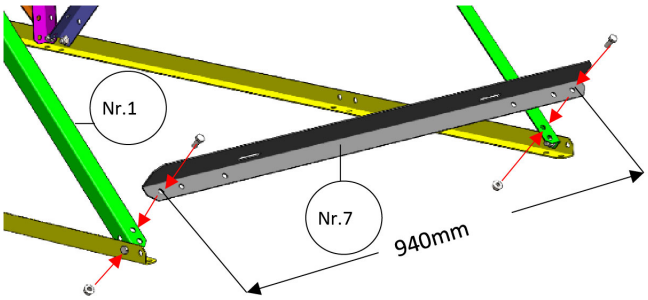
For all connections described under point B, use bolts No.12 (M8x20) and relative flanged nuts No.14 (8mm).
The beams are:
Nr.1: 2140mm
Nr.2: 1984mm
Nr.3: 1384mm
Nr.4: 960mm
Nr.6: 1620mm

Valid for 2x2.37m² collectors



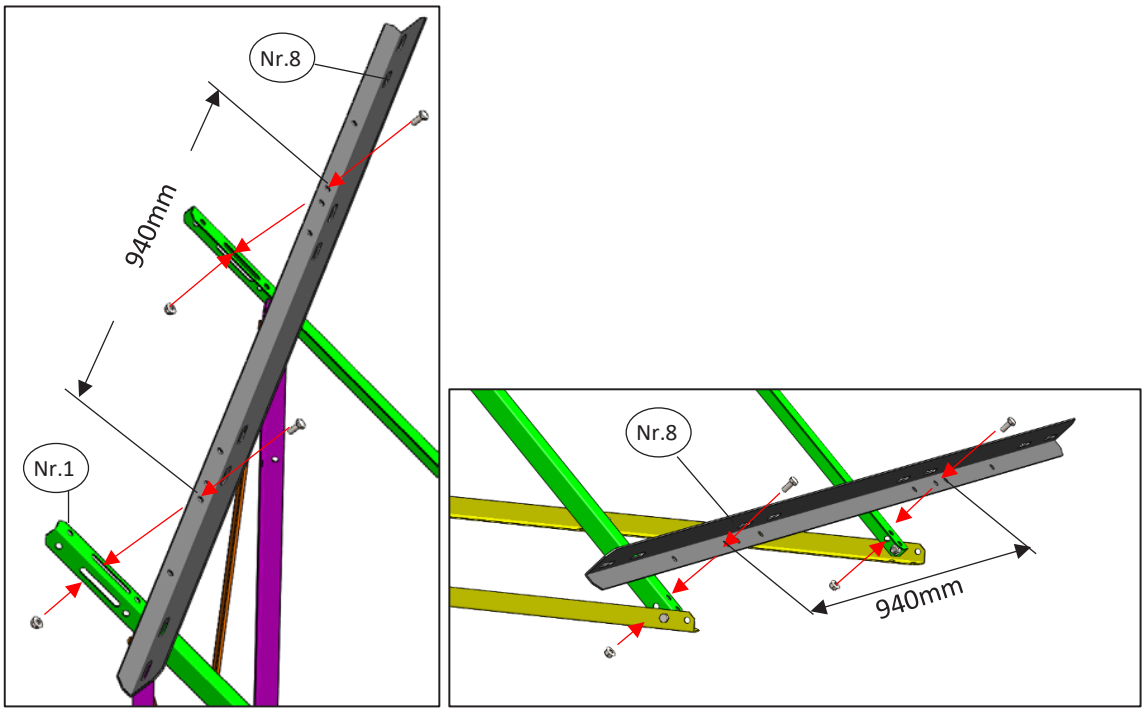
For all connections described under point B, use bolts No.12 (M8x20) and relative flanged nuts No.14 (8mm).
The beams are:
Nr.1: 2140mm
Nr.2: 1984mm
Nr.3: 1384mm
Nr.4: 960mm
Nr.6: 1620mm

8.3.3 PHASE C: Attaching the collector beams

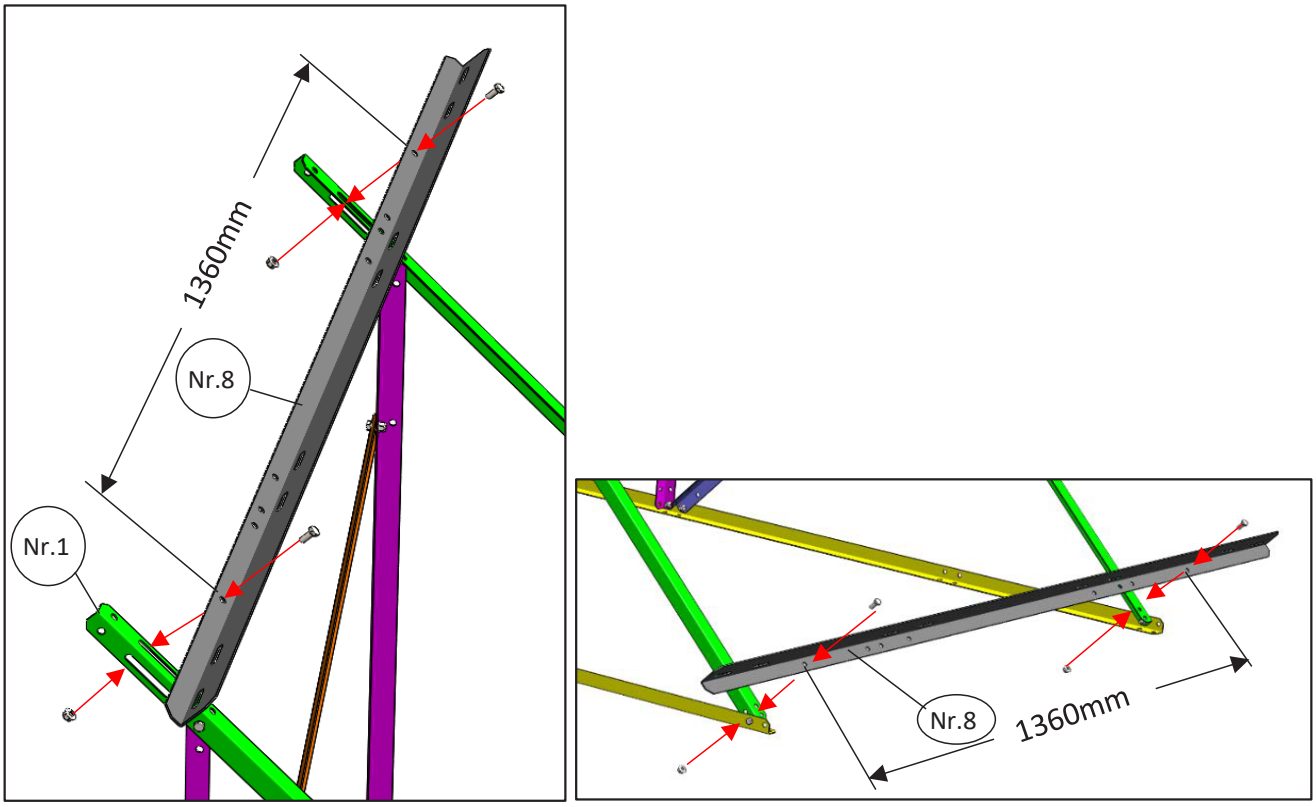
Valid for 1X2.00/2.37m²	Valid for 1X collector
	

For all connections described under point E, use bolts Nr.12 (M8x20) and relative flanged nuts

Valid for 2x2.00m² collectors



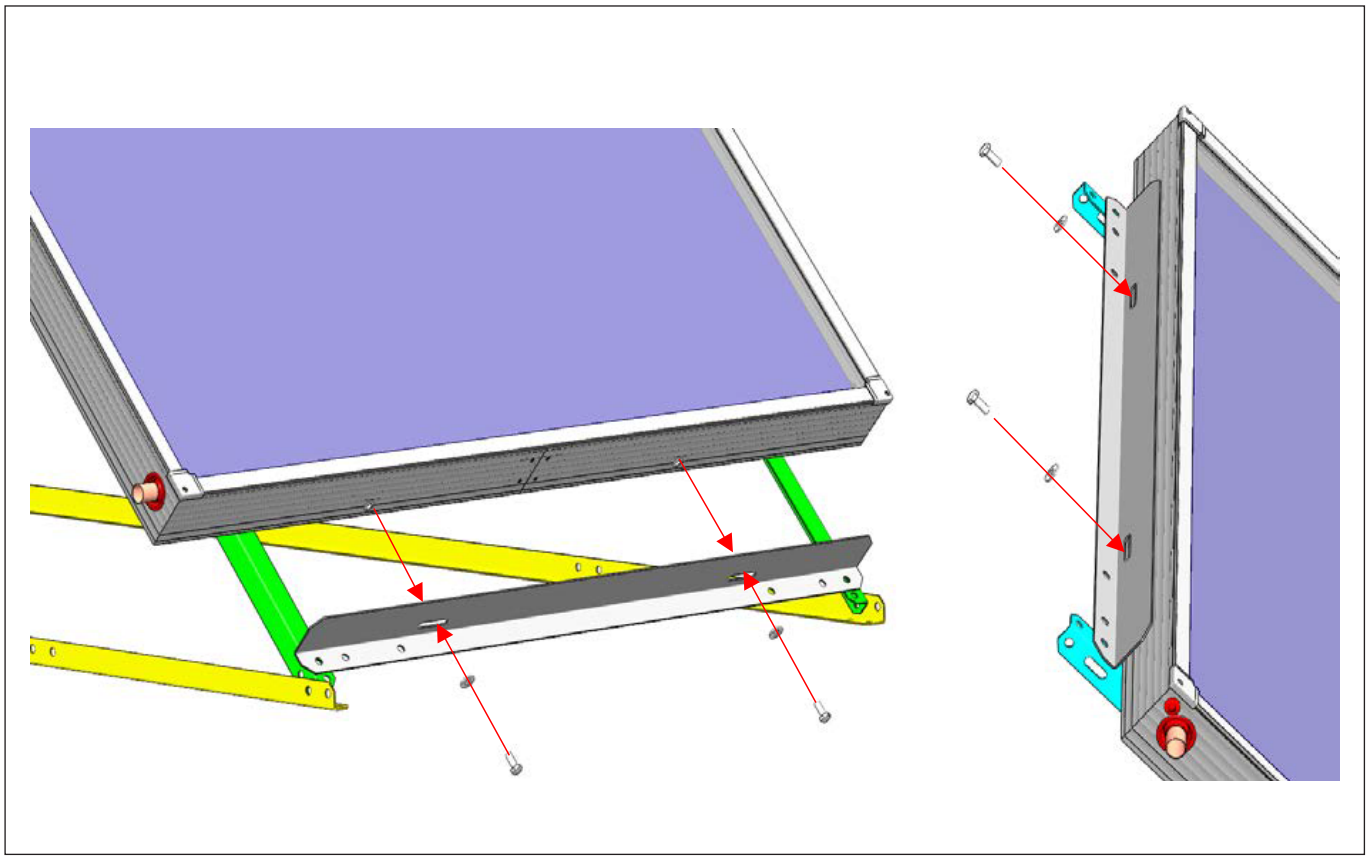
Valid for 2x2.37m^2 collectors



For all connections described under phase E, use bolts Nr.12 (M8x20) and relative flanged nuts.

8.3.4 PHASE D: connecting the collectors

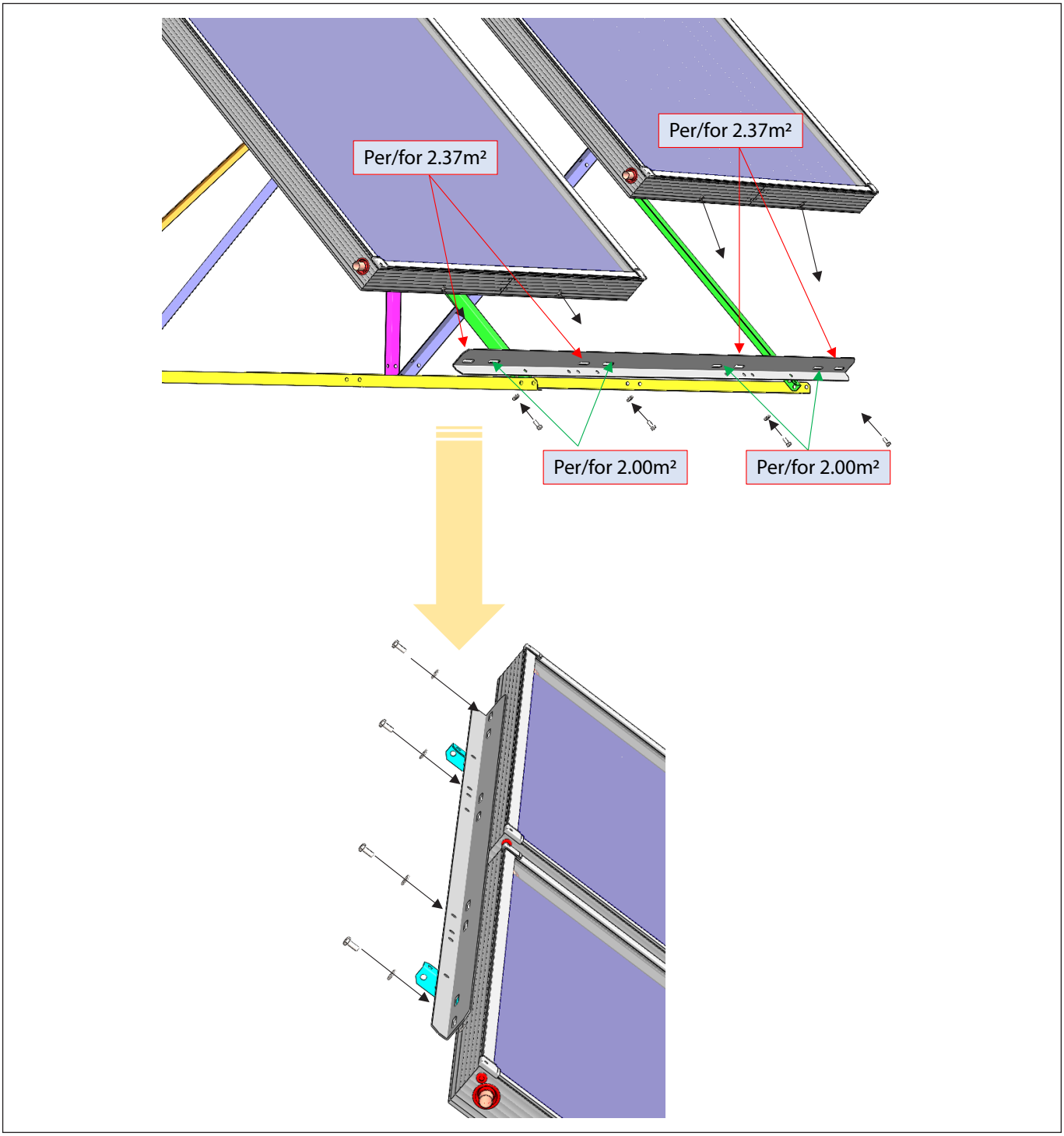
Valid for 1X collector



Connect the bottom part and then adjust the top part no. 7 and tighten all 4 M8 bolts and washers with the rivets on the collector.

Similar procedure for all sizes.

Valid for 2x collectors



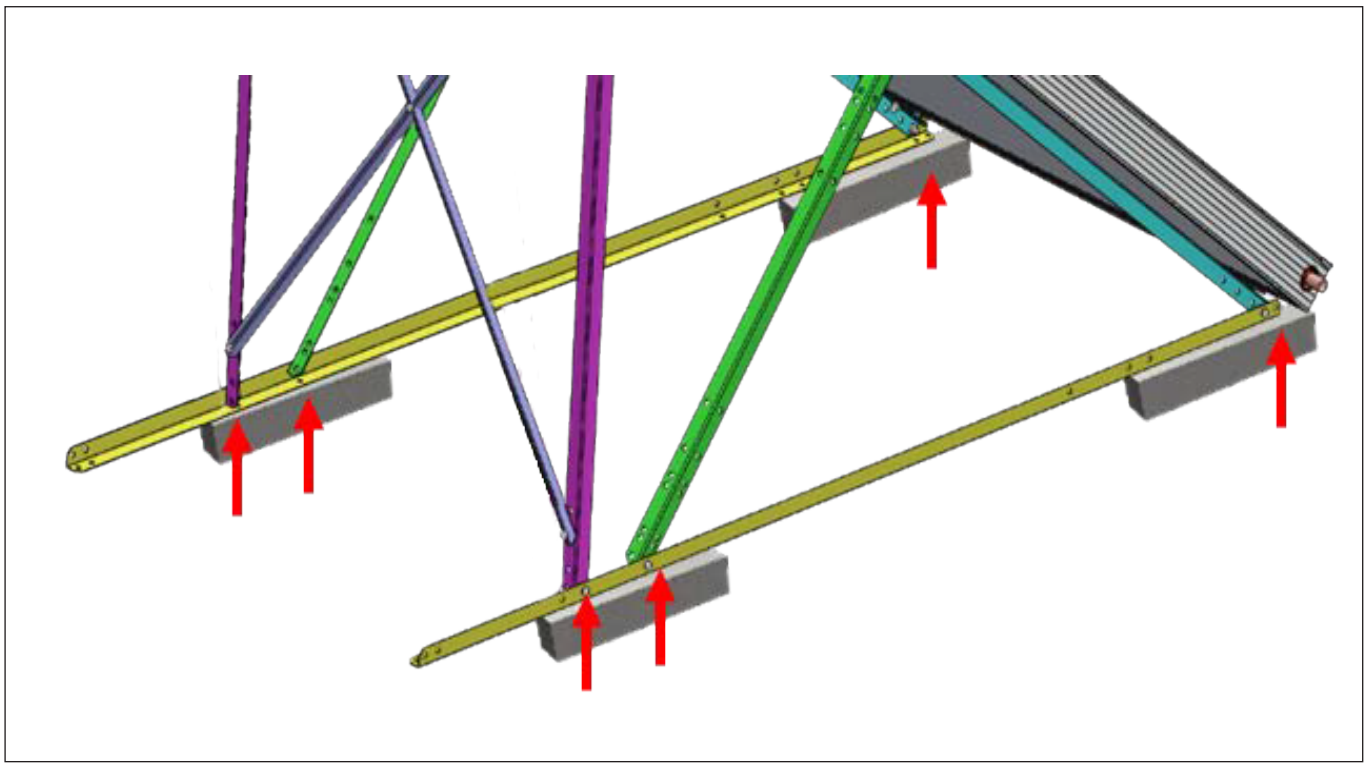
First position the left collector.

Connect the bottom collector support frame no. 7 to the collector with the M8 rivets, using two M8x20 bolts and washers, but do not tighten them yet.

Now connect the right collector as described above, after inserting the hydraulic fittings, but do not tighten them yet.

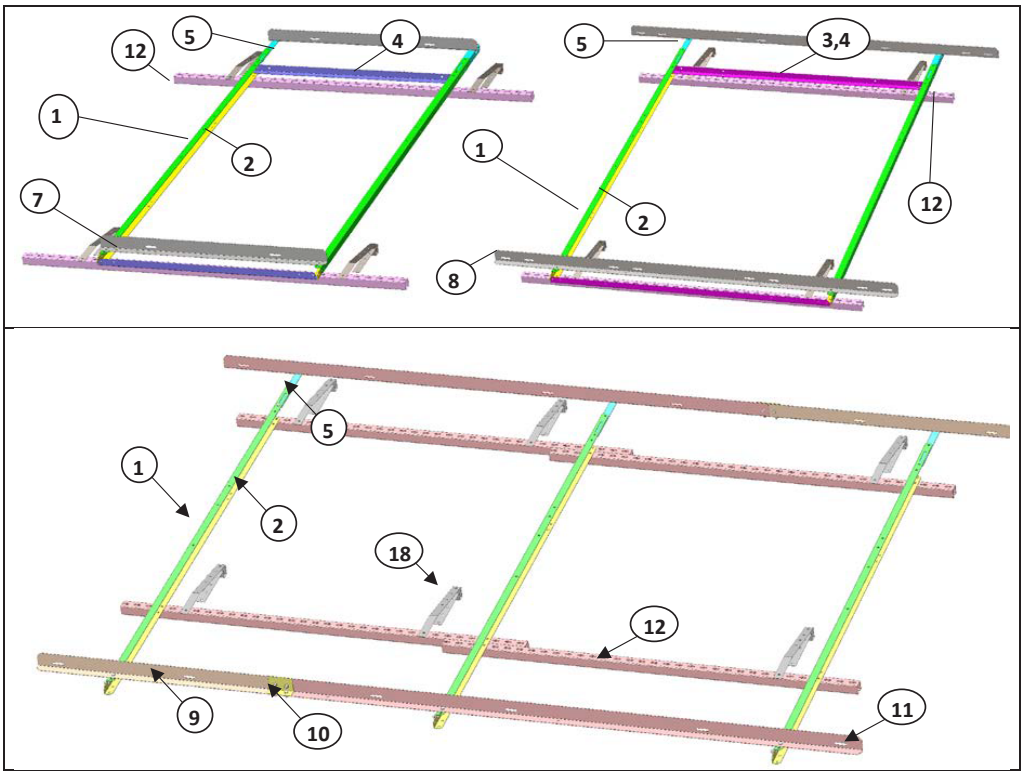
Then move the top bracket no. 7 on to the collector and tighten in the same way.

8.3.5 FASE E: Installing the mount



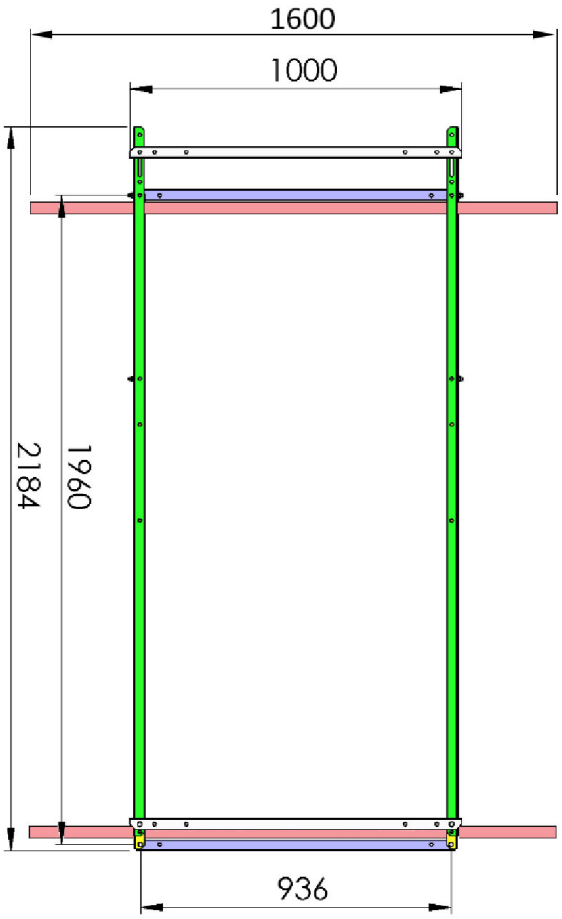
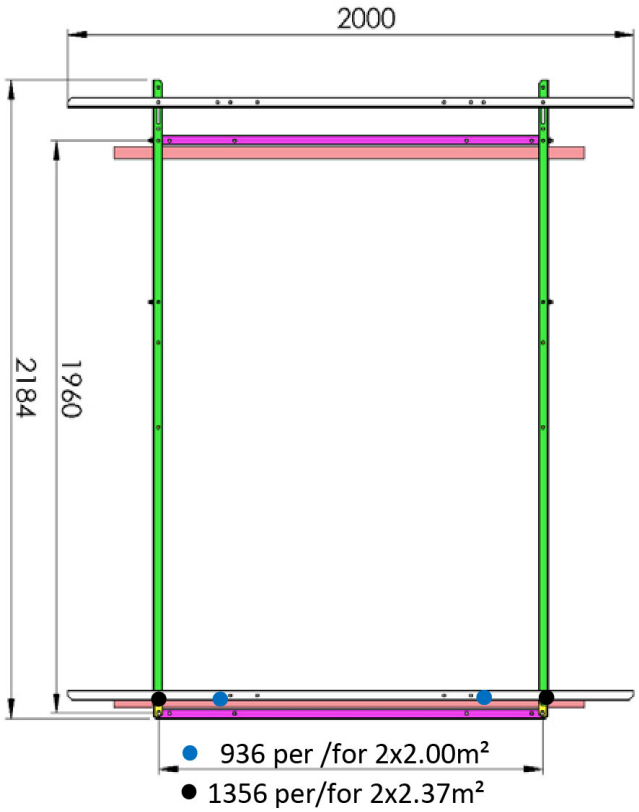
Fix both (yellow) beams to the flat roof or to the slabs as instructed above. The anchors must be at the front of the horizontal beam as indicated above and choose one of the 2 positions again indicated above on the rear side of the horizontal beam. 4 anchor bolts and 4 anchors are included in the kit.

9. Assembly on sloping roof

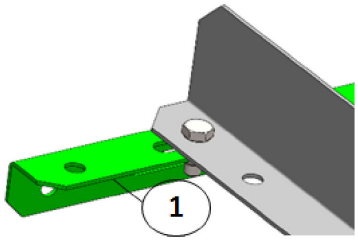
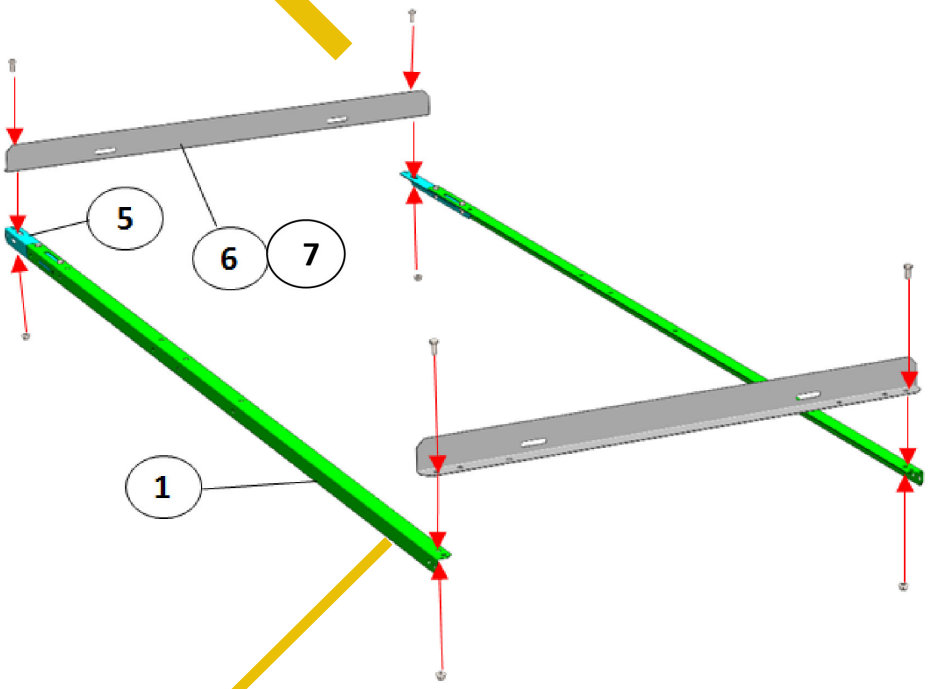
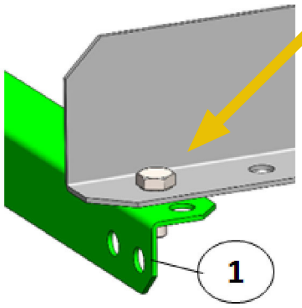


Parts				
a/a	Description	1x 2.00-2.37	2x 2.00	2x2.37
1	2140mm L-shaped bar profile	2	2	2
2	1984mm L-shaped bar profile	2	2	2
3	1380mm L-shaped bar profile	0	0	2
4	960mm L-shaped bar profile	2	2	0
5	325mm L-shaped bar profile	0	0	0
6	1620mm crossbars	0	0	0
7	1000mm L-shaped bar profile	2	0	0
8	2000mm L-shaped bar profile	0	2	2
9a	960mm split L-shaped bar profile	0	0	0
9b	1000mm split L-shaped bar profile	0	0	0
9c	1015mm split L-shaped bar profile	0	0	0
10	100mm L-shaped bar profile	0	0	0
11a	2000mm split L-shaped bar profile	0	0	0
11b	2300mm split L-shaped bar profile	0	0	0
11c	2345mm split L-shaped bar profile	0	0	0
12	1600mm (L1600R) П-shaped track profile	2	2	2
13	DIN933 M8x20 bolts	22	26	26
14	DIN933 M10x20 bolts	8	8	8
15	DIN6923 8mm nuts	18	18	18
16	DIN6923 10mm nuts	8	8	8
17	DIN9021 8.5mm washers	12	16	16
18	Stainless steel strip	4	4	4
19	DIN574 8x60mm anchor bolts	8	8	8

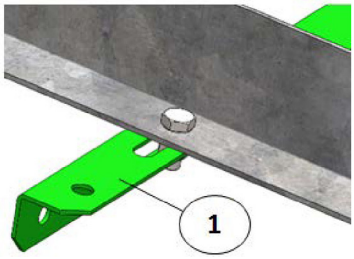
9.1 Important dimensions

1X 2.00/2.37m² collector View from above	2X 2.00/2.37m² collectors View from above
	

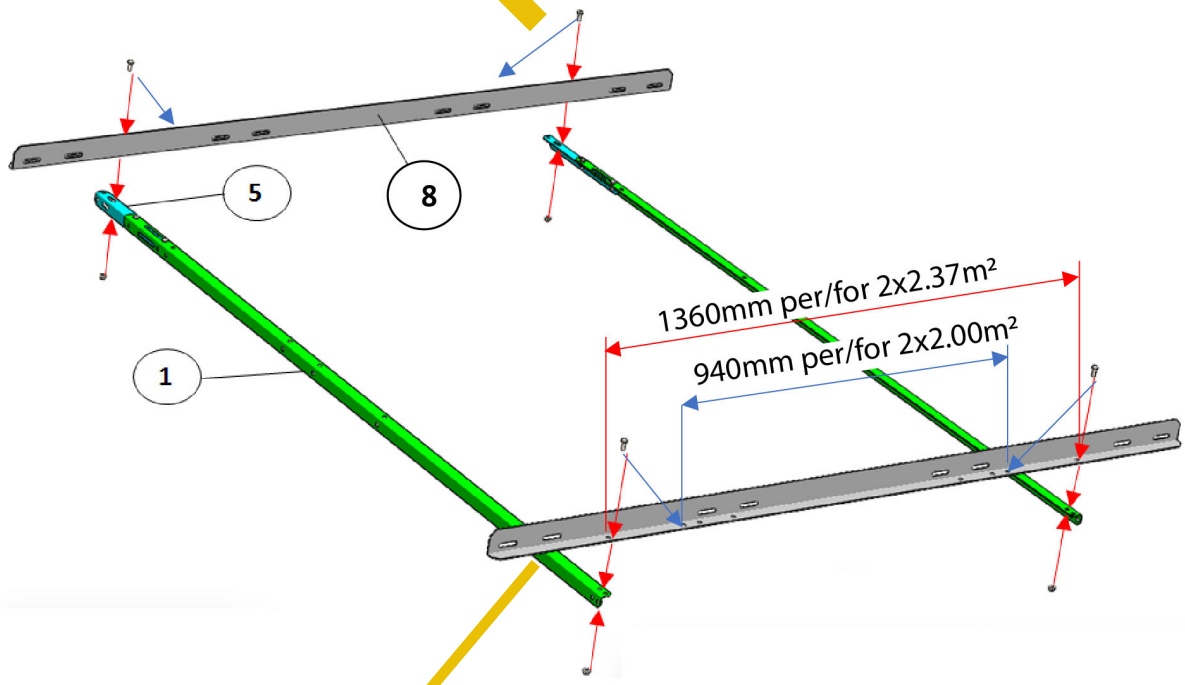
9.2 Mount assembly phases for 1 or 2 collectors

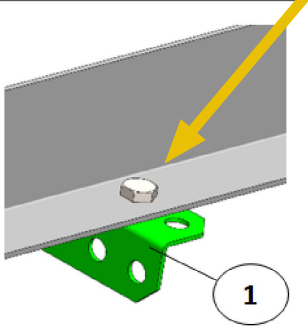
1 x 2.00/2.37m²	
	
Valid for 1X collector	Top frame assembly
	
1x collector	
	

Connect beams No. 1 to beams No.7 for 1 2.00 / 2.37m².
Use M8x20 bolts and nuts

2 x 2.00/2.37m²


Valid for 2x collectors	Top frame assembly

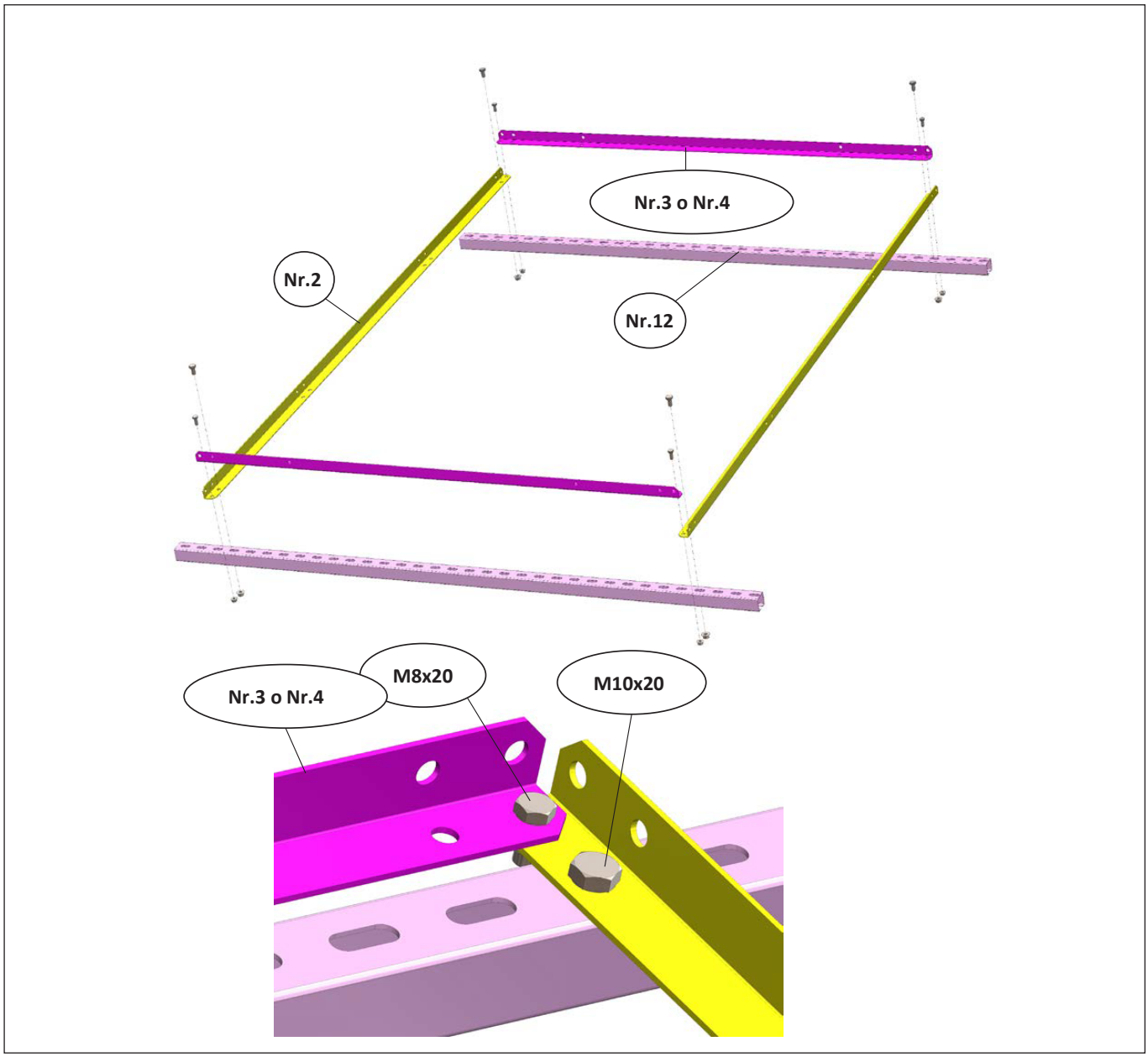


2x collectors


Connect beams No. 1 to beams No.8 for 2 2.00 / 2.37m²
Use M8x20 bolts and nuts

Valid for 1 or 2 collectors

Bottom frame assembly

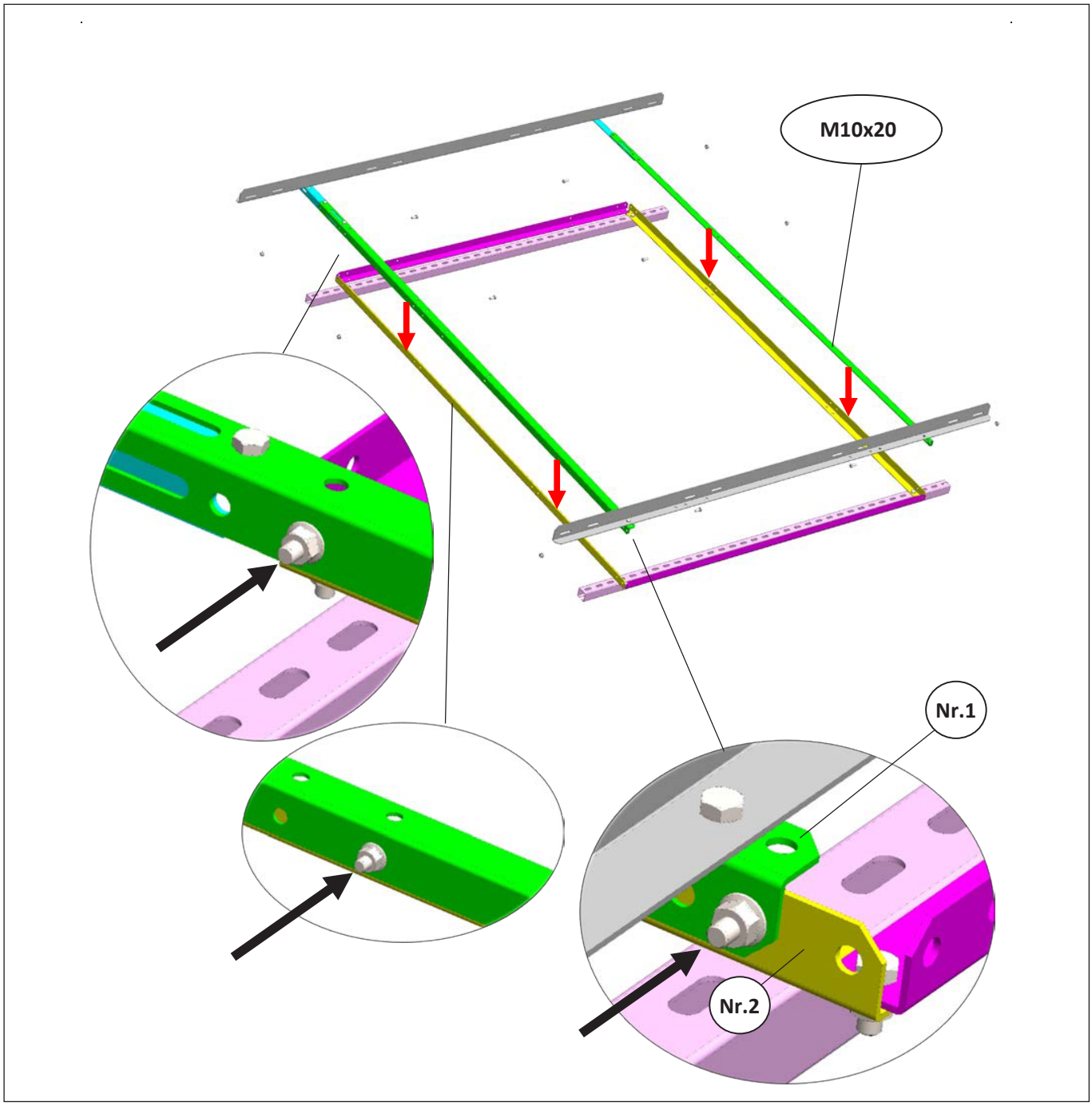


For all connections described under point D, use bolts No.12 (M8x20) and flanged nuts No.14 (8mm).
The beams are:
For collectors 1 2.00/2.37m^2 or 2 2.00m^2 use beam No.4 (960mm)

- For collector 2 2.37m^2 use beam No.3 (1380mm)

Valid for 1x or 2x collectors

.Connect the top frame to the bottom frame

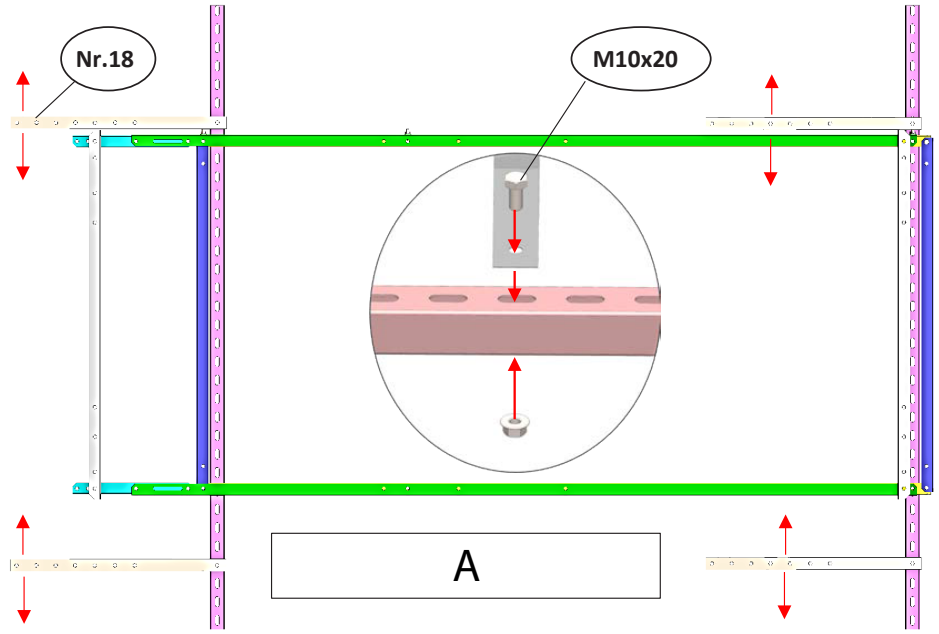


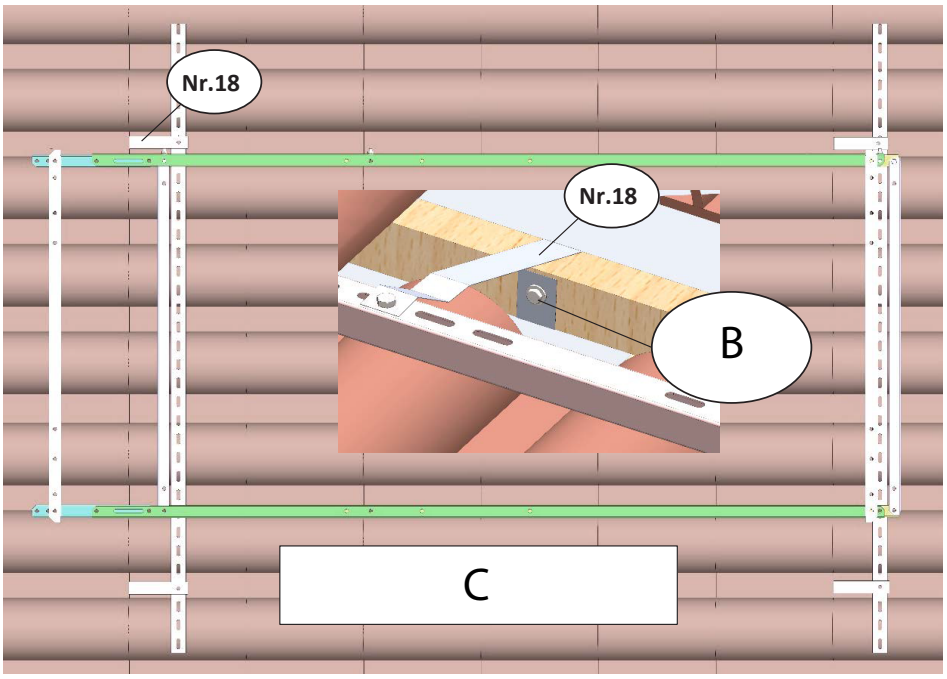
Connect using 3 M8x20 bolts and nuts on each side. Make sure you connect at the points illustrated

9.3Fixed mount on sloping roof

For 1 or 2x collectors

(the images below are for 1 collector but the procedure is exactly the same for 2 collectors)



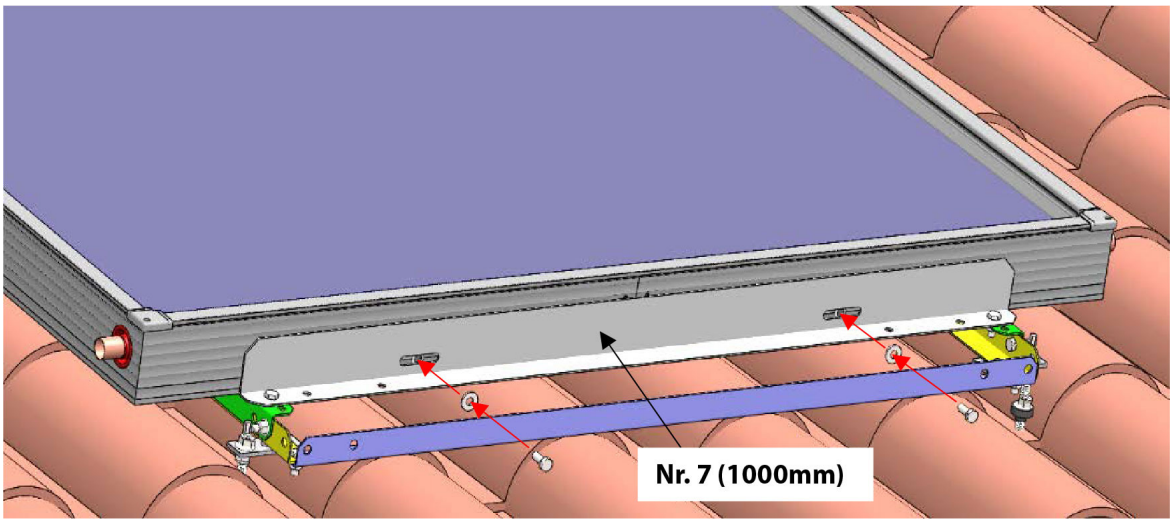


A Find the most convenient points on track no. 12 according to the roof structure

B 8x60mm anchor bolts and 8.5mm washer

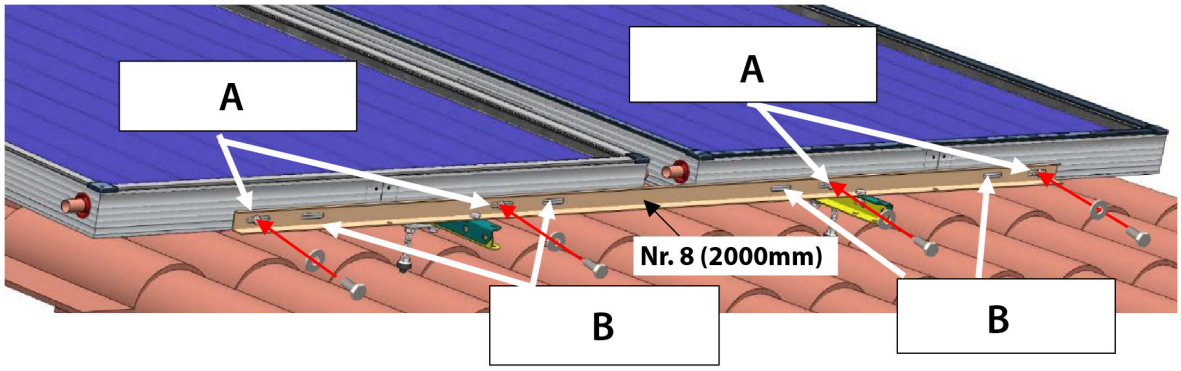
C Assemble as shown here. There are 8 8x60mm anchor bolts provided in the kit so you can use them all if need be

Connect the collector: for 1 collector



Connect in the exact points indicated. Use M8x20 bolts, washers and M8 nuts.

Connect the collector: for 2 collectors

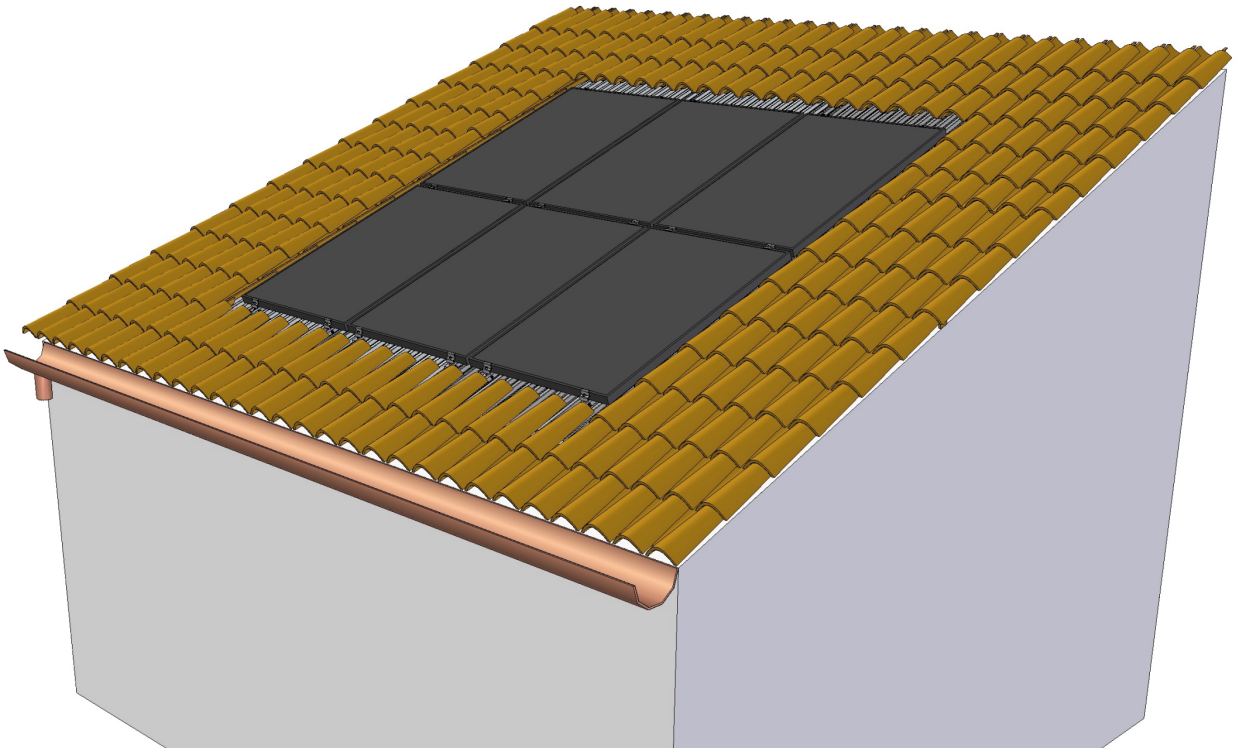


A Position for 2.37m^2
B Position for 2.00m^2

Connect in the exact points indicated. Use M8x20 bolts, washers and M8 nuts.
Before tightening the bolts, put the Ø22xØ22 hydraulic fittings between the collectors.

10. Uncased installation kit

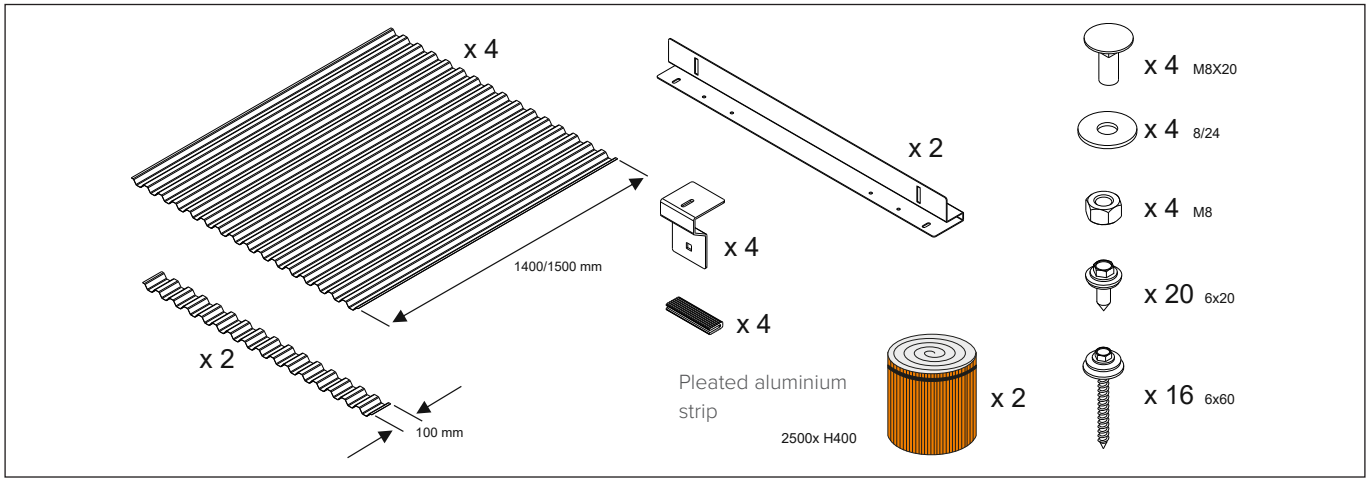
10.1 For vertical solar thermal collectors



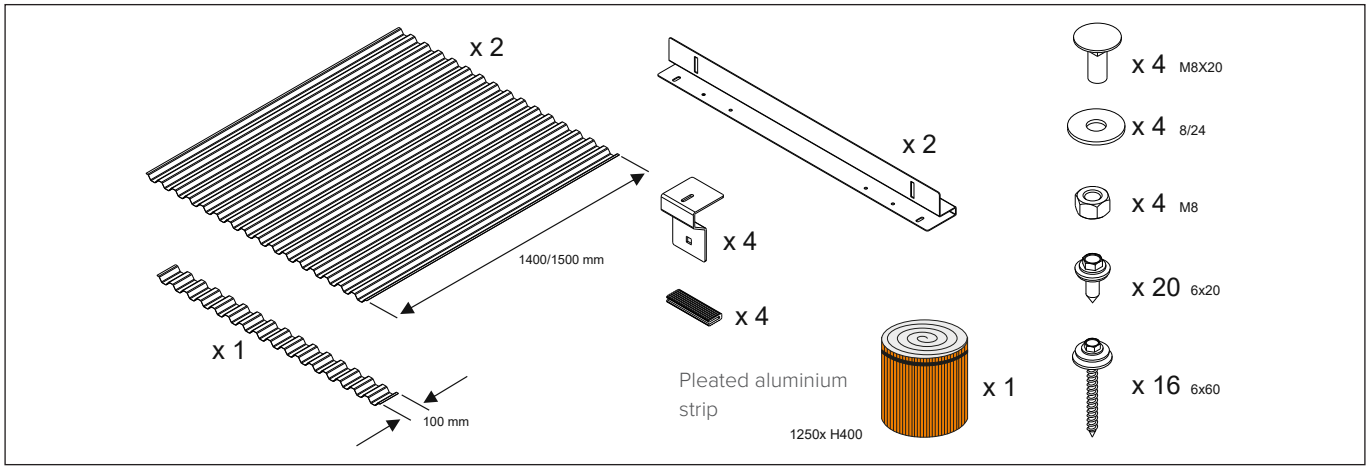
10.2 Assembly instructions

Installation may only be carried out by specialised and suitably qualified personnel, in compliance with all the instructions in this technical manual, with current legal provisions, with the requirements of national and local regulations and in accordance with the rules of good engineering. The installation of one or more panels constitutes an intervention that changes the pre-existing roof structure. The permissible roof load and attachment points must be checked on site by a statics expert. It is imperative for the static capacity of the roof to be verified on site before the panels are installed. This verification must be carried out according to local standards and is especially required in areas subject to heavy snowfall or in regions exposed to strong winds. In these cases, all the characteristics of the installation site (Foehn effect, nozzle effect, vortex formation, etc.), which can lead to higher stresses, must be taken into account. The distance to the roof ridges/edges must be at least 1m. It is advisable to carry out an inspection whenever panels and supporting structures are subjected to extraordinary stresses.

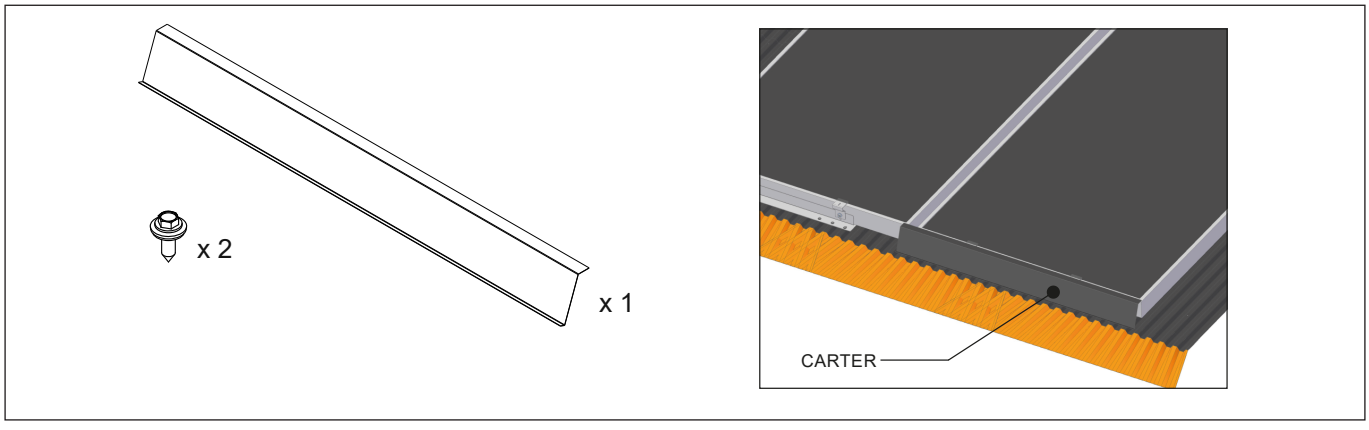
BASIC KIT (for first panel)



EXTENSION KIT (for subsequent panels)



COVER CASING KIT (optional)

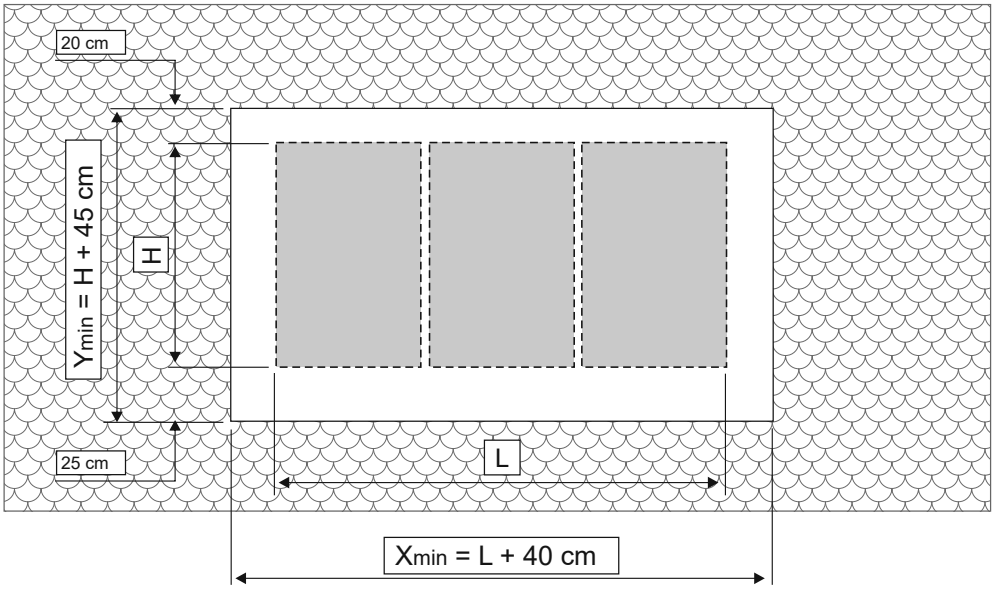


One cover casing kit is required per collector
(e.g. for 3 collectors you need 3 cover casing kits)

10.2.1 Remove the roof shingles/tiles to create the space needed for installation of the system.

Consider the useful surface area of the collectors plus roof flashing (see diagram in figure A)

Figure A

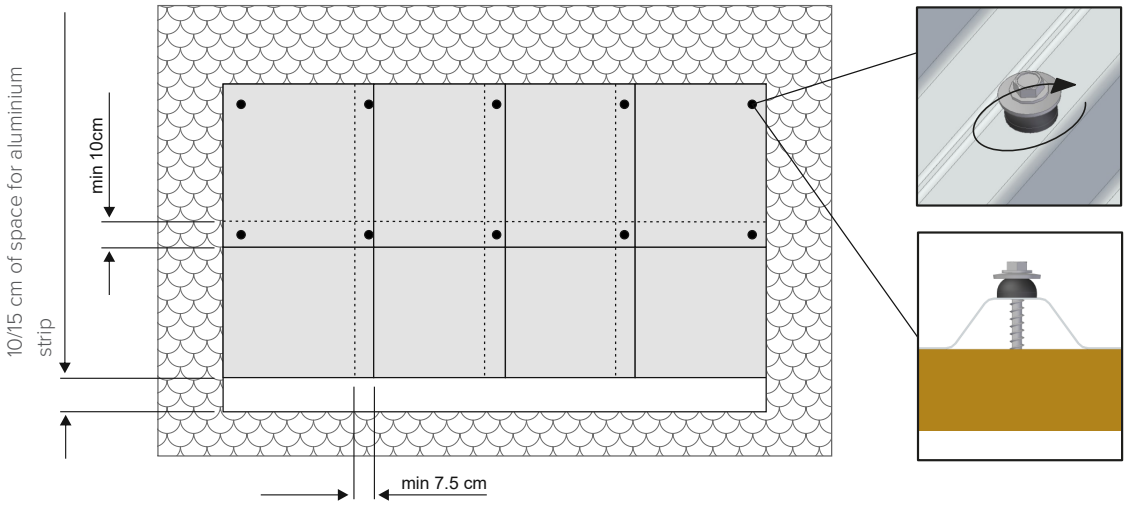


BEFORE LAYING THE CORRUGATED SHEET, IT IS RECOMMENDED

To install a breathable sheath to avoid the formation of condensate

To use some wooden joists to increase the effect of ventilation under the system

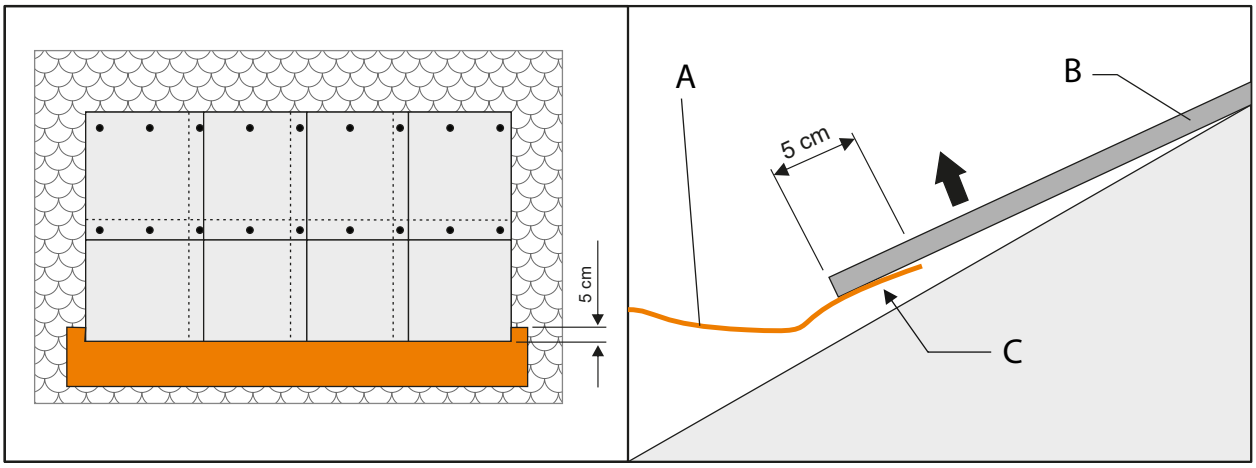
10.2.2 Lay the corrugated metal sheets respecting the minimum overlap dimensions. Anchor the sheets on the roof



WARNING

Temporarily fix only the sheets upstream, leaving the option of raising the edge of the sheets downstream to insert the aluminium strip (step 3)

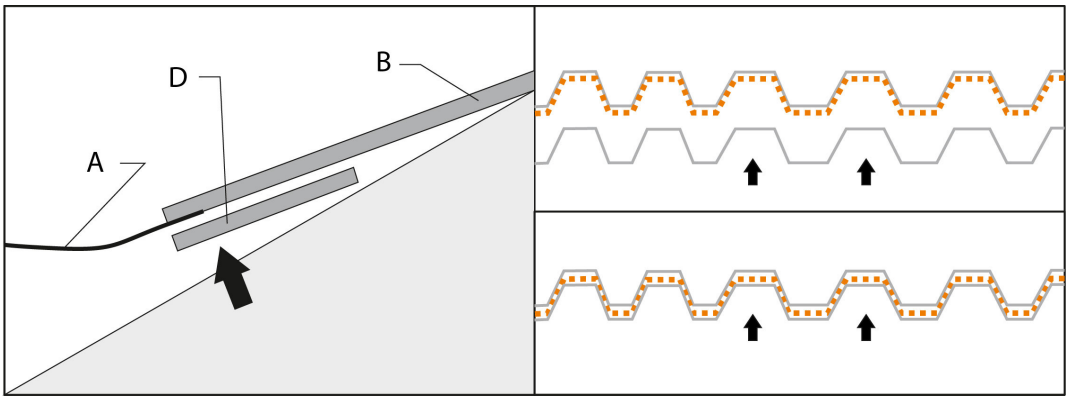
10.2.3 Slightly raise the sheets downstream and glue the aluminium strips under them on the side of the chosen colour.



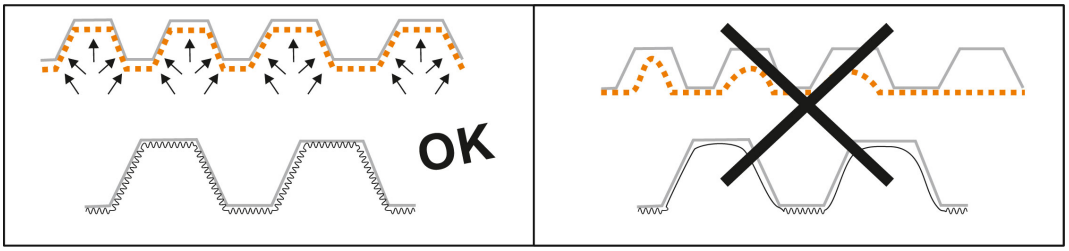
A Aluminium strip B Corrugated sheet C Bonding with butyl

10.2.4 Place the strip of corrugated sheet under the aluminium strip and align it with the section of the sheet above.

⚠ The aluminium strip must be secured between the two corrugated sheets.



A Aluminium strip B Corrugated sheet D Corrugated sheet L = 1000mm



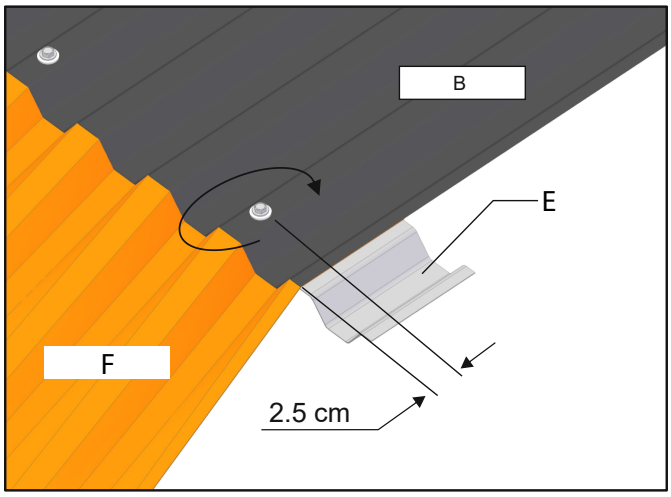
WARNING

For correct installation, the aluminium strip must be shaped on the profile of the corrugated sheet without being stretched.

The aluminium strip must maintain its shape

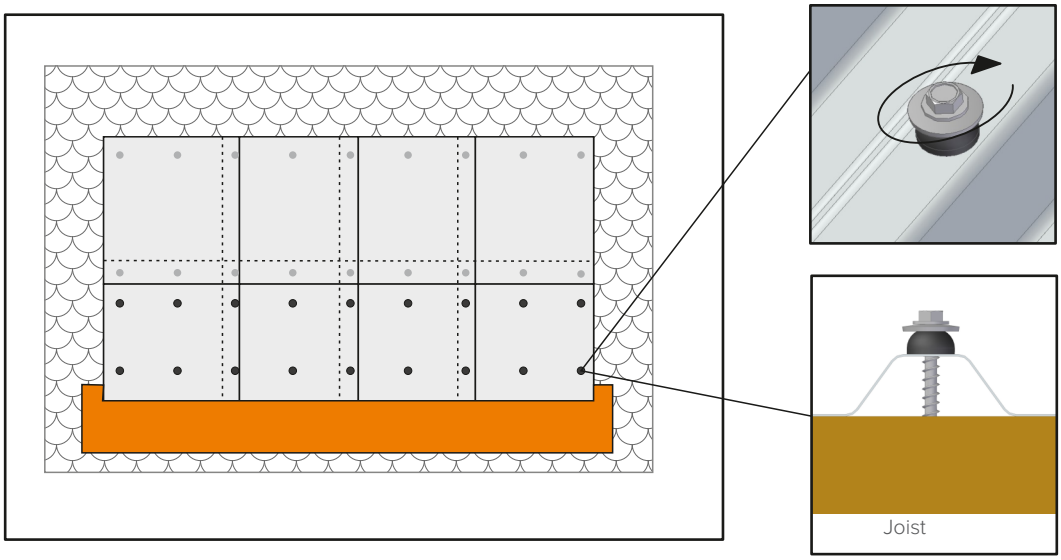
10.2.5 Using the 6x20 self-tapping screws with gasket provided, screw the corrugated sheets together to definitively secure the aluminium strip.

Maintain a distance of about 30/40mm from the edge of the sheet



B Corrugated sheet **E** Aluminium strip **F** Corrugated sheet L = 10 cm

10.2.6 Fix all the sheets and try to evenly distribute the screws.



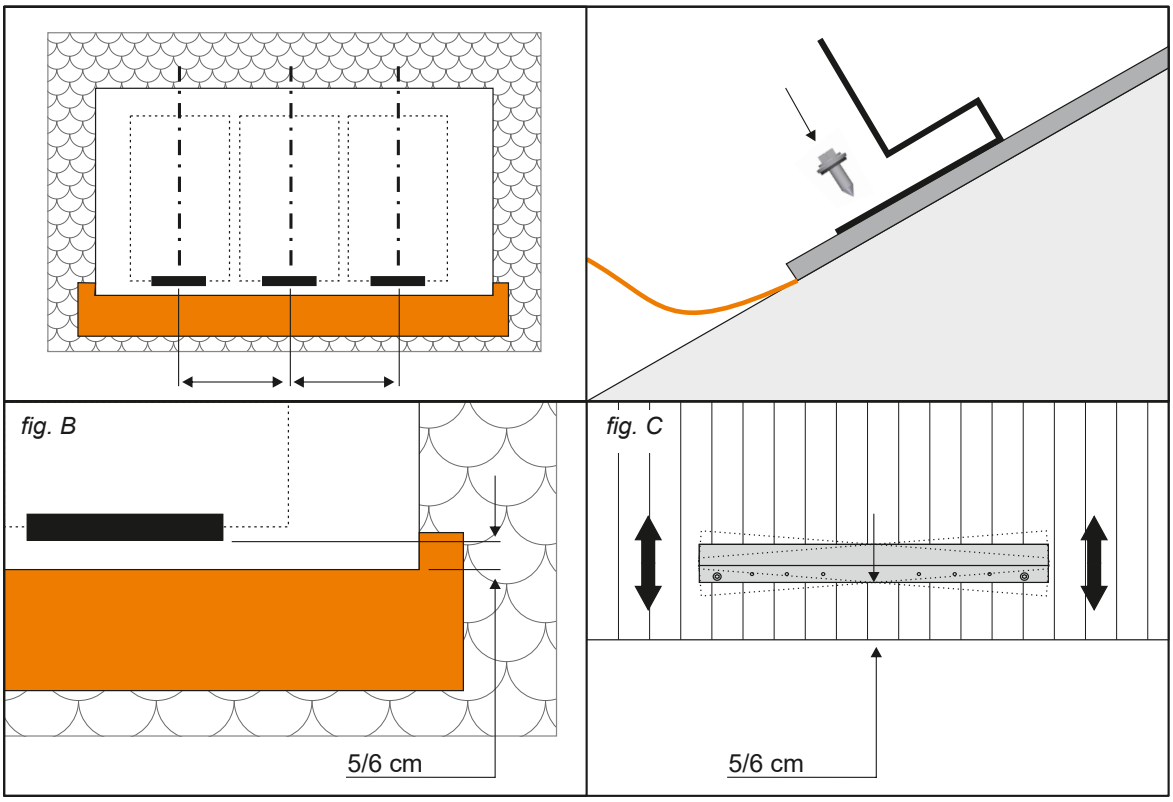
WARNING

In the case of roofs with an inclination greater than 25° (45%), increase the fixing points of the metal sheets on the surface.

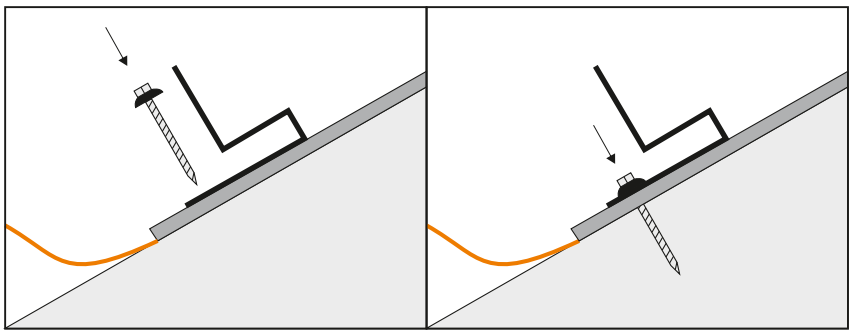
Note that the screws must withstand the stresses exerted on the panel plus the weight of the panel itself.

Consider using screws and plugs suited to the type and material of the structure on which the system is installed.

10.2.7 Fix the support profiles downstream respecting the distance of 50/60mm from the edge of the corrugated sheet (fig. B).



Initially fix only the screws in the slots (fig. C).
Check the linearity of the profiles.
The profiles are where the collectors are positioned.



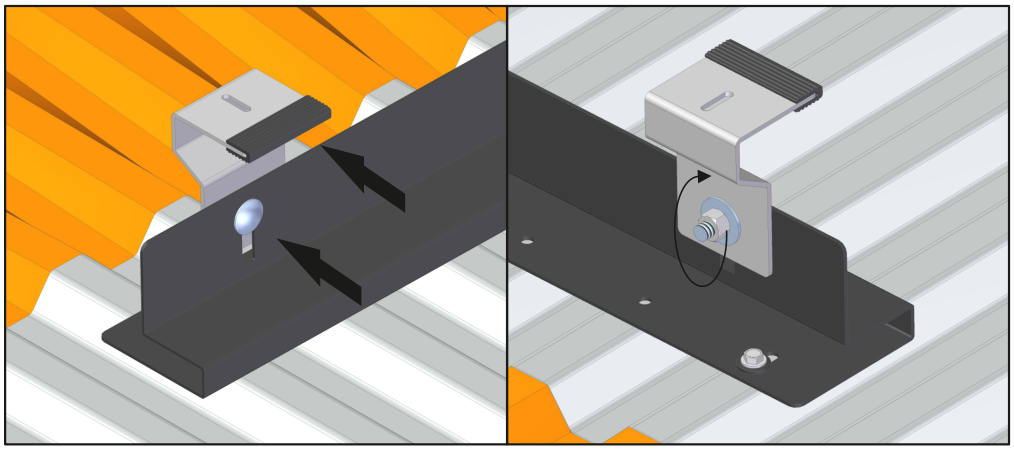
WARNING

In the case of roofs with an inclination greater than 25° (45%) or in areas where heavy snow can occur, use longer screws to anchor on the roof surface.

Note that the screws must withstand the stresses exerted on the panel plus the weight of the panel itself.

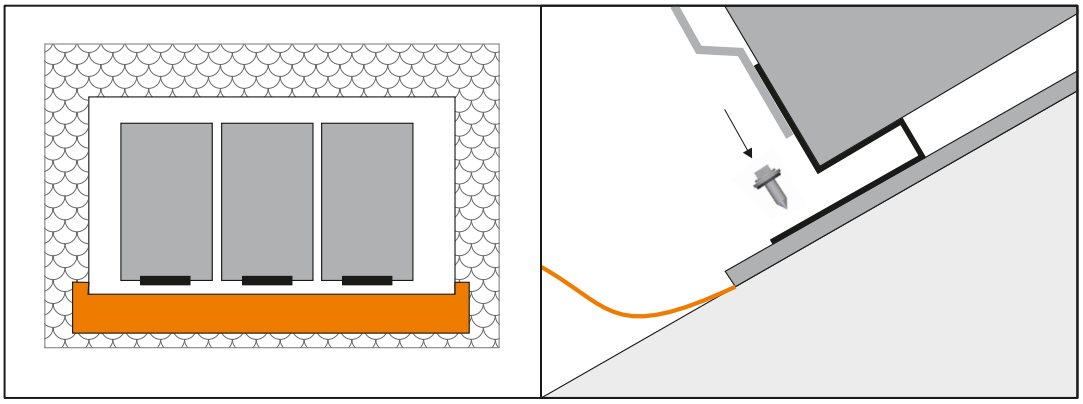
Consider using screws and plugs suited to the type and material of the structure on which the system is installed.

10.2.8 Pre-mount the clamping brackets ON THE support profiles

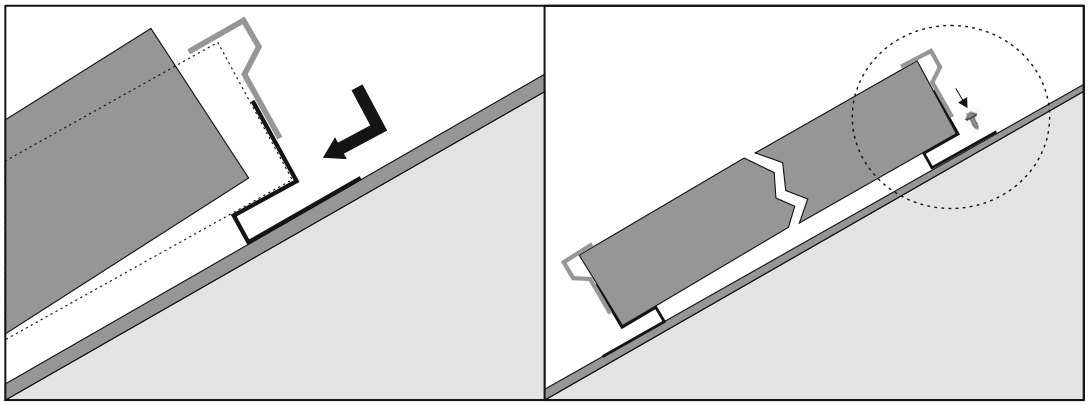


10.2.9 Put the collectors in place.

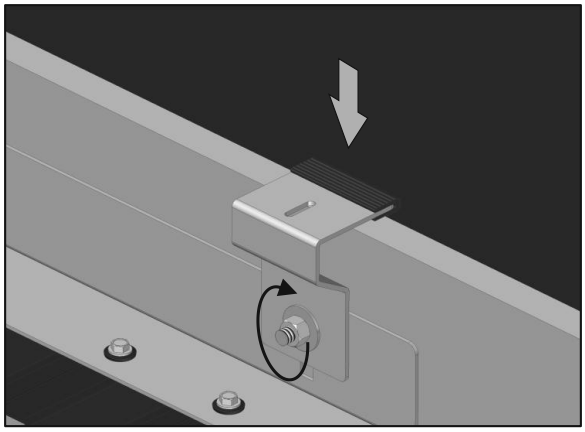
Check the positioning and linearity of the collectors.
Permanently secure the support profiles downstream.



10.2.10 Slightly raise the collectors and position and then fix the profiles upstream as previously done with the ones downstream.

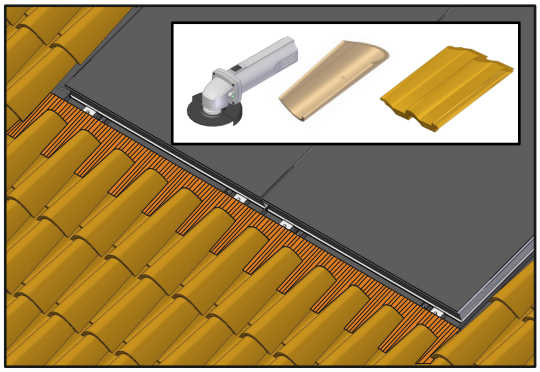


10.2.11 Secure the panel by closing the clamps

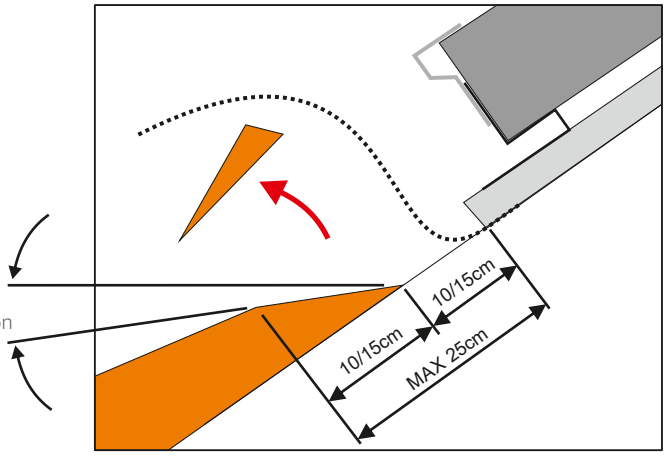


10.2.12 Reposition the previously moved roof shingles/tiles.

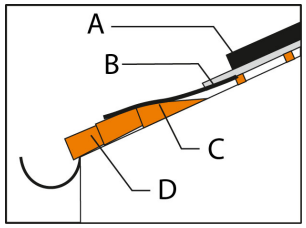
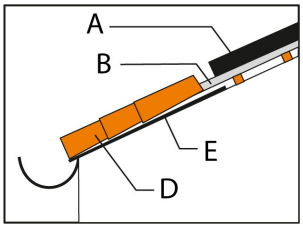
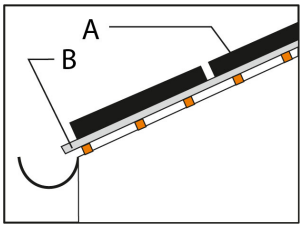
Shape the aluminium strip modelling it according to the type of roof.
Avoid the stagnation of water.
If necessary, smooth the roof shingles/tiles.
Check the work



The angle should be such as not to create possible points of water stagnation

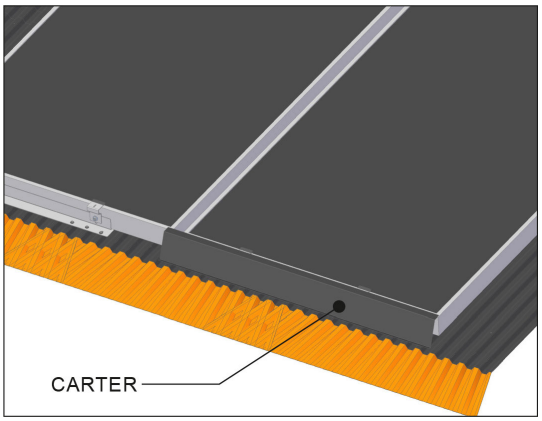


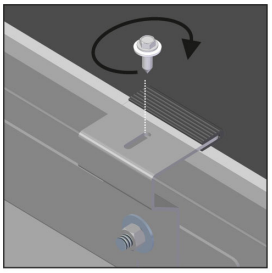
Examples of installation

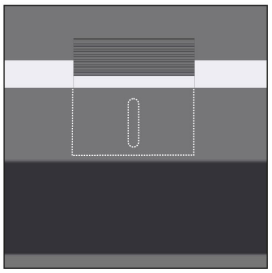
1	2	3
		
Use the aluminium strip to lead The water back over the roof shingles/ tiles. If necessary, cut the roof shingles/tiles so as not to create counter slopes where water could be caught	Use a waterproof sheath to let the water flow from the sheets to the gutter under the roof shingles/tiles.	Make the corrugated metal Sheets directly reach the Gutter. Caution: to avoid the risk of corrosion (redox), make sure the aluminium corrugated sheet does not make contact with the copper gutter.

A	Modules	**B**	Corrugated sheet	**C**	Aluminium strip	**D**	Roof shingles/tiles	**E**	Sheath

Cover casing kit assembly







Position the casing and secure it using the 6x20 self-tapping screws.

The screws must enter the centre of the slot in the clamp below.

11. System components

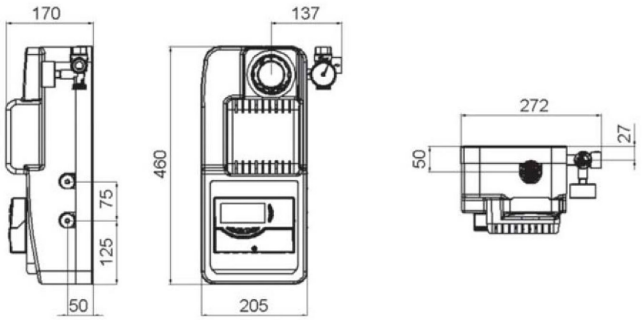
11.1 Single-column solar unit

GS1

Description

GS1 single-column solar unit comprising: UPM3 SOLAR 15/75 high-efficiency pump with PWM input, ogive connections for copper Cu pipe ø22, flow regulator 2÷12 l/min or alternatively 8÷28 l/min, thermometer 0÷160°C, pressure relief valve 6 bar, pressure gauge 0-10 bar, flanged ball valve on supply line (cold side) with integrated thermometer, ¾"M filling and discharge hose with hose connector ø15mm, ¾"FF corrugated stainless steel pipe, wall bracket for expansion tank, black EPP insulation with 40 kg/m^3 density.

Technical information	GS1 12
	With uncased option for the Vega 2.2 solar controller
Circulator	Grundfos UPM3 SOLAR 15/75
Pump power supply	230 V- 50 Hz
Flow regulator	2÷12 l/min
Check valve opening	Δp: 2 kPa (200 mm c.a.)
Max pressure	6 bar
Operating temperature	130-150 °C
Check valve material	Ryton
Insulation material	Black EPP 40 kg/m^3 density
Expansion tank connection	¾"M
Gasket material	Tesnit
Connections	2 ogive type for Cu ø 22 mm pipe
Blue thermometer	1
Red thermometer	-
Check valve	1
Flanged ball valve with integrated thermometer	1



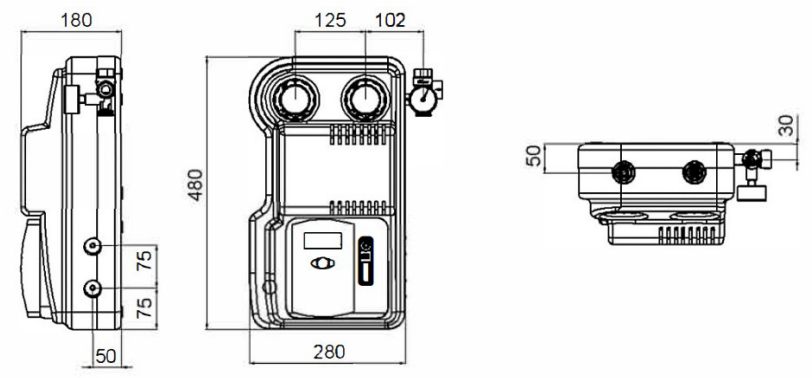
11.2 Bicolumn solar unit

GS2

Description

GS2 bicolumn solar unit comprising: UPM3 SOLAR 15/75 high-efficiency pump with PWM input, ogive connections for copper Cu pipe Ø22, flow regulator 2÷12 l/min or alternatively 8÷28 l/min, thermometer 0÷160°C, pressure relief valve 6 bar, pressure gauge 0-10 bar, flanged ball valve on supply line and return with integrated thermometers, ¾"M filling and discharge hose with hose connector ø15mm, spacer coupling with built-in degasser, ¾"FF corrugated stainless steel pipe, wall bracket for expansion tank, black EPP insulation with 40 kg/m^3 density with recessed possibility for control unit.

Technical information	GS2 12
	With uncased option for the Vega 2.2 solar controller
Circulator	Grundfos UPM3 SOLAR 15/75
Pump power supply	230 V- 50 Hz
Flow regulator	2÷12 l/min
Check valve opening	Δp: 2 kPa (200 mm c.a.)
Max pressure	6 bar
Operating temperature	130-150 °C
Check valve material	Ryton
Insulation material	Black EPP 40 kg/m$^{3\ density}$
Expansion tank connection	¾"M
Gasket material	Tesnit
Connections	4 ogive type for Cu ø 22 mm pipe
Blue thermometer	1
Red thermometer	1
Check valve	2
Flanged ball valve with integrated thermometer	2



11.3 UPM3 solar circulation unit

UPM3 solar 15/75 electronic pump

The electronic pump is a high-efficiency pump that provides flexible solutions for solar systems. Possibility of operation with or without PWM control signal.

PWM speed is controlled via a special quick-coupling cable supplied with the solar unit.

The pump can be set to:

4 constant curves (operation without PWM signal)

4 C-profile curves with speed variation via PWM control (stops without PWM signal)

Falls below the 2015 ecodesign benchmark from IEE ≤ 00:20 en 16297/3

Connection cables

Power supply cable:

Brown wire	-	Phase
Blue wire	-	Neutral
Yellow/green wire	-	Earthed

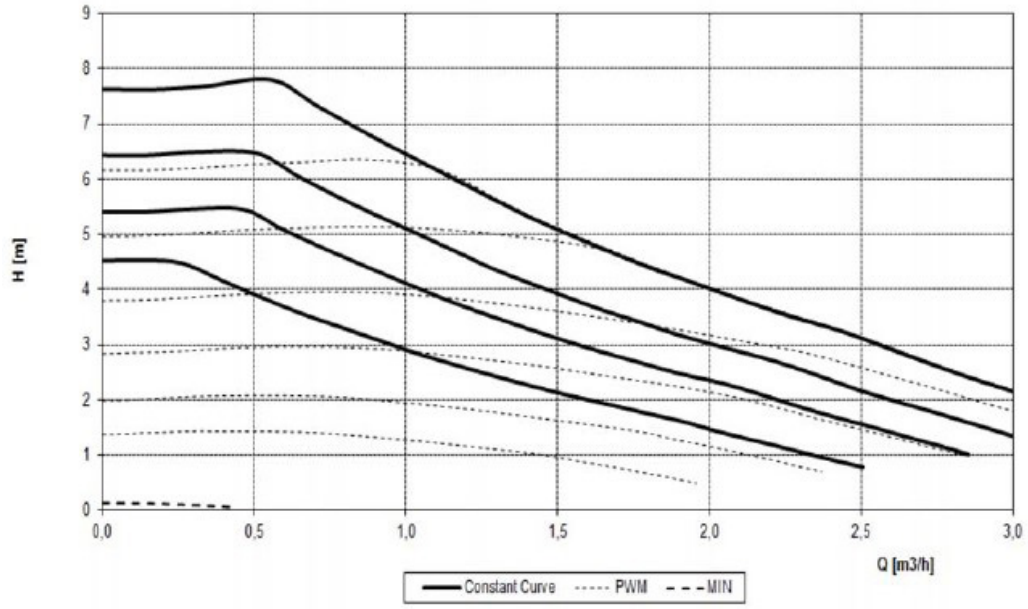
PWM control cable:

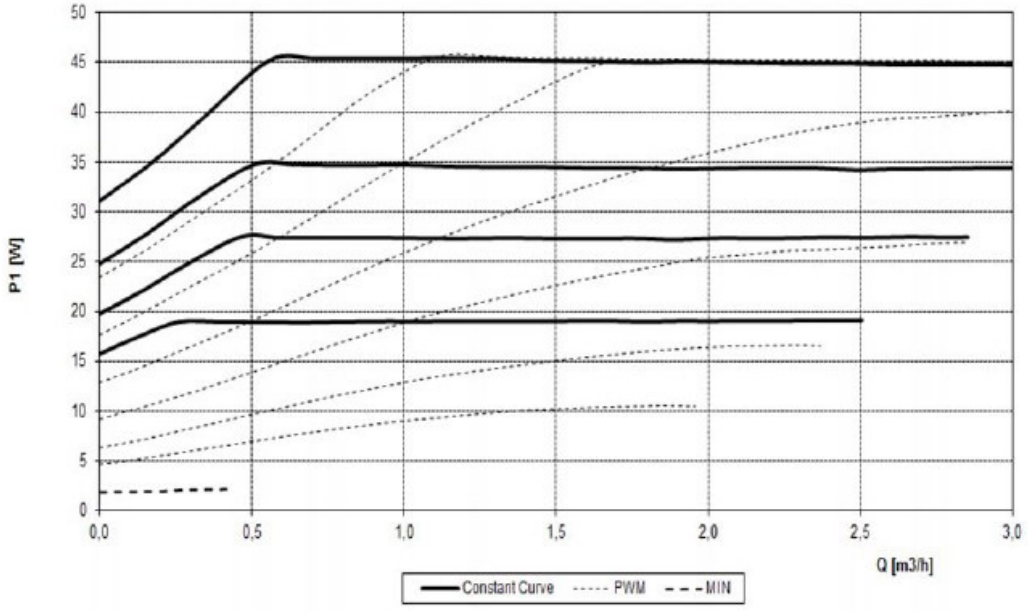
Brown wire	-	Phase
Blue wire	-	Neutral
Black wire	-	Not used

Technical characteristics

Maximum environment temperature	+70°C
Fluid temperature	+2 °C ➔ 110 °C with cast iron casing (short temperature peaks up to 130 °C)
Maximum operating pressure	1 MPa (10bar)
Minimum inlet pressure	00:05 MPa (0.5 bar) at 95 °C liquid temperature
Minimum mount temperature	+0°C
Humidity	Maximum 95%
Storage temperature	-40°C a +75°C
Rated voltage	UE: 1x230 V + 10% / -15%,50Hz
Minimum power supply voltage	160 VAC (at reduced power)
Motor protection	The motor is protected by electronics and requires no external protection
Protection class	IPX4D
Approval and marking	VDE,CE

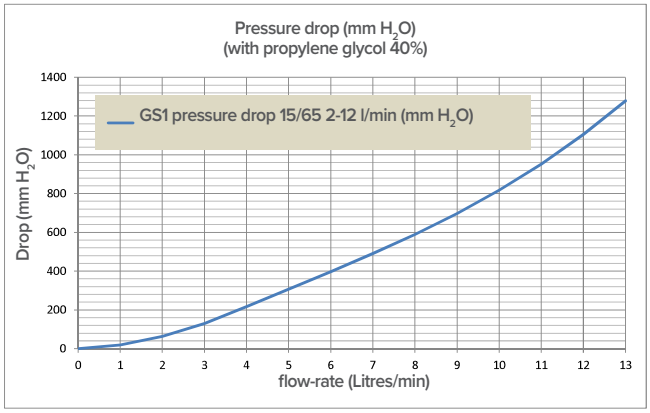
Head curve



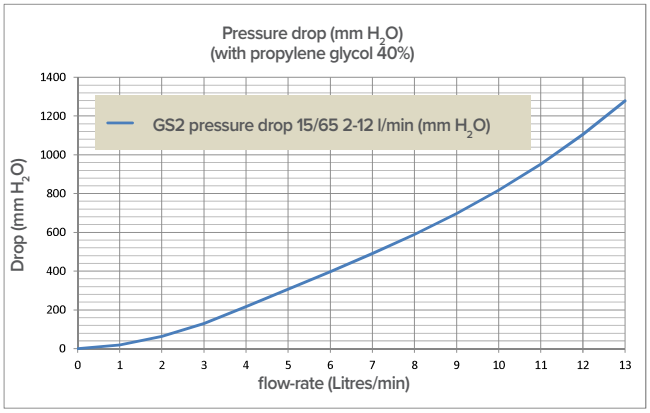


Pressure drop of the solar unit

GS1 single-column 12 2-12 l/min (mm H_2O)



GS2 single-column 12 2-12 l/min (mm H_2O)



11.4 Operating curve setting

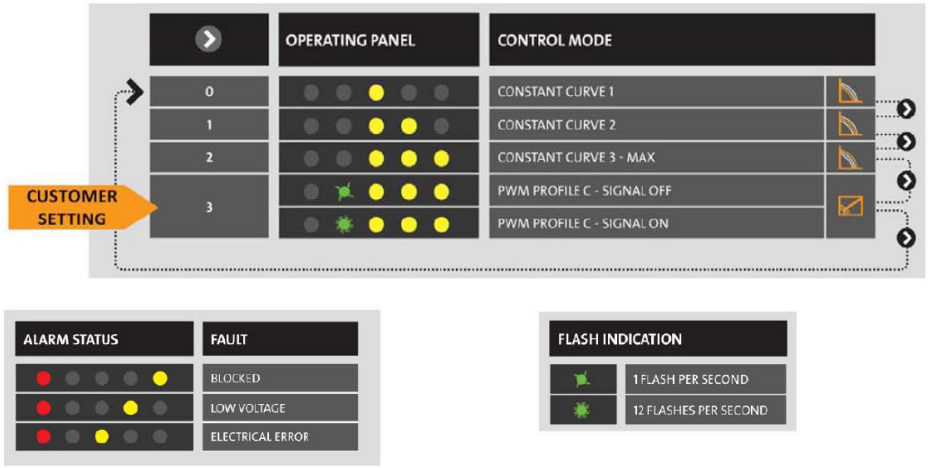
The pump's operating curves are set with a button on the pump.
Each combination of lights on and off is a specific operating mode.
As shown in the figure below.

To change the curve:

To change from one curve to another, simply press the button once to switch in sequence:

- 1 yellow dot on: constant curve 1 operation (with ON/OFF control)
- 2 yellow dots on: constant curve 2 operation (with ON/OFF control)
- 3 yellow dots on: constant curve 3 operation (Max) (with ON/OFF control)
- 1st green dot slow flashing 1 flash per second and 3 yellow dots on: operation at maximum speed with PWM speed control (no signal, pump stopped)
- 1st green dot fast flashing 12 flashes per second and 3 yellow dots on: operation at maximum speed with PWM speed control (control on, pump running)
- all LEDs off: no power supply (pump off)

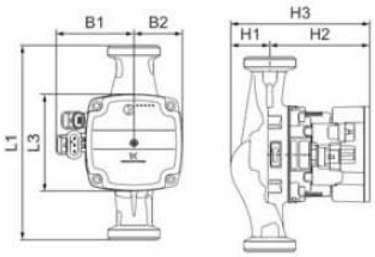
Configuration



			Curve selection	H nom	P1 nom
Speed	P1 (W)	I 1/1 (A)	Curve 2	5,5 m	28 W
Minimum	2	0,04	Curve 3	6,5 m	35 W
Maximum	45	0,48	Curve 4	7,5 m	45 W

Dimensions

	Dimensions (mm)							Connection	Weight (kg)
PUMP	L1	L3	B1	B2	H1	H2	H3		
UPM3 15-75	130	90	72	45	36	92	128	1"	1,8



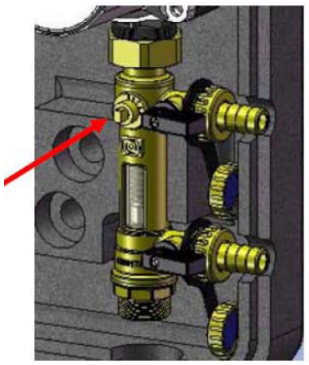
11.5 Setting the correct flow-rate based on the system installed

For optimal performance, the circulating flow-rate will be varied automatically by the controller based on the thermal conditions occurring during operation. However, when starting up the system, the maximum flow-rate of the system must be set according to the surface area of the collectors installed.

The table below contains the optimal maximum flow-rate according to the number of collectors installed.

Type of collector	Optimal flow-rate based on the number of collectors installed l/min									
	1	2	3	4	5	6	7	8	9	10
F-L	2	3	4	5	6	8	9	10	12	13
F-XL	2	3	4	6	7	9	10	12	14	15

The flow-rate can be quickly (but roughly) adjusted as follows:



- throttle with the adjustment screw located above the window in the solar unit just below the pump, bearing in mind that the reading must be taken from the bottom of the float inside the window, and that the pump must be set in manual mode on the controller so that it operates at its maximum flow-rate.
- Or more precisely by setting the maximum operating % of the pump on the controller.

Depending on the controller installed, the parameter to be set has different codes and is located in different places in the menu

▶ With a **Solar 1** controller, go to this menu:

Pump → **Psol** → **Max1** → value can be set from 25 to 100 (default setting is 100)

▶ With a **Vega 2.2** controller, go to this menu:

nMX → value can be set from 10 to 100 (default setting is 100)

Lowering the parameter's % value will lower the pump's flow-rate accordingly until the optimal operating flow-rate is reached. It is necessary to keep trying until the actual flow-rate is as shown in the table. To do this, put the pump into manual mode and read the flow-rate in the solar unit window to check that it matches (approximately) the required value.

Again, the parameter that manually starts the pump from the controller is located in different places in the menu depending on the controller.

▶ With a **Solar 1** controller, go to this menu:

Man → **R1** → **and set ON**

▶ With a **Vega 2.2** controller, go to this menu:

Man → and set ON

In both controllers, once the pump is switched to manual mode, the hand symbol will be displayed. It is essential to switch the pump back **OFF with a Solar 1 controller** and **to AUTO with a Vega 2.2** controller before finishing the operation.

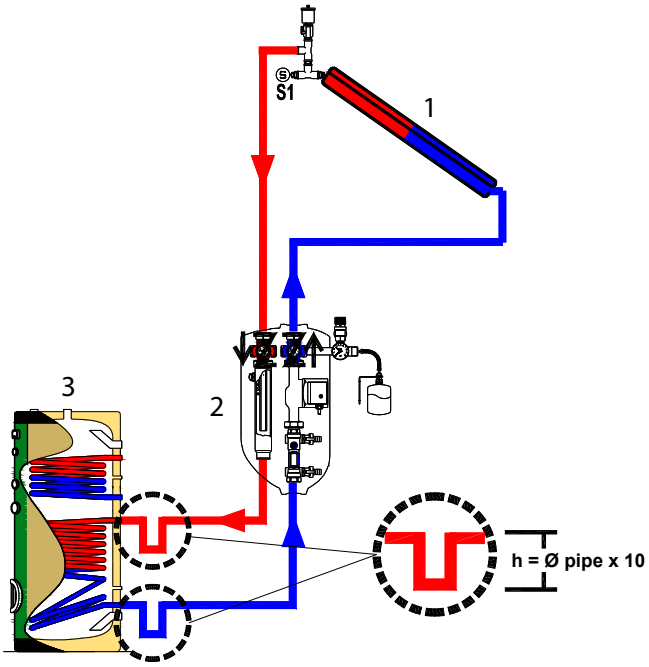
A good compromise could be to lower the pumps operating % to 60/70% and then possibly lower the flow-rate even further (if necessary) with the adjustment/shut-off screw indicated by the arrow in the figure.

Installation

- The pump and all the other accessories included with the solar unit must be installed in the return section of the solar collectors (coldest pipe), as there is less thermal stress on the individual components.
- **Before starting the pump, ensure that the 2 gate valves controlled by the knobs (red and blue containing the thermometers), one on the supply line and the other on the return line of the collectors, are open.**
- **Ensure that the screw in the flow meter (under the pump) is also fully open for the time being (then, when the system is charged, it will need to be calibrated based on the flow-rate).**
- It is advisable to connect the pressure relief valve discharge to a collection tank, so as to monitor any fluid discharges from the valve and to be able to restore the mixture in the system if necessary.
- A fitting with a double non return valve is mounted on the expansion tank bracket, which is useful when replacing the tank as it stops fluid from leaking out of the solar system.
- Do not throw away the black EPP insulation, which is used during transport as packaging and during operation as insulation of the solar unit to reduce leakage and improve its appearance.
- **Since the smooth operation of the flow meter can be altered by dirt that may settle inside it, it is strongly recommended to install a Y filter immediately before the flow meter.**

11.6 Thermosiphon effect

To avoid the thermosiphon effect that can occur when the fluid in the boiler's exchanger is hotter than the fluid in the solar collectors (e.g. during the night), in addition to the 2 non return valves located in the supply and return lines of the solar unit, it is advisable to create a siphon with a height of 10 x the diameter of the pipes used.



1 Solar unit
2 Solar control unit
3 Boiler

11.7Expansion tanks

Solar expansion tanks must have a nitrile diaphragm as the heat transfer fluid circulating in the primary circuit consists of water and non-toxic propylene antifreeze. Universal expansion tanks with butyl diaphragm and heating tanks with SBR diaphragm must never be used as the antifreeze would damage them (being an extremely aggressive substance).

18/25/40-litre expansion tanks with fixed nitrile rubber diaphragm; galvanised carbon steel crimped flange;

max pressure 6 bar;
3/4" fitting,

Sizing

The expansion tanks must be appropriately sized to contain the additional volumes of the water-antifreeze mixture, generated by thermal expansion and steam, which could occur in the collector. The diaphragms in the expansion tanks must be suitable for the maximum discharge pressure delivered by the pressure relief valve (6 bar) and must be resistant to the water-antifreeze mixture (heat transfer fluid).

Maximum sizing of solar expansion tanks based on the pipe diameters and lengths given in the table (under standard conditions):

n° collettori	1	2	3	4	5	6	7
Litri	18	25	40	40	60	60	80

(indicative design data, in any case always refer to what your heating engineer has designed)

Check that the pre-charging pressure of the expansion tank is about 0.3 bar less than the cold charging pressure of the system (see the "Start-up" chapter)

11.8 Propylene glycol for flat glass panels

Glycol is an antifreeze combined with rust inhibitor to protect heating, cooling and solar systems from frost damage, rust and corrosion. Furthermore, it is also suitable for heat pump systems and underfloor heating systems.

Chemical-physical characteristics

Form	liquid
Colour	light blue
Odour	none
Specific weight	1,03 - 1,05 (20/20°C)
Freezing point/---	> -50°C
Boiling point/---	> 185°C
Vapour pressure	< 10 mbar (20°C]
pH	7 - 8
Water solubility	mixable in any ratio
LogP (Octanol/water)	0.92 (glycol-propylene)
Flashpoint	undetermined
Ignition temperature	420°C (prop.)
Auto-ignition limit	higher than 420T
Upper explosion limit	12,5 Voi. O/o (prop.)

Proportion of mixture

Volume %	Protection down to
25	-10°C
30	-14°C
35	-17°C
40	-20°C
45	-26°C
50	-32°C
55	-40°C

11.9 Thermostatic mixers for small systems

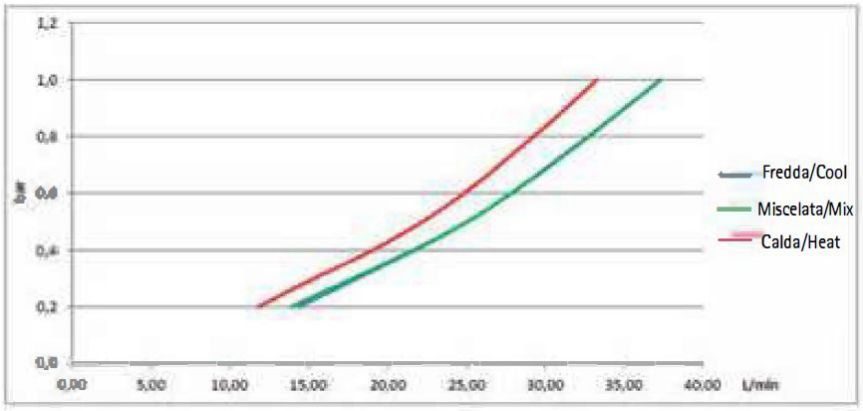
Thermostatic mixing valves for small thermostatically controlled systems are used wherever a constant mixed water temperature with high control accuracy is desired and required.

The devices are particularly suitable for mixers in detached houses, semi-detached houses or where low simultaneous use is required.

Technical characteristics	
Valve body	brass
Gaskets	EPDM
Spring	Stainless steel
Mixed outlet temperature	35-55°C
Minimum inlet temperature	3,9 °C
Maximum inlet temperature	85°C
Minimum operating pressure	2 bar
Maximum operating pressure	10 Bar
Flow-rate Kvs	2,17
Minimum flow-rate	6l/min

Pressure drops

3/4” mixer pressure drops



11.10 Solar 1 solar controller

The main function of solar controllers is to control the circulation in the primary circuit with the signal given by the pump, based on the Δt measured by the solar collectors and the bottom of the solar storage tank.

Depending on the type of system, the controllers also control the integration of the secondary circuit.

Solar 1 solar controller

The Solar 1 controller is designed for the control and speed control of both traditional and high-efficiency pumps for solar and heating systems.

It is an electronic controller with two output relays: an ON/OFF one and a PWM semiconductor one that can control the speed of the circulation pump, whether it is a traditional type or one of the new high-efficiency models, via the PWM outputs.

Up to 3 temperature probes can be connected to the inputs.

The system diagram is shown on the LCD screen that displays the probes, the solar pump and any integration.Standard parameters can be easily controlled and changed with the LCD display and buttons. The display, with backlighting, also shows the operating status and any errors for quick troubleshooting via pictograms.

The controller has a set of functions to support the control such as:

- temperature limitation of the collectors
- TIMER function with 3 settable time slots for integration
- collector cooling and tank cooling option
- antifreeze function (for systems without antifreeze fluid)
- AUTO/ON mode for the individual relays

Directions for use

Basic controller for solar and heating systems where speed control of the solar pump is required.

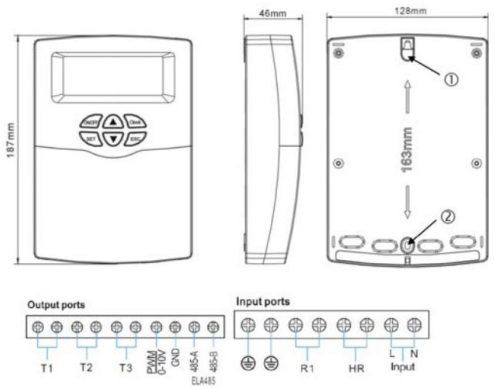
When there is only one solar system user (tank or pool or ....)

When an entry level solar control is required at an affordable price

Avantage

- Entry level solar controller
- 1 output with ON/OFF relay
- 1 output with semiconductor or PWM relay
- 3 probe inputs: 1 for PT 1000 + 2 for NTC10K
- Timer function with 3 time slots for integration
- AUTO/ON mode to test both outputs
- Collector and boiler cooling function
- Antifreeze function for glycol-free systems in temperate zones

Dimensions and overall dimensions



Technical information	SOLAR 1
Inputs	–1 collector probe (PT1000 silicone cable ≤280°C supplied) –2 tank probes (NTC10K PVC cable ≤105°C supplied)
Collector probe reading range	-10 ÷ 220°C
Tank probe reading range	0 ÷ 110°C
Outputs	–1 semiconductor and PWM relay (switchable ON/OFF 0-10V) for solar pump, power: ≤ 600W –1 relay for integration, power ≤ 600W
Power supply	V ~ (50....60 HZ)
Power supply	< 3 W (in standby)
Temperature reading accuracy	± 2°C
Functions	–thermostat function with 3 settable time slots - collector cooling function –tank cooling function (holiday function) –antifreeze function –AUTOMATIC/MANUAL ON function for each of the 2 relays
Casing	in plastic, PC-ABS and PMMA
Assembly	on the wall or inside the electrical panel
Display	backlit LCD display with system diagram pictogram and operating indicators
Control	with 6 buttons on the front
Protection rating	IP40
Environment temperature	0...40°C
Dimensions	187mm x 128mm x 46mm

Examples of use

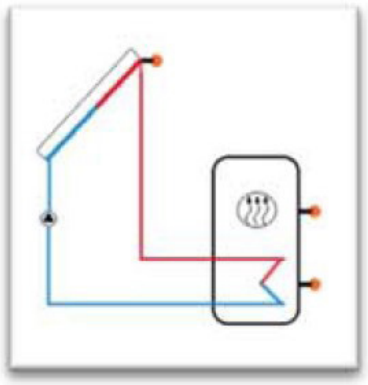


Diagram displayed:

Standard solar system with or without boiler integration symbol

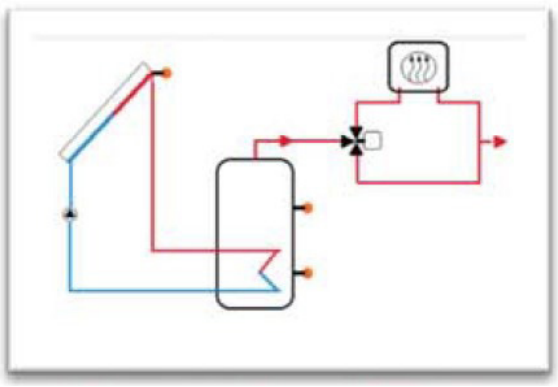


Diagram displayed:

Standard solar system in series with integrated tank or instant producer

11.11 Controller data setting

Some of the controller's factory data must be changed according to the system layout used. To simplify the setting, a few "controller setting excerpts" are enclosed with each system, where the values to be changed and the electrical terminal block connections are simply and schematically shown.

11.12 Electrical device connection

Installation of the controller's temperature probes and laying of the respective cables can be carried out by the plumbing installer; whereas connection to the 220 V mains, power supply to the solar circulator and motorised valves must be carried out by a qualified electrician, as required by the regulations in force, in compliance with the specific instructions enclosed with the system.

To avoid probe malfunctions, it is advisable:

1. Not to lay temperature probe cables in a pipe where a 220 Volt line is already laid;
2. To use shielded cables;
3. To extend the collector sensor cable using high temperature-resistant **silicone cable** (2-wire): **2 x 0.75 mm²** up to 50 m of cable and **2 x 1.5 mm²** up to 100 m.
4. To use the probe with the **black cable** (resistant to high temperatures) to measure the temperature in the solar collectors; the probe with the **grey cable** should be used in storage tanks or heating systems.

12. Solar controller Solar1

12.1 Installation, setting and start-up

12.2 Description of operation

The main function of the Solar 1 solar controller is to manage the energy transfer between the solar collectors and the solar storage tank, integration by a traditional energy source (e.g. gas boiler) and other functions for the safety of the solar circuit.

The controller compares the temperatures read by the collector probe and the solar tank probe: when the temperature of the solar collector is higher than the temperature read at the bottom of the solar tank by the value set, the controller starts the solar pump to transfer energy.

The controller can manage an integration source (instant boiler, heating only, etc.) with its own thermostat function: a third probe reads the reference temperature for integration by the traditional energy source, managing the second output of the controller. 3 time slots can be set for starting the integration function.

12.3 Safety information

Installation and start-up

- When laying the cables, ensure that no fire safety systems in the structure have been damaged.
- Do not install the controller in environments with a possible presence of easily flammable mixtures and/or gases.
- Before connecting the controller, make sure the power supply is compatible with its characteristics.
- All equipment connected to the controller must comply with its specifications.
- Installation and maintenance of the controller must only be carried out by qualified personnel.

12.4 Notes on this manual

This manual describes the installation and start-up of a solar thermal system controller. The other components (e.g. solar collectors, solar pump, etc.) must be installed in accordance with the installation instructions provided by the respective manufacturer.

12.5 Exemption of liability

The manufacturing company cannot control compliance with these instructions or the methods used for the installation, operation, use and maintenance of this controller. Incorrect installation can cause damage to property and/or persons. For this reason, no liability shall be accepted for damage, loss or costs that may arise due to incorrect installation, operation, misuse or poor maintenance. The manufacturing company reserves the right to make changes to the product, technical data or installation and operating instructions without prior notice.

Note: make sure the device cannot be accidentally switched on.

12.6 Description of the symbols

Safety:

Safety instructions in the manual are marked with a triangle. They indicate operations which can lead to personal injury and safety risks.

NOTES: Contain important information on operation.

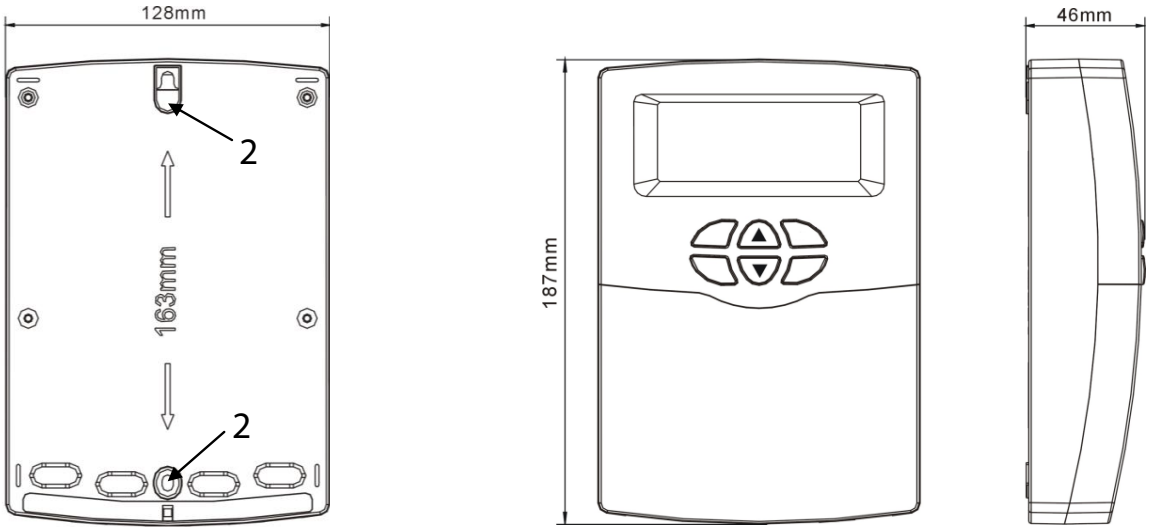
13. Installation

13.1 Controller assembly

Note: the controller can only be installed in a room with an adequate level of protection.

Fixing the controller's structure

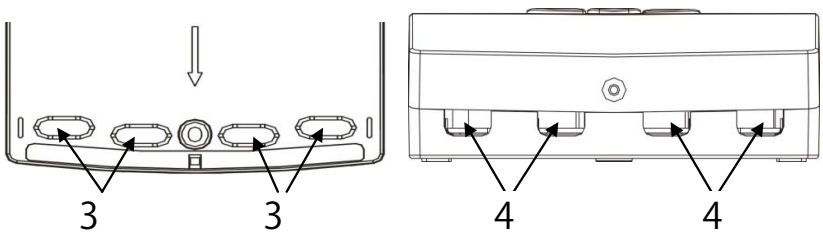
- Choose a suitable position
- Mark the position of the holes
- Drill the hole and insert the expansion screw
- Remove the cover
- Put the back plate in position 1
- Mark the holes 2
- Remove the back plate again
- Drill the hole
- Put the back plate back on and fix on 1
- Insert the screw into the holes 2 on the back plate.



13.2 Power supply connection

The power supply can only be supplied when the controller is closed. Ensure that the controller's IP protection rating has not been compromised during installation. Depending on the type of installation, cables can enter the device through the back hole 3 or the bottom hole 4; if the cables come through the back 3, use a suitable tool to remove the plastic flaps from the back of the frame. If the cables enter from the bottom 4: cut the plastic flaps on the right and left with a suitable tool (e.g. knife).

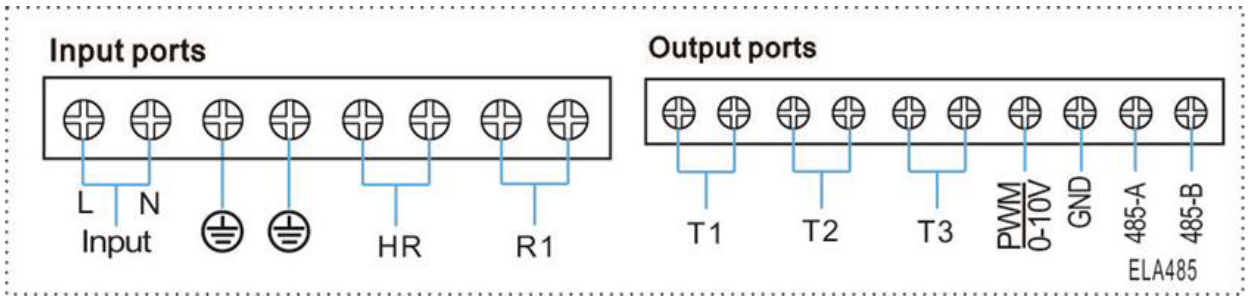
Notes: the flexible cable must be fixed on the case with the terminals



13.3 Connection to the terminals

Before opening the terminal block, make sure the controller is not powered.

Terminal block layout



13.4 Power supply connection

The power supply terminals are “N” and “L” (“Input Ports”); the earth terminal is GND.

13.5 Probe terminals

Connect the PT1000 probe that reads the solar collector’s temperature to terminal T1. Connect the NTC10K probes that read the temperatures in the solar tank to terminals T2 and T3.

13.6 Information on connecting the probes

The PT1000 temperature probe, which is appropriate for use in the solar collector, has a 1.5 m silicone cable, is suitable for all weather conditions and is resistant up to 280 °C. Connection polarity is not relevant.

The NTC10K temperature probes, which are appropriate for use in tanks and central heating plants, have a 1.5 m PVC cable and are resistant to temperatures up to 105 °C. Connection polarity is not relevant.

Do not lay probe cables close to power cables or other signal cables to avoid interferences and incorrect temperature readings. If they are laid close to other existing cables, provide a shielded cable to carry the signal from the probe to the controller.

For cables of up to 50 m long, cables with a cross-section of 0.75mm^2 are permissible; for cables longer than 50 m, use cables with a cross-section of 1.5mm^2.

13.7 Output terminals

Output R1: connect the solar pump (maximum current 1 A).

Output H1: connect the source/integration system (maximum current 2 A).

PWM/0-10V output: signal for solar pump speed control with PWM or 0-10 V signal input

13.8 Reading and changing the parameters

The parameters can be scrolled through and changed with the buttons under the display.

- : holiday button (see chapter 14.9)
- M.H. : do not use this button
- SET : used to enter menus to be changed
- ESC : exits and saves any settings changed
- ARROW or DOWN ARROW : displays the 3 different probes or increases/decreases the parameter to be changed

13.9 Technical information

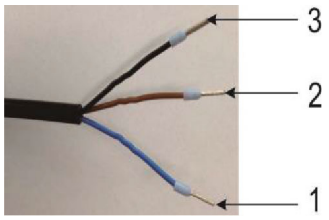
Description	Technical information
Dimensions	187mm x 120mm x 43mm
Power supply	AC 100....240V (50...60 Hz)
Absorption	< 3W
Temperature reading accuracy	±2 °C
Collector probe reading range	-10 ~ 220 °C
Tank probe reading range	0 ~ 110 °C
Permissible pump capacity	2≤ 600W
Inputs	1 Pt1000 probe (≤500 °C) for collector (silicone cable ≤280 °C), 2 NTC10K probes, B3950 (≤ 135°C) for tank, (PVC cable ≤105°C),
Outputs	1 semiconductor relay, max current 1 A, 1 relay for integration, max current 2 A, 1 PWM output (switchable On/Off, 0-10 V)
485 A/B communication port	Not active in this model
Environment temperature	-10°C ~ 40°C
Protection rating	IP41

13.10 Pack

Material	Quantity
Controller	1
Technical manual	1
PT1000 probe (bulb Ø 6.5 mm, cable 1.5 m long)	1
NTC10K probe (bulb Ø 6.5 mm, cable 1.5 m long)	2
Plastic expansion screw	3
Screw	3
Terminal	1

13.11 Connection of a high-efficiency solar pump with pwm / 0-10 v input

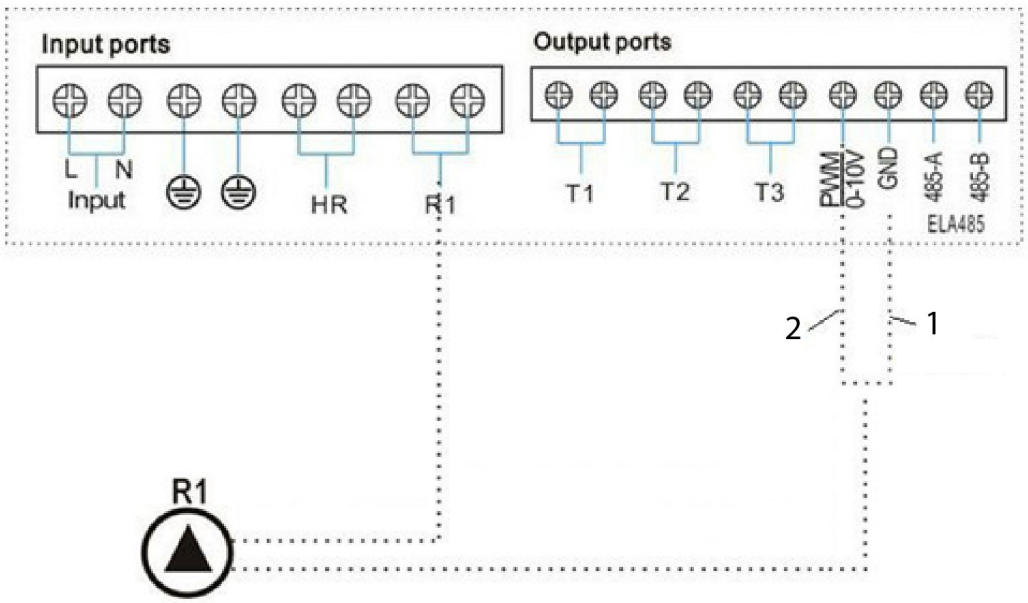
Connecting the PWM signal cable of the Sunwood solar units' high-efficiency pump.



Cable 1 (grey or blue) to GND terminal

Cable 2 (brown) to PWM / 0-10 V terminal

Cable 3 (black) **do not connect**



1 Grey or blue

2 Brown

Caution !!

Do not connect the black cable

Electronic pump cables

Power supply cable:

Brown wire	-	Phase
Blue wire	-	Neutral
Yellow/green wire	-	Earthed

PWM control cable:

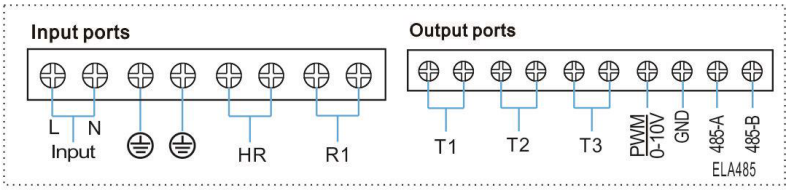
Brown wire	-	Phase
Blue wire	-	Neutral
Black wire	-	Not used

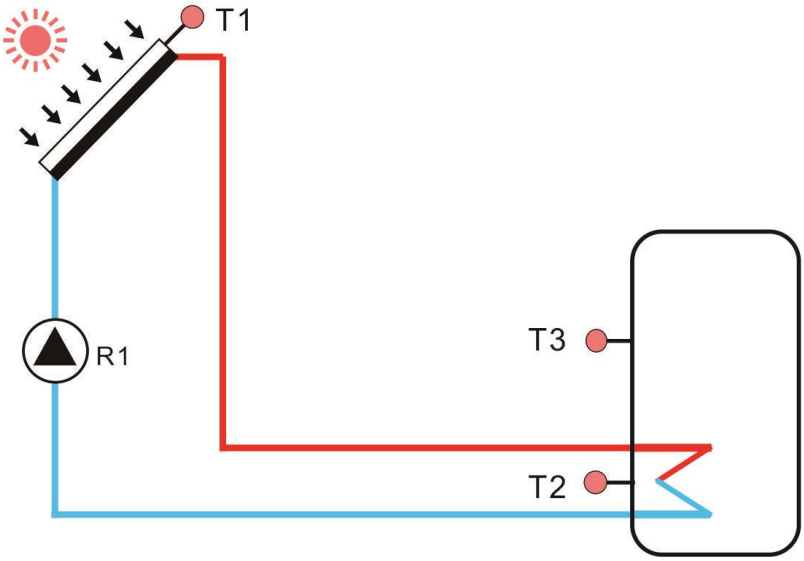
14. Connections based on the system

14.1 Solar system with panels and boiler

The controller manages the energy transfer between the solar collectors and the solar tank. Connect the solar connector's probe (T1, black silicone cable) to terminals T1; the probe at the bottom of the solar tank (T2, grey cable) to terminals T2; the solar pump to terminals R1, with earth to the terminal indicated (⏚).

Probe T3 must be connected to terminals T3, in which case it will function as a simple temperature display.



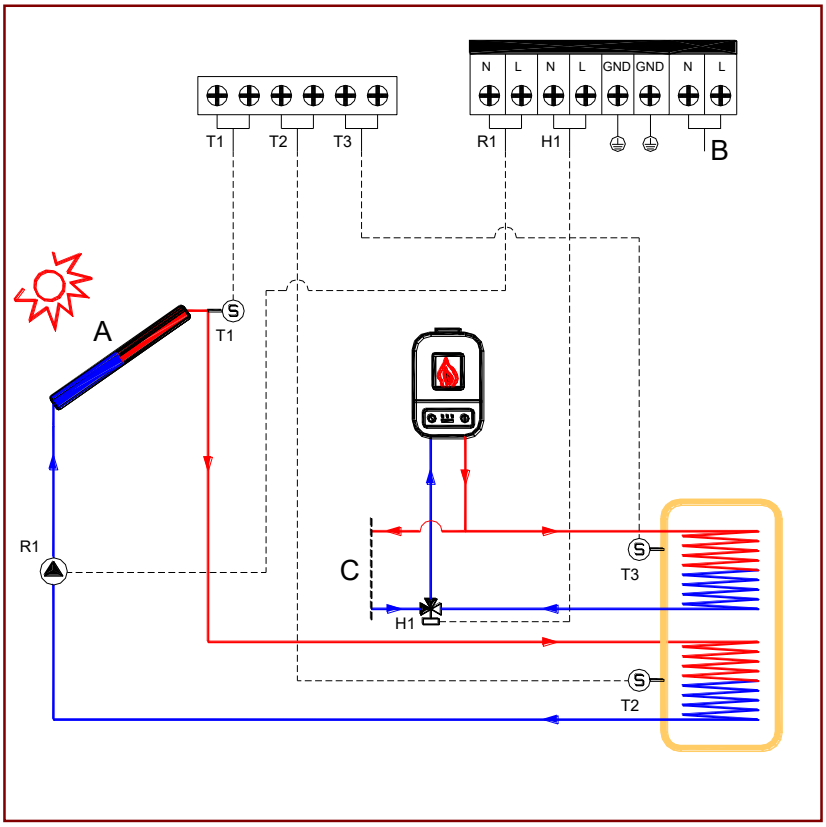


14.2 Solar system with panels, boiler and integration with heating-only boiler.

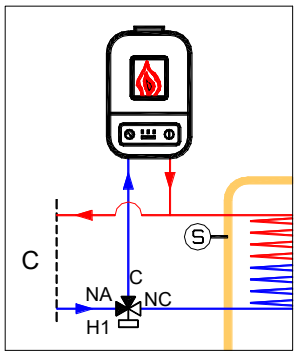
The controller manages the energy transfer between the solar collectors and the solar tank. It also manages integration from a traditional energy source (e.g. heating-only gas boiler), based on the temperature measured at the top of the solar tank.

Connect the solar connector's probe (T1, black silicone cable) to terminals T1; the probe at the bottom of the solar tank (T2, grey cable) to terminals T2; the probe at the top of the tank (T3, grey cable) to terminals T3; the solar pump to terminals R1, with earth to the terminal indicated (⏚); the switching valve for integration in the solar tank to terminals H1.

The motorised valve diverts the flow of power produced by the heating-only boiler (2-pipe) from the heating system to the top coil of the solar tank, when the temperature measured at that height by probe T3 is lower than the temperature set in the parameters.



A Solar unit
B Network
C Heating system



The valve body must be connected as follows: C way (common) to the cold return side of the boiler; NO way (normally open) to the heating side; NC way (normally closed) to the top coil side of the solar tank.

Caution! To simplify the graphics, the valve has been drawn with the servomotor facing downwards.

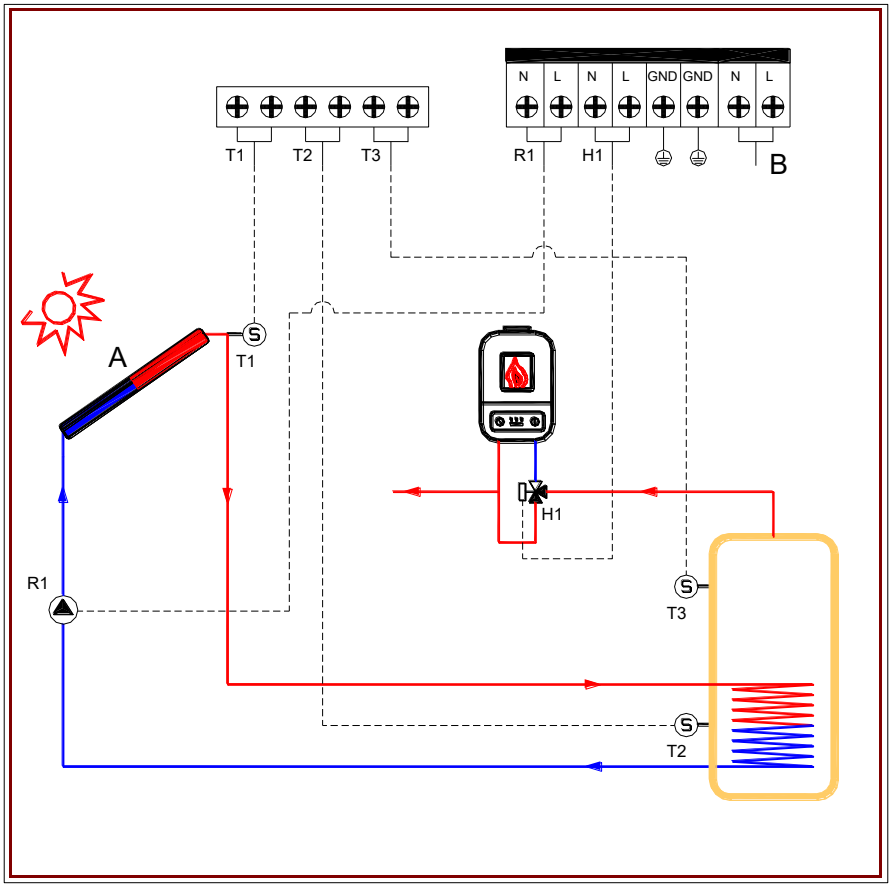
In reality, the motorised valve should be mounted so that the servomotor faces upwards or sideways.

14.3 Solar system with panels, boiler and integration with instant boiler

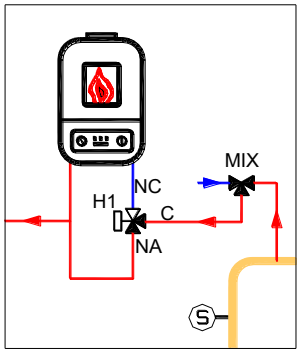
The controller manages the energy transfer between the solar collectors and the solar tank. It also manages activation for integration from a traditional energy source (e.g. boiler with instant production), based on the temperature measured at the top of the solar tank.

Connect the solar connector's probe (T1, black silicone cable) to terminals T1; the probe at the bottom of the solar tank (T2, grey cable) to terminals T2; the probe at the top of the tank (T3, grey cable) to terminals T3; the solar pump to terminals R1, with earth to the terminal indicated (⏚); the switching valve for integration in the solar tank to terminals H1.

The motorised valve diverts the flow of domestic hot water coming out of the solar tank in series to the instant production of the boiler or directly to the user, based on the temperature read at the top of the solar tank.



A Solar unit
B Network



The valve body must be connected as follows: C way (common) to the domestic hot water outlet of the solar tank (downstream of the thermostatic mixer); NC way (normally closed) in series with the instant production of the boiler; NO way (normally open) directly to the domestic hot water users.

Caution!

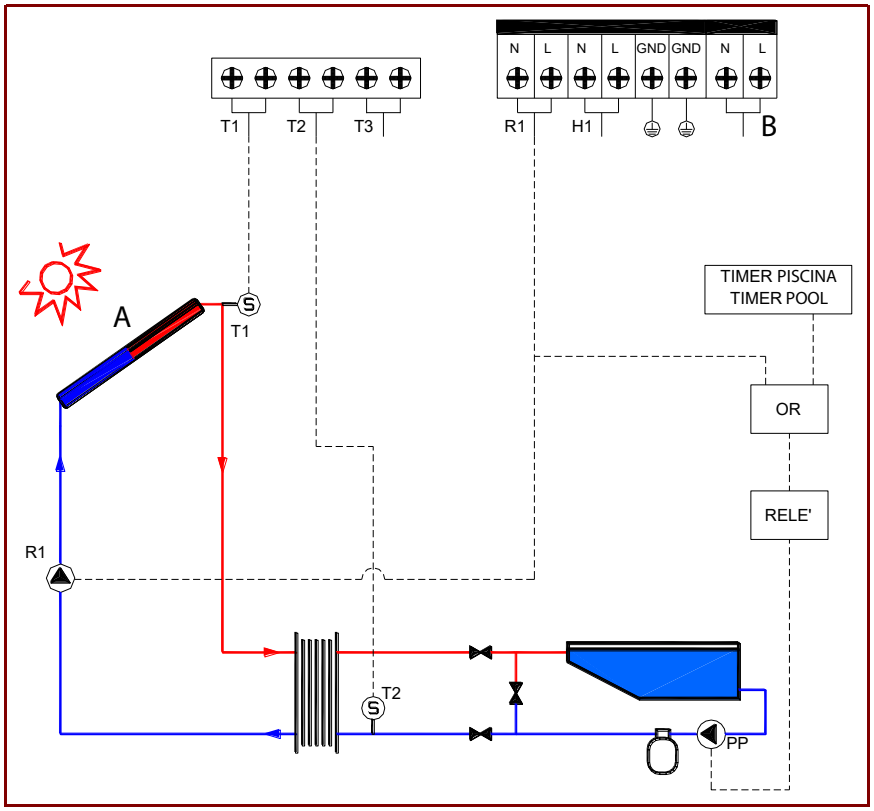
The motorised valve should be mounted so that the servomotor faces upwards or sideways.

14.4 Solar system with panels and pool

The controller only manages the energy transfer between the solar collector(s) and the pool by means of a plate heat exchanger, starting the solar pump based on the ΔT measured between the two points.

Connect the solar connector's probe (T1, black silicone cable) to terminals T1; the pool's cold return probe (secondary side of plate exchanger) (T2, grey cable) to terminals T2; the solar pump to terminals R1, with earth to the terminal indicated (⏚). Probe T3 can be connected to terminals T3, without affecting the controller's operating logic, but showing the temperature read on the display with T3.

In order to allow heat exchange between the solar circuit and the pool, the existing pool pump (PP), which is usually started by the POOL TIMER, must also be started together with the solar pump (R1). The existing pump can be controlled by either the POOL TIMER or the Solar 1 controller.

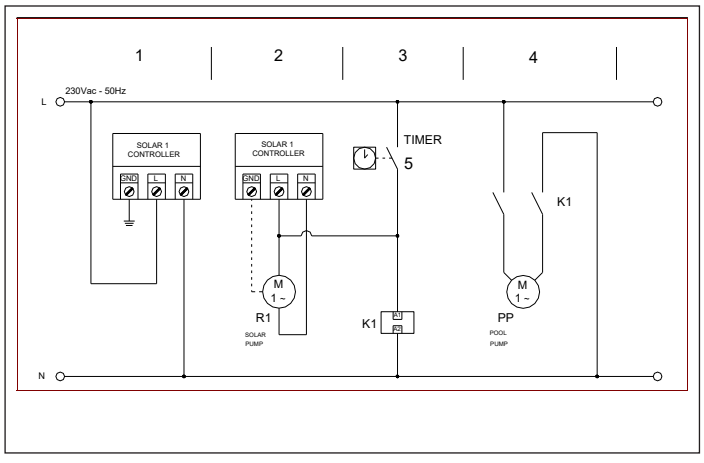


A Solar unit

B Network

NOTE: To avoid night leakage, the operating hours to be set on the POOL TIMER should be set to a daily time slot if necessary.

Electrical connection



1 Solar 1 controller power supply

2 Solar pump control

3 Existing pool pump control with timer

4 Existing pool pump control

Caution!! It is strongly recommended to fit a flow switch that interrupts the output signal of the controller's Relay 1 to the solar pump if there is no water flow in the pool pump circuit (secondary side of the exchanger).

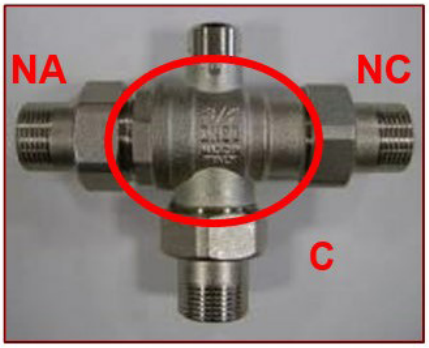
14.5 Electrical connection of the motorised valve

14.5.1 Electrical connection of the ITAP motorised valve

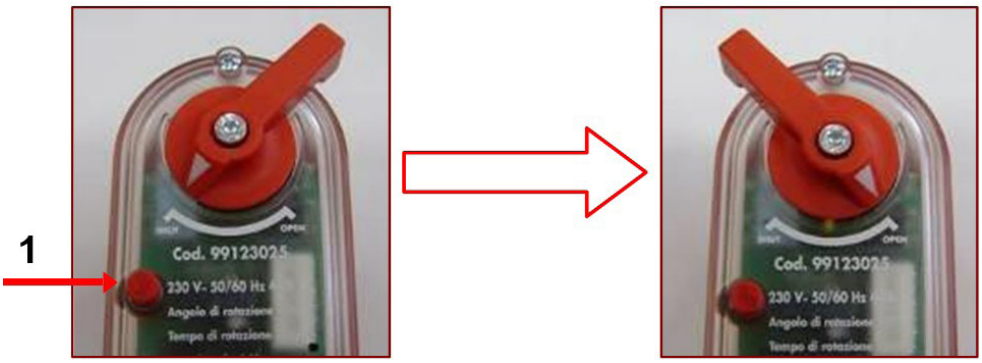
With an ITAP 982 valve, follow the instructions below for the correct water connection.

⚠ **Do not operate the valve body to couple it to the servo control!!**

Keeping the valve body so as to read the writing **¾"- DN20 - MADE IN ITALY** (as shown in the image below), the NO way (normally open) is to the left and the NC way (normally closed) is to the right.



To couple the servomotor to the valve body, remove the locking pin from its seat, manually set the servomotor position to **OPEN** with the red lever, while holding down the red button



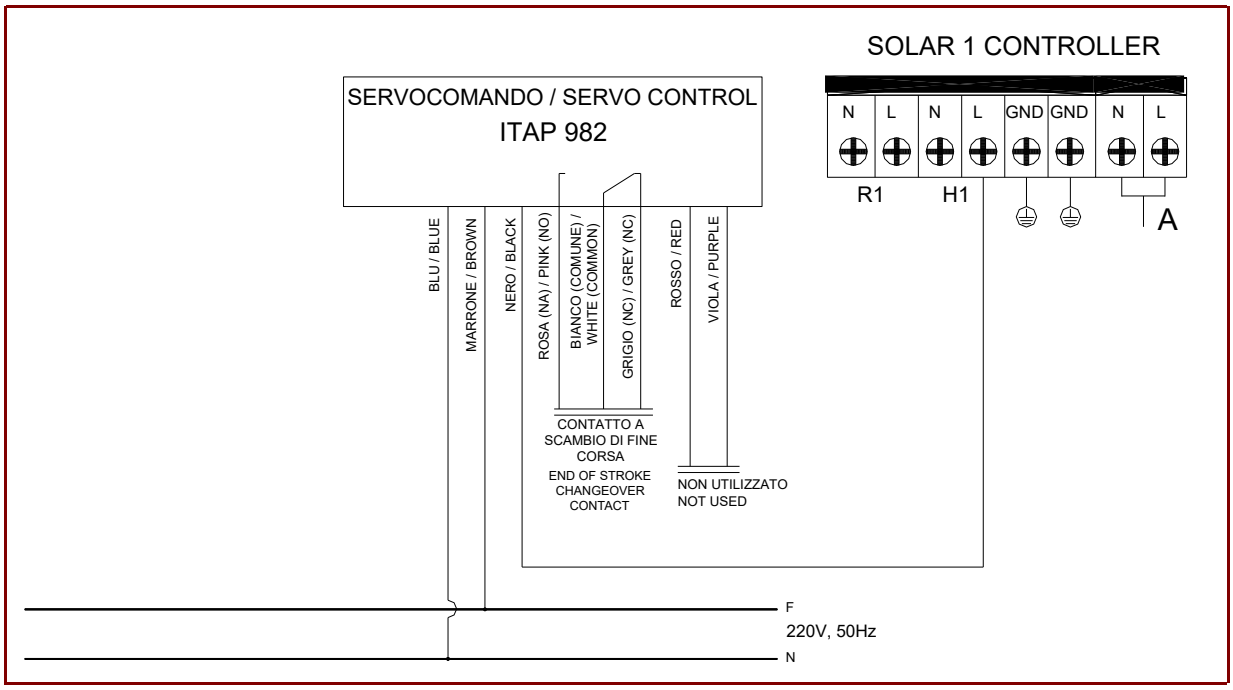
1 Button to be pressed to manually operate the red lever

CAUTION:

AFTER ASSEMBLY, DO NOT OPERATE THE SERVO CONTROL MANUALLY, IT WILL AUTOMATICALLY MOVE ITSELF TO THE CORRECT POSITION WHEN POWERED.

To electrically connect the ITAP 982 servo control to the Solar 1 controller, follow the diagram below while strictly observing the colours of the valve wires.

Electrical connection



A Network

In the absence of an output signal from the controller, the valve has the “NO” way open.

With an output signal from the controller, the valve has the “NC” way open.

14.5.2 Electrical connection of the Siemens motorised valve

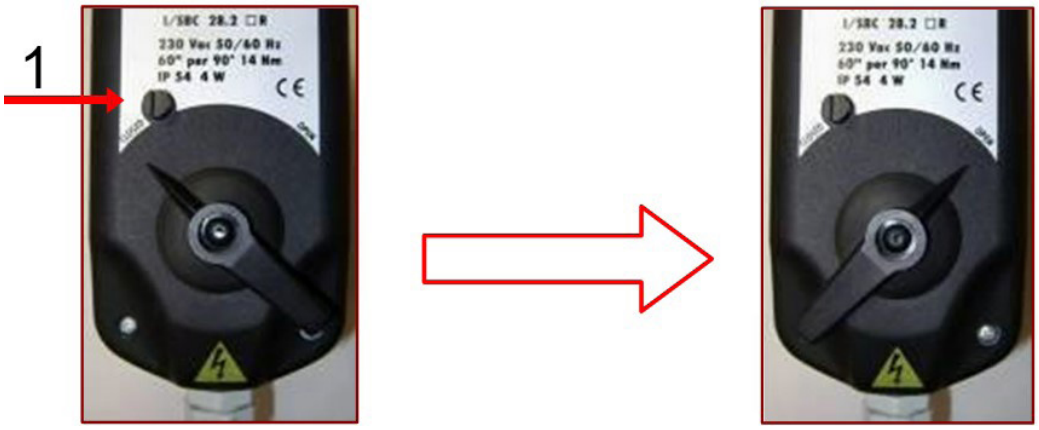
With a SIEMENS I/XBZ valve, follow the instructions below for the correct water connection.

⚠ **Do not operate the valve body to couple it to the servo control!!**

With reference to the diagram opposite, the valve ways correspond to the following markings on the valve body

Valve way (see diagram)	Correspondence on valve body
C	B
NO	AB
NC	A

To couple the servomotor to the valve body, manually set the servomotor position to **OPEN** with the black lever, while holding down the black button (see images below).



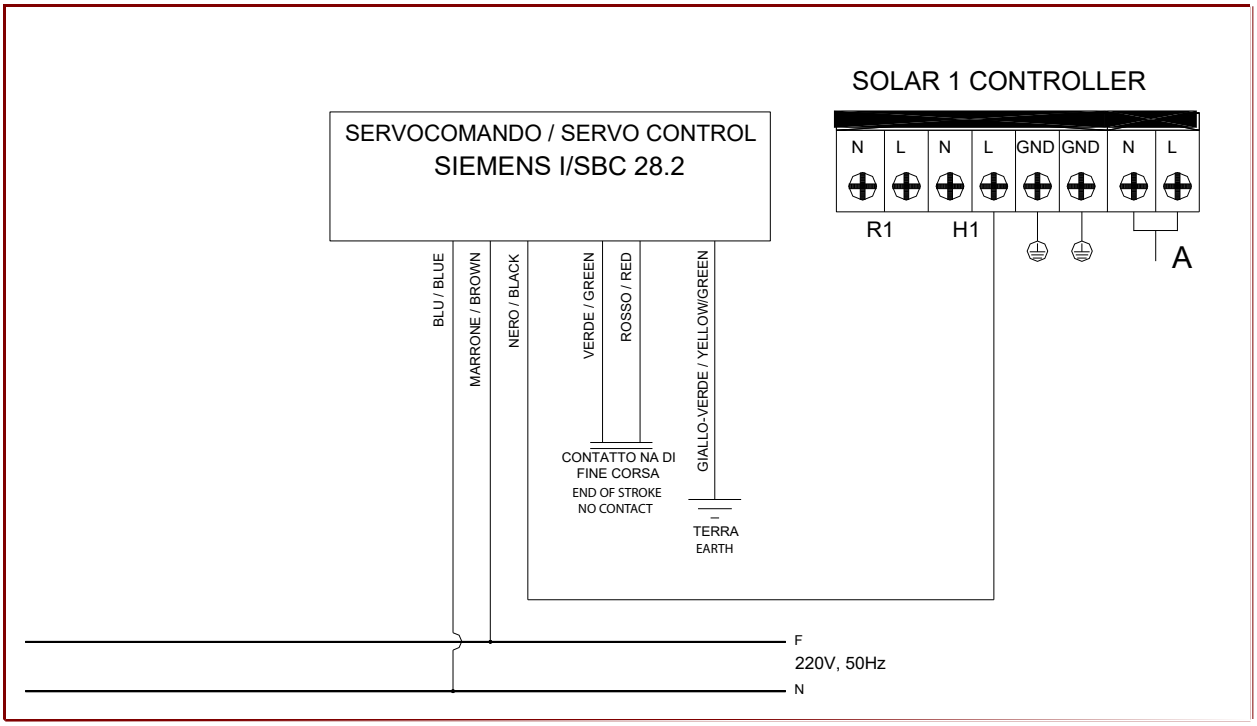
1 Button to be pressed to manually operate the black lever

CAUTION:

AFTER ASSEMBLY, DO NOT OPERATE THE SERVO CONTROL MANUALLY, IT WILL AUTOMATICALLY MOVE ITSELF TO THE CORRECT POSITION WHEN POWERED.

To electrically connect the Siemens I/SBC servo control to the solar controller, follow the diagram below while strictly observing the colours of the valve wires.

Electrical connection



A Network

In the absence of an output signal from the controller, the valve has the “NO” way open.
With an output signal from the controller, the valve has the “NC” way open.

14.6 Parameter setting (user)

Connect the probes, pumps or switching valves to the controller before supplying power! The parameters that can be set at user level are the time and the thermostat temperature for integration/dissipation (if integration is not managed by the boiler with its own probe). To change other parameters at expert level (see chapter 13.15), the password must be entered, which is factory set to **0000**.

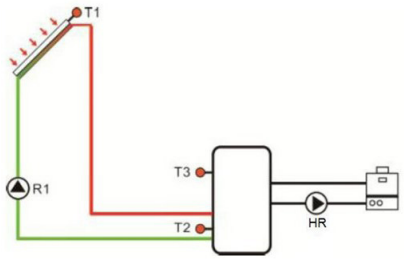
14.6.1 Setting the time (CLK)

- Press the ESC button several times to display the time at the top and the temperature at the bottom
- Press the SET button to display the CLK menu
- Press the SET button again, the hours will start to flash on the display
- Press the ▲/▼ arrows to edit the hour
- Press the SET button to confirm, the minutes will start to flash on the display
- Press the ▲/▼ arrows to edit the minutes
- Press SET or ESC to save the changes

Note: in the event of a power failure, the date and time will be kept for 36 hours

14.6.2 Thermostatic function setting (AH) on relay H1, for integration/dissipation/valve control

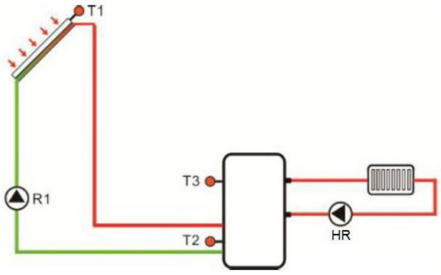
The thermostatic function operates independently of the solar control and can be used, for example, to transfer/dissipate surplus energy or for integration on the boiler by a generator.



If set:

AH O < AH F

The function is set for integration



If set:

AH O > AH F

The function is set to dissipate surplus energy

It is possible to select the sensor (parameter AHS) to which the thermostatic function refers (T2(S2) or T3(S3))

The operating times and temperatures of relay HR (integration) can be managed with up to 3 time slots within 24 hours.

Press the ESC button several times to display the time at the top and the temperature at the bottom, then press the SET button once to display CLK; now scroll through the parameters with the ▲ button to display parameter AH. Press the SET button again to display parameter AHS where the reference probe can be set, S3 default setting (press SET and ▲/▼ to edit, then press SET or ESC to save).

Scroll through the parameters with the ▲ button to set the switch-on/off temperatures and the 3 time slots in sequence, as given in the table below:

The settings of each submenu can be accessed and edited by pressing the SET button.

Parameter	Designation	Default setting	Recommended setting	Range	Notes
AHS	Reference probe for integration	S2	**S3**	S2/S3	Note: For integration of a boiler in the top boiler coil, change the reference probe of parameter AHS from S2 to S3.
AHO	Slot switch-on temperature	45°C	**40°C (in the event of integration with instant boiler)** **45°C (in the event of integration with heating-only boiler)**	10°C ÷ AHF-2°C	Relay H1 (integration) is in operation if during one of the 3 set time slots the temperature read by probe T3 is lower than the switch-on temperature. The relay remains energised until the switch-off temperature is reached When probe T3 is not installed, the controller will acquire the signal from T2 to control the integration function.
AHF	Switch-off time	55°C	**42°C (in the event of integration with instant boiler)** **55°C (in the event of integration with heating-only boiler)**	AHO +2°C ÷ 80°C	
					For each parameter press SET and use the +/- buttons to edit the hours, minutes and temperatures. After setting the temperature, press the ESC button to confirm the changes. Press the +/- buttons to move from one value to another
tA1O	Time slot 1 switch-on time	00.00	**00.00-23:59**		
tA1F	Time slot 1 switch-off temperature	23:59	**00.00-23:59**		
tA2O	Time slot 2 switch-on time	00.00	**as required (see notes to the side)**		**Note** – The switch-off time must be longer than the switch-on time. For example: to set the 17.00 to 6.00 slot, it must be split into two slots, the first from 17.00 to 23.59, the second from 00.00 to 06.00.
tA2F	Time slot 2 switch-off temperature	00.00	**as required (see notes to the side)**		
tA3O	Time slot 3 switch-on time	00.00	**as required (see notes to the side)**		– If the controller is not to control any integration, set the start and end times at the same value.
tA3F	Time slot 3 switch-off temperature	00.00	**as required (see notes to the side)**		– If you don't want to split the integration into time slots, set the switch-on time at 00.00 and the switch-off time at 23.59.

NOTE:

An electric heater can be installed in the boiler for integration. If an electric heater is used as integration, it is advisable to have a back-up contactor (power relay) so as to supply the heater with the correct contact capacity.

When the integration is in operation, the relative symbol flashes on the display.

14.7 Parameter setting (expert)

Connect the probes, pumps or switching valves to the controller before supplying power! The parameters to be set are the time, the password and the system parameters.

As soon as the controller is switched on, it displays the time and the temperature read by probe T3. Press the +/- button to scroll through the temperatures measured by the 3 connected probes (T1,T2,T3), the pump speed percentage (n1 %), the days elapsed since the first start-up (DAYS), and the version of the software implemented in the controller (SW). When ESC is pressed, the controller returns to displaying the time and the temperature read by probe T3.

Parameter	Designation	Default setting	Recommended setting	Notes
T1	Collector Temperature (T1)	Read only		Temperature in °C
T2	Tank Temperature (bottom, T2)	Read only		Temperature in °C
T3	Tank Temperature (top, T3)	Read only		Temperature in °C

To scroll through the menus, choose the parameters, edit them, and then save the changes always following the sequence below:

- press SET to enter a menu or submenu
- press the arrows to scroll through the parameters or submenus
- press SET to enable the change
- change the value with the arrows
- press SET (or ESC) to confirm the change and ESC to exit

To open the editable parameters (expert level) Press the ESC button several times to display the time at the top and the temperature at the bottom, press SET once and then the editable time (CLK) and integration thermostat (AH) parameters (user level), confirm or change the password (PWD) which is factory set to “0000” (use the +/= buttons to enter the 4 password digits and confirm each one with the SET button). To set a new password see (PASS)

Once the password has been entered, e.g. after confirming each digit of the default password with the SET button, it is possible to scroll through the main menu and change the other parameters (expert level)

Main menu:

LOAD	COL	PUMP	COOL	MAN	BLPR	OTDI	UNIT	BEEP	RET	PASS

LOAD

In this menu, the parameters are set for switching the solar pump on/off.

Parameter	Designation	Default setting	Recommended setting	Range	Notes
DTO	Temperature difference On for relay 1 (R1)	8,0 °C	6,0÷8,0 °C	1÷50 °C	Minimum ΔT for switching on the solar pump. **Press SET and then the +/- buttons to change the parameter. Press ESC to confirm.**
DTF	Temperature difference Off for relay 1 (R1)	4,0 °C	4,0 °C	0,5÷49,5 °C	Minimum ΔT for switching off the solar pump **Press SET and then the +/- buttons to change the parameter. Press ESC to confirm**

NOTE: to avoid errors, DTO and DTF cannot be set with a difference of less than 0.5°C

Parameter	Designation	Default setting	Recommended setting	Range	Notes
DTS	Temperature difference (T1-T2) at which the speed control of the solar pump (R1) starts	10,0 °C	10 °C	1,5÷50 °C	
RIS	Temperature rise above DTS at which a 10% increase in solar pump speed is triggered	2,0 °C	2,0 °C	1÷20 °C	
SMX	Maximum temperature for collecting solar energy in the tank	85 °C	70÷85 °C	4÷95 °C	
SMAX	Sensor for measuring the maximum temperature in the tank	S2	S2	S2 / S3	S3 stands for T3, S2 stands for T2
HYST	Hysteresis for maximum tank temperature	2 °C	2 °C	0,1÷10 °C	

COL

In this menu, the parameters are set for the collector.

Parameter	Designation	Default setting	Recommended setting	Range	Notes
OCEM	Enabling the collector Limit temperature function	ON	ON °C	ON / OFF	If set to ON, sub-parameter CEM is displayed where the limit temperature value can be set
Sub-parameter CEM	Collector limit temperature	130 °C	130 °C	80÷200 °C	if exceeded, ✹⚠ (10 °C hysteresis)
OCCO	Enabling the collector cooling function	ON		ON / OFF	If set to ON, sub-parameter CMAX is displayed where the temperature value can be set at which the solar pump switches on to cool the collector. 5 °C hysteresis
Sub-parameter CMAX	Collector limit temperature	110 °C	110 °C	70÷160 °C	
OCMI	Enabling the collector's minimum temperature function	OFF		ON / OFF	If set to ON, sub-parameter CMIN is displayed where the minimum temperature value can be set for enabling solar pump switch-on
Sub-parameter CMIN	Collector's minimum temperature for enabling solar pump operation	10 °C	30 °C	10÷90 °C	
OCFR	Enabling the antifreeze function	OFF		ON / OFF	If set to ON, sub-parameters CFRO and CFRF are displayed where the temperatures can be set at which the solar pump switches on and off to perform the antifreeze function
Sub-parameter CFRO	Temperature below which the pump switches on in antifreeze mode	4 °C	4 °C	-40÷8 °C	

Sub-parameter CFRF	Temperature above which the pump switches off in antifreeze mode	5 °C	5 °C	-39÷9 °C	
OTCO	Enabling the pipe collector function	OFF		ON / OFF	If set to ON, sub-parameters TCST / TCEN / TCRU / TCIN are displayed where the values can be set to control periodic switching on of the solar pump in cases where tube collectors are used and the probe is not fitted in the collector.
Sub-parameters **TCST** **TCEN** **TCRU** **TCIN**	Start-up time Switch-off time pump ON time pump OFF time	07:00 19:00 30 sec. 30 min.	00-23:00 00-23:00 30-300 sec. 5-60 min		

PUMP

In this menu, the control mode is set for the solar pump (R1/PWM 0-10 V).

Parameter	Designation	Default setting	Recommended setting	Range	Notes
C	Setting for standard pump without speed control	OFF		ON / OFF	
* **PULS**	Setting for standard pump with speed control (not used for high-efficiency pumps)	OFF		ON / OFF	
* **PSOL**	Setting for high-efficiency pumps with speed control and PWM control (solar)	130 °C		ON / OFF	already ON for a high-efficiency solar pump with PWM input (present in all new solar units)
* **PHEA**	Setting for high-efficiency pump with speed control and PWM control (heating)	OFF		ON / OFF	
* **0-10**	Setting for pumps with 0-10 V control input	OFF		ON / OFF	

* For each of these 4 parameters, if enabled ON (and consequently automatically disabling the others), the following sub-parameters are displayed (which can be left with their default settings):

Sub-parameter min1	Minimum speed of the solar pump connected to relay R1	30 %	30 %	20÷95%	
Sub-parameter max1	Maximum speed of the solar pump connected to relay R1	100 %	100 %	25÷100%	

COOL

In this menu, the parameters are set to activate 3 cooling functions: system cooling (OSYC), tank cooling (OSTC), heat dissipation on a heat sink.

The system cooling function (OSYC) enables energy to continue to be stored in the tank beyond the maximum temperature value set in parameter SMX (and in any case not more than 95 °C), thus allowing overheating to be dissipated from the collectors until the limit temperature stored in parameter CEM has been reached on the panel or the limit temperature of 95 °C has been reached in the tank.

NOTE: this function is available, only the collector cooling and heat dissipation on a heat sink functions are not activated.

The tank cooling function (OSTC) allows the controller, if the temperature measured in the tank is higher than parameter SMX and the temperature measured in the collector falls, to switch on the pump and dissipate the energy stored in the tank (typically during the night). If the temperature in the tank is higher than parameter SMX and the temperature difference set in parameter DTCO is reached, the solar circuit pump remains on or is switched on until the temperature difference (tank-collector) falls below the value stored in parameter DTCF.

Parameter	Designation	Default setting	Recommended setting	Range	Notes
OSYC	Enabling the system cooling function	OFF		ON / OFF	
OSTC	Enabling the boiler cooling function	ON		ON / OFF	if activated, the ✹ symbol flashes on the display
Sub-parameter DTCO	Collector limit temperature		20 °C	1÷30 °C	
Sub-parameter DTCF	Collector limit temperature		15 °C	0,5÷29,5 °C	

MAN

In this menu, relay outputs R1 and HR can be forcibly set to ON. If one of the 2 relays is manually switched ON, the flashing ☝ symbol is displayed. After 15 minutes, the controller automatically resets automatic operation of the relays. The relays actually switch ON only when all the menus have been exited (by repeatedly pressing the ESC button).

Parameter	Designation	Default setting	Recommended setting	Range	Notes
R1	Forced switch-ON of relay 1	OFF		ON / OFF	If set to ON, relay R1 will forcibly operate for 15 minutes regardless of the control laws
HR	Forced switch-ON of relay HR	OFF		ON / OFF	If set to ON, relay HR will forcibly operate for 15 minutes regardless of the control laws

BLPR

In questo menù (protezione delle pompe da bloccaggi) si attiva la funzione che ogni giorno, alle 12:00 aziona per 10 secondi i relè in sequenza per evitare bloccaggi della pompa.

Parameter	Designation	Default setting	Recommended setting	Range	Notes
BLPR		OFF		ON / OFF	

OTDI

In this menu, the thermal disinfection function is activated, which starts the additional heating (relay HR) on the boiler to help prevent Legionella in the domestic hot water tank. Activation of this function ensures that at the end of the monitoring period (PDIS), the disinfection temperature (TDIS) is reached continuously, without interruption, during the disinfection phase (DDIS). The monitoring period begins as soon as the temperature in the tank drops below the disinfection temperature. At the end of the monitoring period (PDIS), the disinfection period begins at the set time (SDIS) where the additional heating is switched on. Once the disinfection temperature is exceeded, the disinfection phase begins for the time set in parameter DDIS.

Parameter	Designation	Default setting	Recommended setting	Range	Notes
OTDI	Enabling the thermal disinfection function of the boiler	OFF		ON / OFF	
Sub-parameter PDIS	Monitoring period	7d (7 days)		0÷30 d	
Sub-parameter DDIS	Disinfection phase	10 min		1÷180 min	
Sub-parameter TDIS	Disinfection temperature	70 °C		0÷90 °C	
Sub-parameter SDIS	Disinfection start time	18:00 °C		00:00÷21:00	

UNIT

In this menu, the unit of measurement for temperatures, either degrees Celsius (°C) or degrees Fahrenheit (°F), is selected.

Parameter	Designation	Default setting	Recommended setting	Range	Notes
UNIT					
Sub-parameter TEMP	Switch from °C to °F	°C		°C / °F	

BEEP

In this menu, it is possible to choose whether to enable the acoustic alarm in case of probe failure

Parameter	Designation	Default setting	Recommended setting	Range	Notes
BEEP	Enables/disables the acoustic alarm in case of probe failure	OFF		ON / OFF	Press ESC to stop the acoustic warning

RST

In this menu, the controller can be reset to the default settings. All changes made to the parameters will be cancelled.

Parameter	Designation	Default setting	Recommended setting	Range	Notes
RST	Resets the parameters to the default settings				Press SET to display sub-parameter RSTP
Sub-parameter RSTP					Press SET to display the flashing word YES. **Press the SET button for 3 seconds to hear 3 beeps in sequence and the controller will be reset to the default parameters**

PASS

In this menu, a new password can be set for the controller

Parameter	Designation	Default setting	Recommended setting	Range	Notes
PASS					Press SET to display submenus PWDN and PWDG
Sub-parameter PWDN PWDG		0000			PWDN: Press SET and the first digit will start flashing. Change the value with the arrows and confirm by pressing the SET button again. Follow this procedure for the next 3 digits. Parameter PWDG is then displayed, where the newly-entered password must be reconfirmed, and lastly OK is displayed with the Password set below it. **Should the password be forgotten, it can be reset to the default setting (0000) as follows:** **a) switch off the controller** **b) hold down the ESC button and switch the controller back on, once you hear 3 beeps in sequence release the ESC button**

14.8 M.H. (manual heating function) button

⚠ **Do not use this function**

14.9 (Holiday function) button

The holiday function can be used to manage the solar system when no domestic hot water will be used, such as when on holiday. This function, if enabled, cools the system to reduce the thermal level. When the temperature at the top of the tank drops below 35 °C, the solar pump is switched off.

To enable/disable this function:

- press the button for 3 seconds, HDAY 05 is displayed
- press the arrows to set the number of holiday days (from 0 to 99)
- press the button again to confirm
- to disable the function, set the holiday days at 0 and press
- during the holiday function enabling period, any integration controlled by the controller (relay H1) will remain disabled.

14.10 Protection functions

Memory protection

In the event of a power failure, the controller retains the parameters recorded.

Screen protection

If no button is pressed for 3 minutes, screen protection is automatically activated and the light on the LCD display switches off. Press any button to switch the display back on.

14.11 Troubleshooting

Protection against problems

When there is a break or short circuit to the temperature probes, the controller disables the outputs and the error symbol is displayed at the same time. If the controller does not work properly, carry out these checks:

Press the +/- buttons to check the error code, the symbol is displayed.

Error message on the display	Description	Cause of error	Corrective action
T1	Probe T1 problem	Probe cable broken, disconnected or short-circuited	Check resistance value, replace
T2	Probe T2 problem	Probe cable broken, disconnected or short-circuited	Check resistance value, replace
T3	Probe T3 problem	Probe cable broken, disconnected or short-circuited	Check resistance value, replace

Meaning of the symbols

Description of the status	Parameter	Fixed symbol on the display	Intermittent symbol on the display
Temperature in the tank above the maximum SMX value	SMX		
The tank's emergency function is activating, which switches off the solar pump because the safety temperature in the tank has been reached (95 °C)			
The collector's emergency function is activating, which switches off the solar pump because the safety temperature in the collector set in parameter CEM has been reached	CEM		
Collector cooling function on	OCCO		
Tank cooling function on	OSTC		
System cooling function on	OSYC		
Antifreeze function enabled	OCFR		
Antifreeze function running	OCFR		
Collector's minimum temperature function on	OCMI		 flashes slowly

Meaning of the symbols

The controller is a quality product, designed for continuous, problem-free use for many years. Very often the cause of problems does not lie within the controller but in external devices or events. The table below should help to identify and solve the problem as quickly as possible. Of course, not all problems can be found in this table, but it can be a valuable aid in identifying the cause of the problem. After completing all the checks in the table, contact our Technical Department.

Problems	Secondary problem	Possible cause	Corrective action
The controller does not seem to work	The display shows nothing and is not backlit	The power supply to the controller is interrupted or the program is not working	Check the power cable; press the reset button
The solar pump does not work, even though the ΔT has been met and manual operation is on	The pump symbol on the display flashes	The pump symbol on the display flashes	The cable from the controller to the pump is interrupted
Check the pump and/or the pump power cable	The pump symbol on the display does not flash. on flashing	The maximum tank storage temperature (SMX) has been reached. The maximum solar collector temperature (EM) has been reached.	No fault
	T1__ Error message is displayed	Fault (short circuit or open circuit) in a temperature probe	Check the current value on the temperature probes on the controller; replace faulty probes and/or connection cables
The solar pump works, even though the conditions have not been met.	The pump symbol on the display flashes	Antifreeze protection function on; tank or collector cooling function on.	No problem, this is normal. Disable the functions, if necessary

Caution! Disconnect the device from the mains before opening!

If a probe is potentially faulty, it can be checked with an ohmmeter to verify its condition. To do this, disconnect the probe from the controller's terminal block and compare it with the data in the table below (accuracy ± 1%).

Resistance value for PT1000 probe

°C	0	10	20	30	40	50	60	70	80	90	100
Ω	1000	1039	1077	1116	1155	1194	1232	1270	1309	1347	1385

Resistance value for NTC 10K B=3950 probe

°C	0	10	20	30	40	50	60	70	80	90	100
Ω	33620	20174	12535	8037	5301	3588	2486	1759	1270	933	697

15. Start-up

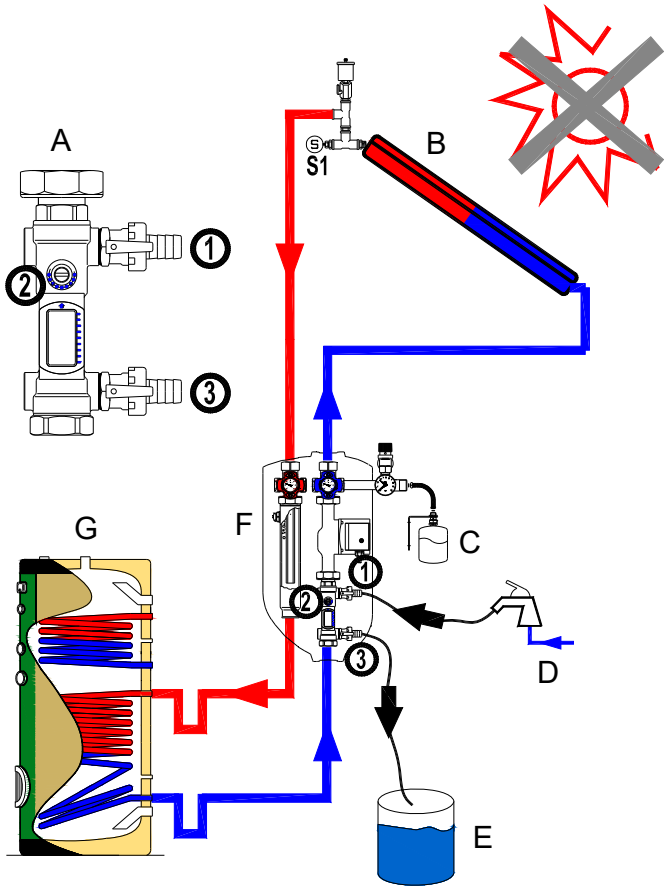
15.1 Cleaning the solar circuit

The two taps in the solar unit are used for cleaning and filling, one for filling and the other for draining, separated by a shut-off valve. For better operation, try to position the taps in the solar unit at the lowest point of the system. If necessary, add a 3rd tap at the lowest point of the system, which shall be used to completely drain the system.

Before filling the system with the water and antifreeze mixture, rinse it out by circulating water. This will remove all processing residues from the solar circuit.

System cleaning operations

- Open the tap (1) and connect it to a cold water tap with a rubber hose
- Close the shut-off valve (2).
- Open the tap (3) and connect it to a water drain with a rubber hose.
- Close the shut-off valves of the automatic vent valves located on the solar collectors or all the manual vent valves.
- Now open the water tap and let the water flow steadily for a few minutes through the solar circuit.



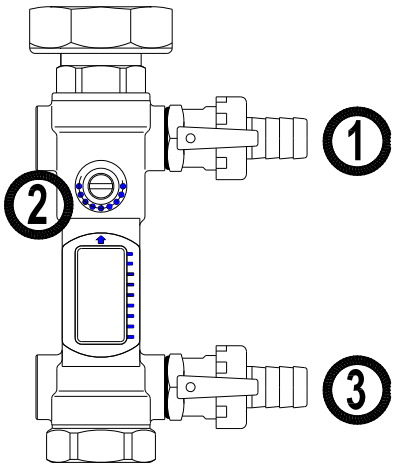
A Flow meter detail
B Solar unit
C Solar expansion tank
D Water from the mains
E Solar control unit
F Disposable water
G Boiler

If this operation is performed when there is a risk of frost, be especially careful when draining the collector afterwards to avoid the formation of ice and consequent breakage of the panel.

If the collectors are not to be operated for long periods, it is advisable to disconnect them from the rest of the system so that the air inside can flow freely, and cover them with a garden shading cover to prevent them from overheating.

15.2 Checking the tightness and emptying

Checking the tightness



Finish the rinsing phase by closing the tap (3).

Raise the pressure inside the solar circuit to reach a high pressure, which should be higher than the operating pressure (see next page) and no more than 0.2 bar less than the pressure relief valve setting (e.g. pressure relief valve 6 bar, test at 5.8 bar).

Close the tap (1) and then close the water tap as well.

Open the shut-off valve (2).

Set the solar circuit pump to run in manual operation on the controller, open the shut-off valves of the vent valves and discharge all the air from the solar circuit, and then by hand:

- on the roof, take the cap off the vent valve and apply pressure with the tip of a screwdriver;
- in the central heating plant, use the degasser in the solar unit.

Check the pressure again and, if necessary, restore it by opening the tap (1) and the water tap.

Visually check all pipes and fittings carefully for leaks and leave the system under pressure for a few hours to check for pressure drops.

The system can be operated for a trial period with water only circulating to check for leaks, if there is no risk of frost.

It has often happened that new systems freeze because the owner bought antifreeze but did not put it into the system. To avoid these problems, make sure antifreeze is actually added.

BREAKAGE DUE TO ICE IS NOT COVERED BY THE WARRANTY

Draining the solar circuit

- ▶ Connect both taps with rubber hoses into a bucket and drain the system. The amount of water can be measured and used to prepare the water-glycol mixture.
- ▶ To drain the system, keep the vent valves open to let air in; apply pressure with a screwdriver, if necessary, to facilitate the operation.
- ▶ Always ensure that all the water charged in the circuit has drained out of the system to prevent it from freezing and damaging the panel

15.3 Antifreeze and charging pressure %

Before filling the circuit, check the pre-charging pressure of the expansion tank with a pressure gauge or with a bicycle pump, which must be about 0.3 bar less than the cold charging pressure of the system.

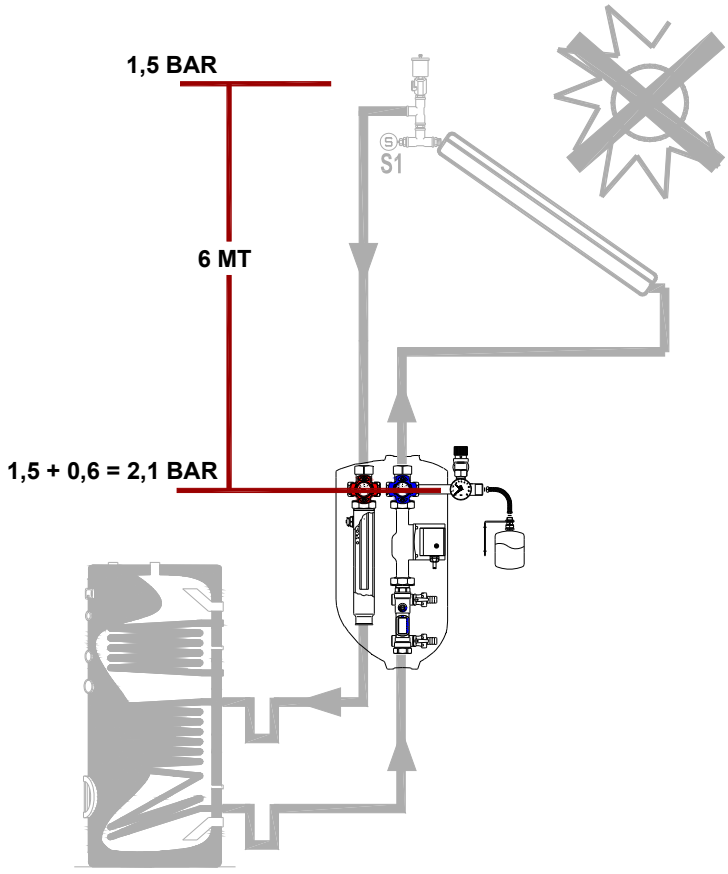
If antifreeze is to be used, the water and glycol must be mixed in a container before being charged into the system. The percentage of glycol depends on the minimum temperature that can be reached in the area where the system is to be installed (this can be found in the historical data on minimum temperatures in the area). This temperature must be reduced by at least another 10°C because the panel can cool down by about 6-7°C more than the environment temperature.

To be on the safe side, antifreeze should be added up to a volume of 40% of the total mixture and no less, regardless of the degree of protection, in order to have an effective corrosion-inhibiting function for the pipes, as this percentage of antifreeze contains a quantity of inhibitor that prevents the antifreeze, which is an organic substance, from prematurely acidifying and turning corrosive towards the system components.

BREAKAGE DUE TO ICE IS NOT COVERED BY THE WARRANTY

The cold charging pressure of the system must be 1.2 - 1.5 bar in the solar collector. If the charging point of the system is in the central heating plant, the pressure resulting from the hydrostatic difference in height between the central heating plant and the solar collector must also be added.

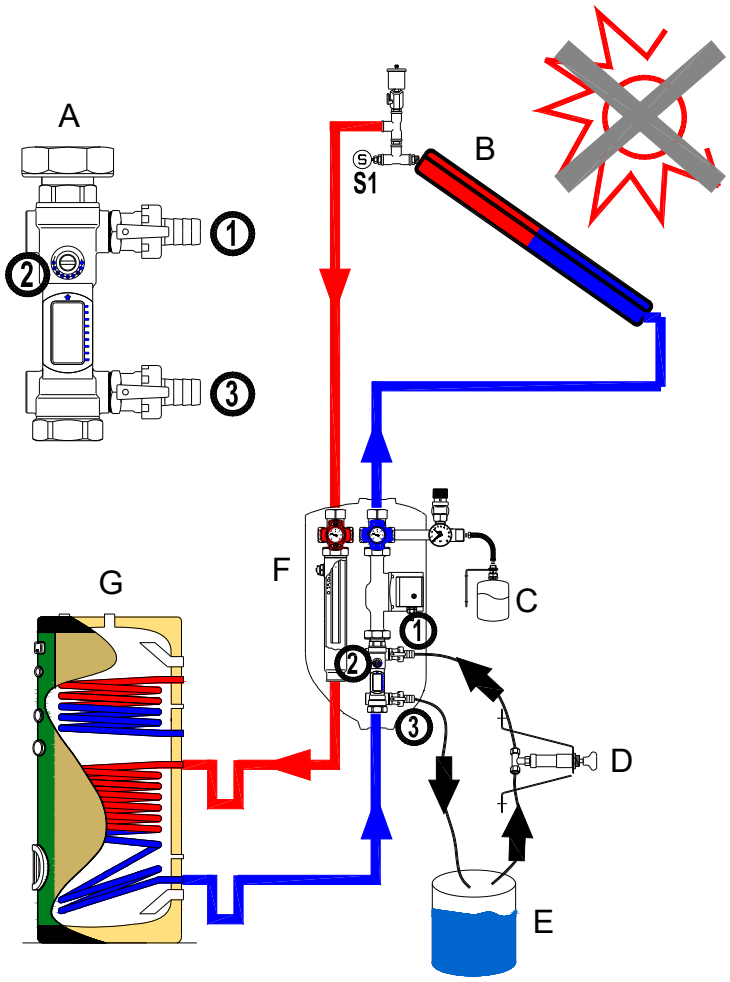
For example, if the collector park is located on the roof, at about 6 m higher than the central heating plant, and 6 m = 0.6 bar, the system will have to be charged at 2.1 bar (1.5 bar + 0.6 bar).



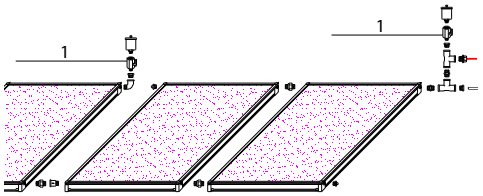
15.4 Filling the solar circuit

The operations must be carried out when the system is cold (early morning) or alternatively by covering the collectors (e.g. with its packaging box).

- Open the taps (1) and (3) and close the shut-off valve (2).
- Connect a filling pump (e.g. manual charging pump or Chromagen system charging pump) to the container and tap (1).
- Connect a rubber hose from the tap (3) to the container.
- Open all the shut-off valves upstream of the automatic vent valves and all the manual vent valves (with the Chromagen automatic charging pump, these can be left closed: the advantage compared to a manual pump is that all the air is removed).
- Fill the circuit with the water-glycol mixture until the fluid starts coming out of the tap (3).
- Close the tap (3). The pressure inside the solar circuit must be increased to the desired initial pressure (see previous chapter). Then close the tap (1) and stop charging.
- Open the shut-off valve (2).
- Switch on the solar circuit pumpand set to continuous operation (see instructions enclosed with the controller), in order to remove the air from the circuit. Manually open the vent valve a few times applying pressure with the tip of a screwdriver. Let the air out of the pump by opening the large brass screw on the front of the pump. Let the air out of the solar unit degasser.
- Check the initial pressure inside the solar circuit again when cold, and add more fluid if necessary.



A Flow meter detail
B Solar unit
C Solar expansion tank
D Manual or automatic charging pump
E Container with water-antifreeze mixture
F Solar control unit
G Boiler



1 Tap to close

- After a few days and after the air has been completely discharged (no more noises can be heard inside the system), close the shut-off valves upstream of the vent valves to prevent any steam from coming out of the collector.
- Check the initial pressure inside the solar circuit again when cold, and add more fluid if necessary.

A B

A Automatic charging pump
B Manual charging pump

15.5 Controller setting - flow-rate setting

Controller setting

Check that all probes and all necessary electrical equipment have been connected properly. Set the controller according to the system configuration, following the setting instructions enclosed with the system.

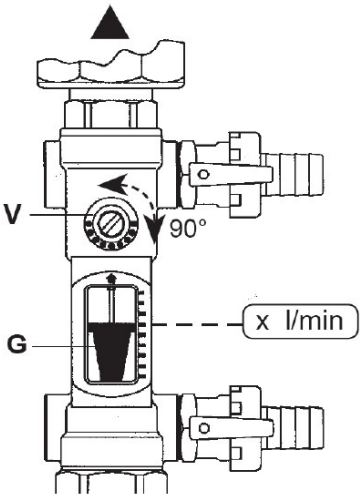
An excerpt of the controller's instructions is provided, based on the type of system to be created: for the system to function properly, refer to the instructions for changing the controller's factory settings. If it is missing, contact our Technical Department.

Flow-rate setting

1 Set the solar unit pump to 3rd speed: by adjusting the VEGA 2.2 or SOLAR 1 controller, it will run from 30% to 100% of its capacity, depending on the temperature on the solar collectors.

2 Set the flow-rate with the flow regulator:

- The volumetric flow must be set when the circuit is hot, i.e. when the sun is shining, because when the system is cold, the pressure drops are greater and therefore the set flow-rate would not be optimal during operation
- Set "MAN 1" (solar pump always running at 100%) to ON (see controller setting instructions);
- Slowly turn the valve V so that the top of the float G is aligned with the reference mark on the graduated scale;
- The recommended flow-rate in solar collectors of HIGH FLOW systems (usually recommended for domestic users) is 40/50 l/h per m^2, so the flow regulator should be set with the following rounded off values:



n° collectors	1	2	3	4	5	6	7	8	9	10	12	14
	2	4	6	8	10	12	14	16	18	20	24	28

If, even after throttling the valve V, the flow regulator measurement is lower than the above values, try setting the pump to 2nd speed. If this isn't enough, set it to 1st speed;

Set "MAN 1" back on AUTO (operation controlled by the controller).

After setting the flow-rate, the solar system is ready to use.

16. **Maintenance**

Summary table

The systems are highly reliable and require only minimal maintenance over the years.
These instructions should be followed:

When	Operations to be performed
EVERY YEAR (before the winter)	Check that the percentage of glycol in the mixture is not below freezing point using the refractometer; top up if necessary.
	Check that the pH of the water-glycol mixture is above 8, otherwise top up with corrosion inhibitor (in any case, all antifreeze liquid must be changed every 3-4 years).
	Check that the pressure in the collector circuit has not fallen below the system's minimum pressure (1.5 bar plus the hydrostatic difference in level) and, if necessary, top up the water-antifreeze mixture when the system is cold.
	Check the magnesium anode with the tester and replace it if worn. Do this simply by pressing the anode tester button: if the pointer stays on green, the anode is still present, but if it goes to red, it must be replaced. If the anode tester is not present, the domestic hot water in the boiler must be drained and the anode unscrewed to check its condition of wear. In the event of an impressed current anode, the rod inside the boiler does not have to be replaced as it is not subject to wear and tear like the magnesium anode.
	We recommend cleaning the inside of the boiler every 12 months.
	Drain the collector circuit and flush it with disposable water.
EVERY 3-4 YEARS	Replace the water-antifreeze mixture in the correct percentage with new antifreeze fluid.

Caution!!! Checking the magnesium anode

For the warranty to be valid, the magnesium anode must be checked annually and replaced when worn.

In areas with particularly hard water, it can happen that a layer of limescale forms on the anode, preventing it from working normally and effectively rendering its protection useless.

In these cases, the layer of limescale must be mechanically removed from the anode so that it can protect the tank.

An anode in this condition does not protect the tank and is useless.
An anode in this condition voids the warranty.
And in case of failure, the tank would not be replaced.

17. Troubleshooting

Summary table

1 The system does not heat up or does not heat up well
2 The pump is noisy
3 Decreased system pressure
4 Pressure relief valve leak
5 Incorrect values displayed on the controller
6 High collector temperature at night
7 Extreme pressure fluctuations
8 Water in the boiler gets very cold at night
9 High temperature in the solar collectors

Cause / Problem	1	2	3	4	5	6	7	8	9	Solution
Air in the system	X	X	X						X	When the system is hot, vent the air vent valve on the collectors and the degasser on the solar unit. Repeat the operation for a few days.
Pump blocked	X	X							X	Open and close the pump to unblock it, replace if necessary.
Dirt in the pump	X	X							X	Disassemble the motor and clean it
Incorrect pump assembly	X	X							X	Assemble the pump correctly
Pump speed range set incorrectly	X	X							X	Always set the pump to optimal flow-rate
Sealing defects in the pipes	X		X						X	Find the leak and have it repaired by a qualified installer
Excessive pressure in the system causing the pressure relief valve to open	X		X	X			X		X	Restore the heat transfer fluid in the system when cold, put it back under pressure and vent it when hot
Incorrect temperature probe assembly	X				X	X		X	X	Assemble the probe correctly or replace it if burnt
Incorrect controller setting	X								X	Set the controller following the instructions enclosed with it
No power supply voltage	X								X	Check the fuse in the controller and in the fuse box
No insulation	X							X		Insulate the system well with solar insulation
Excessive water consumption	X									Measure the water consumption
Solar unit gate valves closed	X								X	Open all solar unit gate valves
Pre-charge too low or too high in the expansion tank	X		X	X			X		X	Set the pre-charging pressure of the solar expansion tank to 0.3 bar less than the cold charging pressure of the system.
Expansion tank too small	X		X	X			X		X	Replace the expansion tank and have a larger one installed (installer).
Non return valve of the solar unit blocked	X					X		X		Unblock the non return valves of the solar unit.

18. Disposal of the system

Operating phases

The system mainly consists of the following components:

SOLAR UNIT

Can be disposed of by separating it into its basic components:

- Metal parts (aluminium casing, copper absorbing plate, brass connections);
- Glass cover sheet;
- Insulation (mineral wool sheet, CFC-free polyurethane foam);
- Back cover sheet in polypropylene (black) or PVC (white) or embossed aluminium.

BOILER

Can be disposed of by separating it into its basic components:

- Metal parts (boiler body, magnesium anode, casing if in stainless steel);
- Insulation (CFC-free rigid polyurethane foam);
- Skay cladding (for vertical boilers only).

SOLAR UNIT

Can be disposed of by separating it into its basic components:

- The pump consists of metal parts made of cast iron (pump body), copper (windings), steel (shaft), and reinforced resin (impeller);
- Metal parts (steel and brass fittings);
- Insulation (thermoformed in black EPP 40g/l)

CONTROLLER

Can be disposed of by separating it into its basic components:

- Plastic parts (outer casing and transparent cover);
- Electronic parts.

PIPES

Can be disposed of by separating them into basic components:

- Copper or stainless steel pipes;
- Elastomer foam insulation.

SUPPORT FRAME

The support frame is made of hot-dip galvanised steel or stainless steel.

All system components must be disposed of in accordance with current waste disposal regulations.

19. General conditions

General aspects:

This manual cancels and replaces all previous releases.

Products:

We reserve the right to make technical changes to products as a result of technical updates without prior notice.
Subject to typing and printing.
The figures and diagrams used are symbolic.

FOR OVER 30 YEARS, WE HAVE BEEN OFFERING SOLUTIONS TO ENSURE SUSTAINABLE

COMFORT AND THE WELL-BEING OF PEOPLE

AND THE ENVIRONMENT

www.clivet.com

MideaGroup
humanizing technology

sales and assistance

CLIVET Home

CLIVET S.p.A.
Via Camp Lonc 25, Z.I. Villapaiera 32032 - Feltre (BL) - Italy
Tel. +39 0439 3131 - info@clivet.it

CLIVET GMBH
Hummelsbütteler Steindamm 84,
22851 Norderstedt, Germany
Tel. +49 40 325957-0 - info.de@clivet.com

Clivet Group UK LTD
Units F5 & F6 Railway Triangle,
Portsmouth, Hampshire PO6 1TG
Tel. +44 02392 381235 -
Enquiries@Clivetgroup.co.uk

CLIVET LLC
Office 508-511, Elektozavodskaya st. 24,
Moscow, Russian Federation, 107023
Tel. +7495 6462009 - info.ru@clivet.com

CLIVET MIDEAST FZCO
Dubai Silicon Oasis (DSO) Headquarter Building,
Office EG-05, P.O Box-342009, Dubai, UAE
Tel. +9714 3208499 - info@clivet.ae

Clivet South East Europe
Jaruščica 9b
10000, Zagreb, Croatia
Tel. +3851 222 8784 - info.see@clivet.com

CLIVET France
10, rue du Fort de Saint Cyr - 78180 Montigny le Bretonneux, France
info.fr@clivet.com

Clivet Airconditioning Systems Pvt Ltd
Office No.501 & 502,5th Floor, Commercial –I,
Kohinoor City, Old Premier Compound, Off LBS Marg, Kirol Road, Kurla West, Mumbai
Maharashtra 400070, India
Tel. +91 22 30930200 - sales.india@clivet.com