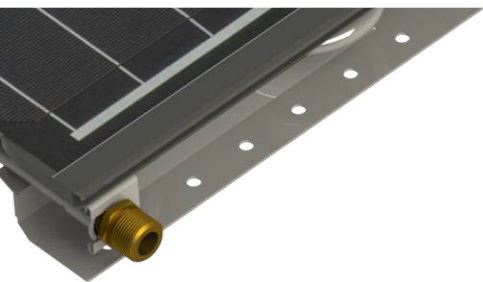


triple solar
heat pump panels



product information
heat pump panels

USP's

- ▶ Brine system for water / water heat pump
- ▶ PVT heat pump panels for heat and electricity
- ▶ Proven combination with NIBE w/w heat pump
- ▶ Quality certificate
- ▶ Silent solution for when an outdoor unit is not an option
- ▶ Gas-free and energy-neutral heating and hot water
- ▶ Modular system for large and small roofs
- ▶ SPF space heating up to 5.6
- ▶ SPF tap water up to 3.8



Description

The Triple Solar® brine source consists of heat pump panels, and needs to be combined with a water / water heat pump. It's the ideal alternative to the less efficient air / water heat pump and the more expensive geothermal heat system. In addition, the solar panels supply electricity to be used for the heat pump. The total electricity yield is usually higher than the consumption of the heat pump.

Application

The Triple Solar® heating system is used in residential housing, apartment complexes, care centres, swimming pools or other utility.

Especially when:

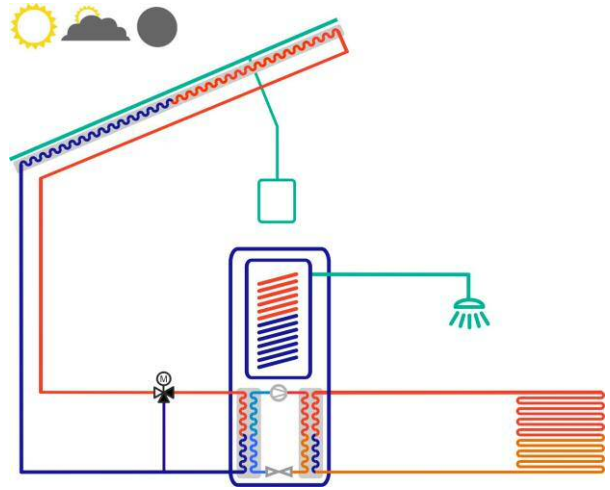
- ▶ Zero or low energy use is required
- ▶ No drilling is allowed
- ▶ Nuisance of the outdoor unit of the air / water heat pump is to be limited

Also suitable for:

- ▶ Regeneration of Heat and Cold Storage
- ▶ Too small dimensioned earth source
- ▶ Triple Solar® combined with earth source

Connecting the heat pump

Triple Solar® heat pump panels are connected to a water / water heat pump, just like a brine heat exchanger for geothermal energy.



SUITABLE HEAT PUMPS

The Triple Solar® heat pump panels can only be used in combination with preselected heat pumps.

For high energy efficiency it is important to have a heat pump with a low permissible source temperature of at least -12 °C. In this case, minimal use is made of its built-in electric element.

LIMITING THE BRINE TEMPERATURE

The "Brine IN" temperature, also called the evaporator temperature, must be limited by a temperature controlled mixing valve. The maximum temperature setting depends on the selected heat pump.

Triple Solar supplies the mixing valve as an accessory to the heat pump.

ACTIVE COOLING

The Triple Solar® heat pump system also provides building cooling. The heat pump must be equipped with an active cooling option. Hereby the source and the heating system are reversed by four valves through a corresponding control system. Space cooling is done via the underfloor heating, a convector or a separate exchanger in the ventilation system.

Dimensioning

PANEL SIZING

Starting point is the SPF (seasonal performance factor), also called SCOP (seasonal coefficient of power), the efficiency seen over a year. In short: the amount of electricity the heat pump uses to supply the heat.

To get a SPF of 4,5 by using a heat pump of 6 kW the required minimum amount is 8 panels of 2 m² (16 m²).

This calculation is valid for the Netherlands.

For other capacities, the rule of thumb applies:

Panel surface [m²] = 2.7 x heat pump capacity [kW]

Attention:

The SPF mentioned above is an estimate, this is depending on the under floor heating or convector, plus the annual required heat and hot water.

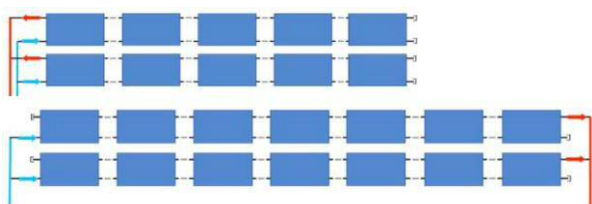
Further explanation about the conditions is mentioned in the declaration of equivalence.

SETTING UP THE PANELS

The Triple Solar® heat pump panels can be linked together by using the supplied flexible connectors.

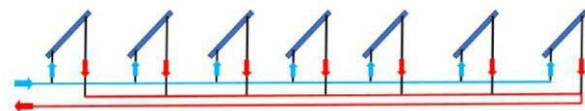
Maximum allowed amount of panels in one row:

- Connecting from one side: 5
- Connecting according Tichelmann: 7

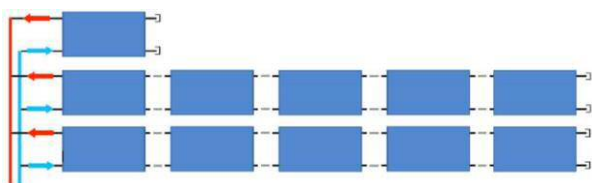


Upper figure one sided, lower figure according Tichelmann

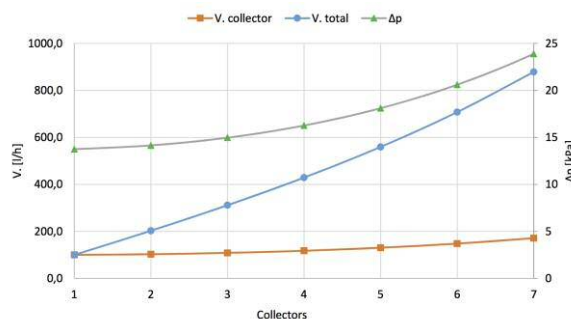
In case of a flat roof, configuration connection according Tichelmann is required due to the longer tubing.



In case the configuration requires different lengths of rows, the flow difference between the rows is less than 30%.



The graph below shows the flow distribution in the panels and the pressure loss with one-sided connection. When connecting more than 6 panels from one side the difference in flow between the individual panels will get unacceptably large.



The chart below shows the pressure loss with the different configurations using ethylene glycol 40%.

Example:

By connecting 5 panels, the pressure drop is 16 kPa. This applies for one sided connection as well as Tichelmann.

The loss of pressure in the supply and return piping needs to be added up and checked with the permissible pressure loss of the heat pump.

Amount of panels	Flow rate	pressure loss
1	100 l/h	14 kPa
2	200 l/h	15 kPa
3	300 l/h	15 kPa
4	400 l/h	16 kPa
5	500 l/h	16 kPa
6	600 l/h	17 kPa
7	700 l/h	18 kPa

Whenever there are two fields (for example, an East - West setup) these are to be connected in parallel and always with equal flow.

ORIENTATION

An orientation to the south with an angle of 30 to 45 degrees is optimal.

Thermal:

For the thermal function as a brine source the orientation is less sensitive. The quality certificate shows same results for a large orientation window between east and west.

Electric yield:

In case of deviations from the south orientation, the PV yield will be reduced. Standard online tools can help you calculate the annual yield for different orientations and angles.

HYDRAULIC DIMENSIONING

Recommended dimensioning with monovalent use of the heat pump and a minimum brine temperature of -12 °C.

Proceed as follows:

1. Calculate the source-side flow for the maximum heat pump capacity at -15 °C and source side a ΔT of 4 K.
2. Calculate the pressure losses in the piping, the fittings, the pump and the evaporator of the heat pump. Make use of pressure loss chart in the various panel configurations from the previous page.
3. When calculating a different flow, make use of the formula $p_1 = p_2 (V_1/V_2)^2$
4. Enter the total pressure loss in the chart of the circulation pump of the heat pump.
5. If required, the pipe diameter or the panel configuration can be adjusted.

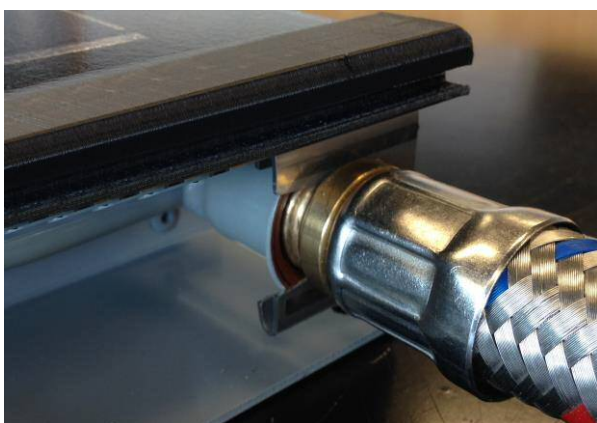
Mounting material

CONNECTING MATERIAL

Triple Solar® panels are supported with the following accessories:

Mounting & hydraulic accessories basic:

- Mounting clamps with bolts and nuts
- Flexible hoses for linking panels in a row
- Connecting plugs with 3/4" thread
- End plugs with and without bleeder
- Retainer clips for the plugs



TUBING

The tubing between the heat pump panels and the heat pump can be installed in different ways. Outdoors on the roof the piping can be installed without insulation till the roof flange.

You can use copper, stainless steel or PEX tubing. If you use PEX or any plastic, take care of the UV protection.

As an alternative product PP-R piping is used like Climatherm. It is available with an UV protection skin.

Fittings have to be protected with an UV resistant paint.

The chart below shows some guidelines for piping dimensions. Brine liquid is mono propylene glycol of ethylene glycol mixture minimum 34%/-15°C.

Correct diameters depending on the total length of the tubing including and all used additional fittings.

Piping dimension (mm)	Power heat pump (0/35)
32	< 8 kW
40	< 15 kW
50	< 28 kW
63	< 50 kW

Indoors all tubing has to be installed with vapour sealed insulation. This prevents condensation of the piping due to fluid temperatures of -15°C. This is also valid for the roof flange. Piping should be insulated past the roof flange. This prevents leakage of condensation water.

Triple Solar can support you with the choice of piping, insulation and the roof flange.

MOUNTING SYSTEM

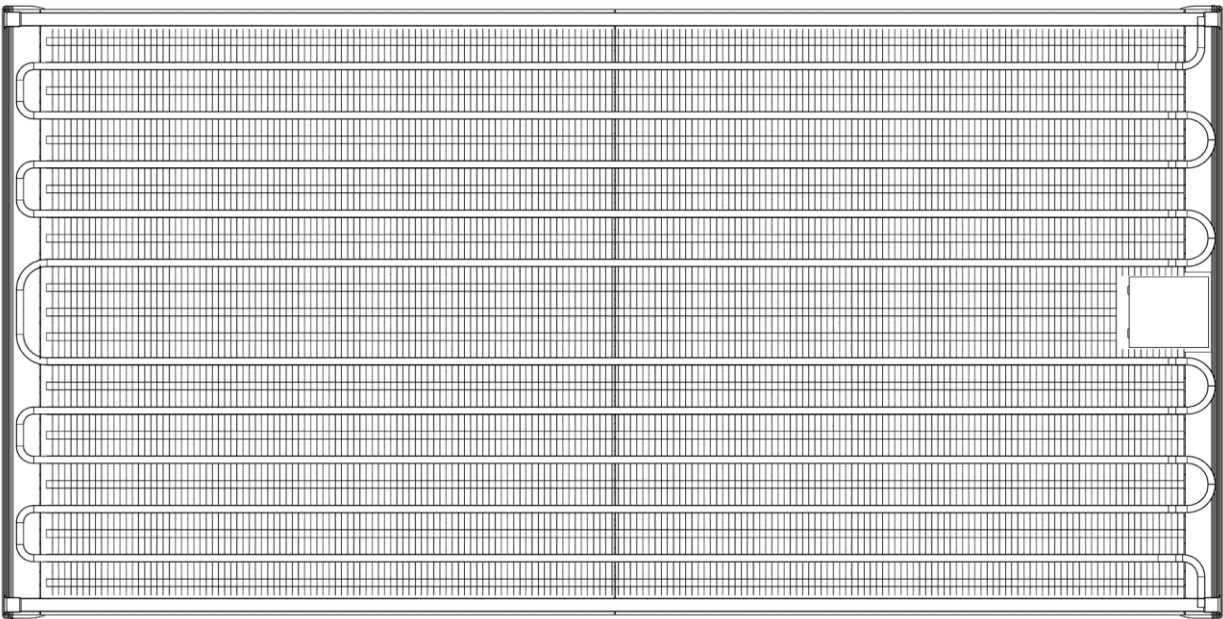
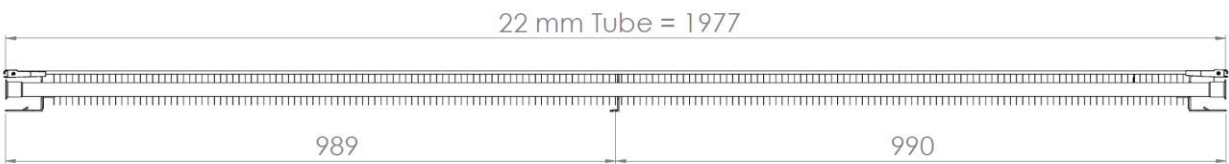
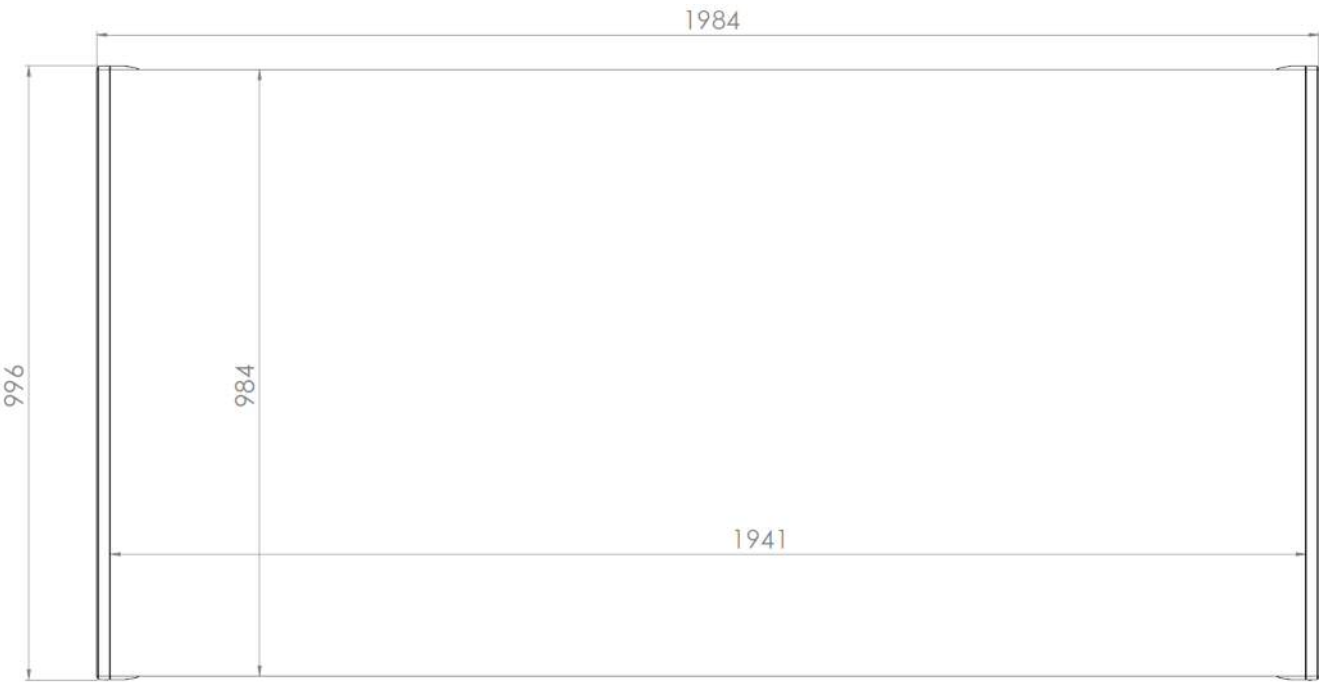
The Triple Solar® heat pump panels can be mounted on almost any standard PV-mounting system. The panels should be fixed on horizontal mounting rails with the supplied special Triple Solar clamps. The clamps are ready for M8 allen screws.

Triple Solar offers a wide range of mounting rails and triangles. See price list.

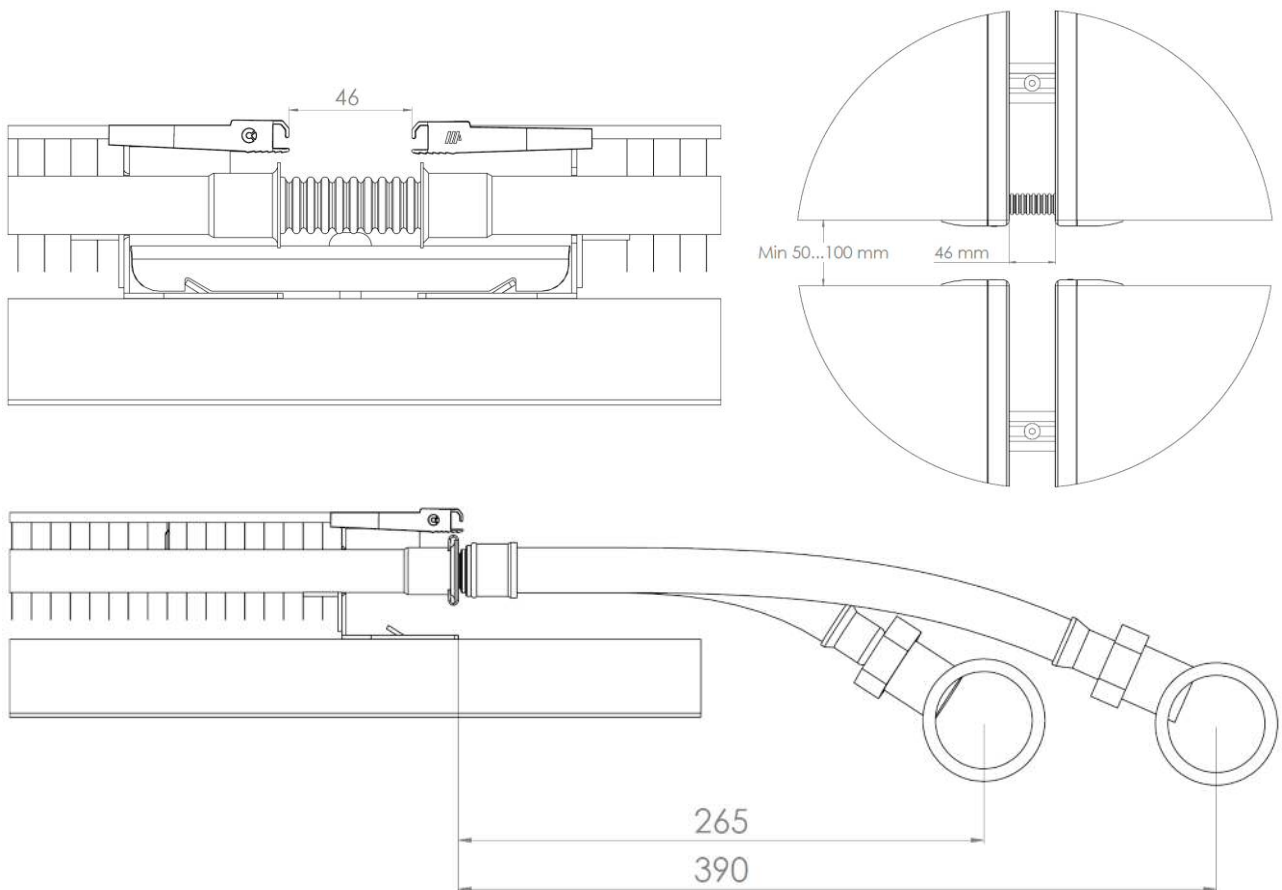
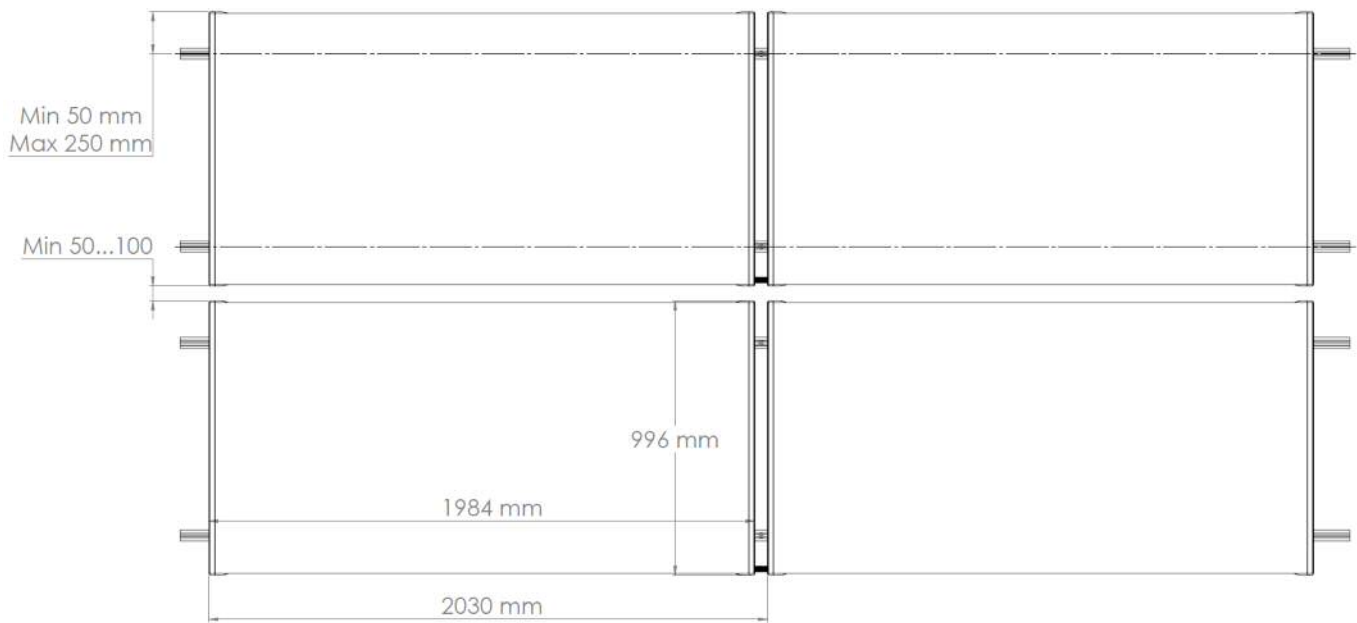
The wind load calculation for calculating the amount of ballast blocks is the responsibility of the installer with the advice of the supplier of the PV-mounting system.

Panel- and Mounting Dimensions

PANEL DIMENSIONS



DIMENSIONS PANEL CONFIGURATION



Specifications

Dimensions	unit	M2 380 200 Landscape	M2 320 165 Landscape	M2 320 165 Portrait (from Q2 2020)
Overall dimensions	mm	1985 x 995 x 65	1668 x 995 x 65	1010 x 1652 x 58
PV dimensions	mm	1965 x 984	1648 x 984	984 x 1642
Weight	kg	32	27	27
Aperture surface	m ²	1,95	1,63	1,63
Overall surface	m ²	1,98	1,65	1,65
Materials	-			
PV-panel	-		Glass	
Heat exchanger tube	-		Copper	
Heat exchanger fin	-		Aluminium	
Surface treatment	-		Black powder coating	

PV-Panel	unit	BXO 380	BLO 320	BLO 320
Manufacturer	-		BISOL (EU)	
Type	-		Monocrystalline	
Nominal power	W _p	380	320	320
Short circuit current	A	10,3	10,05	10,05
Short circuit voltage	V	49,1	41,2	41,2
MPP current	A	9,85	9,85	9,85
MPP voltage	V	38,6	32,0	32,0
Solar cell efficiency	%	21,6	21,5	21,5
Module efficiency	%	19,5	19,3	19,3
Power output tolerance	W	0/+5 W	0/+5 W	0/+5 W
Maximum reverse current	A		18	
Max. system voltage	V		1000 (class A)	
Current temperature coefficient	%/K		0.046	
Voltage temperature coefficient	%/K		- 0,30	
Power temperature coefficient	%/K		- 0,39	
NOCT	°C		44	
Temperature range	°C		- 40 – + 95	

All unspecified tolerances are ± 5 %. Unspecified product properties remain under full discretion of BISOL.

Heat exchanger	unit	M2 200	M2 165 L	M2 165 P
Meander tube	mm		12 x 0,3	
Header tube	mm		22 x 1,0	
Volume fluid	l	3,4	3,0	3,0
Heat exchanger tube	-		Copper	
Heat exchanger fin	-		Aluminium	
Thickness fin	mm		0,18	
Surface heat exchanger	m ²		ca. 18	
Connectors	-		Plug in with double O-ring	
Length compensation	-		Flexible connectors	
Maximum pressure	bar		6	
Pressure loss Water-glycol mixture 40 % ¹⁾	mbar		140	
Specific flow	l/min		ca. 2 – 4 per panel	
Heat exchange capacity Air to liquid, U value ²⁾	W/(m ² K)		62 with parallel roof mounting	
Optical Efficiency ²⁾	%		47	
Heat capacity ²⁾	kJ/(m ² K)		177	
Stagnation temperature	°C		62 °C at 1000W/m2 irradiation with an ambient temperature of 30 °C	

1) At 120 l/h, -15 °C 2) TNO-report 2017 R10903

Quality and Subsidies

SOLAR KEYMARK

Triple Solar heat pump panels are rewarded with the highest and internationally accepted standard, the Solar Keymark certificate. All tests (wind and snow load and yield) carried out by the University of Stuttgart (Germany).



TNO TEST

The independent test institute TNO in Delft (the Netherlands) has tested the Triple Solar® heat pump panel according to the quasi dynamic test procedure described in NEN 12975-2 (report No. 2017 R10903).

To be able to test the full working range, a surface of 10 m2 was tested by the institute for a period of several months.



QUALITY CERTIFICATE

Triple Solar obtained a quality certificate by the independent institute BCRG with the following SPF:

SPF space heating up to 5,6

SPF domestic hot water up to 3,8



The certificate can be downloaded at the Bureau Central Registration Gelijkwaardigheidsverklaringen:

<http://www.bcr.nl/bcr/uploads/bestanden/20170994GGRVWB.pdf>

PATENT

Triple Solar BV and its technology partner Consolar Solaire Energie Systeme GmbH obtained a worldwide patent WO-2018/033409.



SUBSIDY

Most governments have a subvention program to stimulate gas free heating. Please check your local program. For the Netherlands: *Investeringsubsidie duurzame energie (ISDE) of Rijksdienst voor Ondernemend Nederland (RVO).*

For example: the amount of subsidy for a 6 kW heat pump is € 2800 euro. The program runs until 31 December 2020.

For more information check

<http://www.triplesolar.eu/home/particulieren/kosten-en-financiering/>



triple solar 
verder zonder gas

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