mint E-tube

Evacuated tube collector

System Manual

mint renewables

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General Terms and Conditions

Installation and commissioning should be undertaken by an MCS Certified Solar Installer Company.

General terms and conditions of warranty state that all installations must completed by a MCS certified and qualified solar installer company who is currently on the live MCS register of installers.

All installer companies should work to the Building Regulations in force at the time of installation..

The manufacturer's warranty will only apply if these installation instructions are followed. The warranty does not cover any damage caused by non- observance of this manual.

The correct functionality of the system is only guaranteed if the installation instructions are followed.

The end client should be informed at system handover that system should be checked visually once pre year and the heat exchange fluid changed once every four years.

This document is part of the warranty and should be kept in a safe place and handed over to the end user client on completion of works.

Instructions for installation and transport

Mint Solar Collectors kits are delivered on pallets.

Never store outside in water logged conditions.

Always store on a flat surface with glass facing upwards maximum 8 collectors per stack., or vertical with glass facing outwards.

The use of a carrying strap is recommended for transporting the collector. The collector must not be lifted at the connections.

Avoidimpactsandmechanicalactionsonthesolarcollector.

Mint Solar Collectors should only be used in professionally designed systems with all system components and materials being appropriately rated for use in solar water heating systems and properly installed.

Structure

The collectors may only be mounted on sufficiently load-bearing roof surfaces and substructures. The structural load- bearing capacity of the roof and the substructure must be assessed on- site, by a suitably experienced professional before mounting the collectors.

Particular attention should be paid to the quality of the timber substructure in terms of the stability of the screw joints necessary for installing the collectors.

In particular, it is essential to have the entire collector structure verified at the installation site by a qualified engineer in regions with high wind speeds.

The assessment should also take into account any special features of the particular site that could lead to increased loads (high wind speeds, snow loads etc).

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Lightning protection / Potential bonding of the building

It is not necessary to connect collector arrays to the lightning protection of the building (please observe the specific electrical regulations). For installations on metal substructures at the installation site, authorised lightning protection specialists must be consulted.

The metal tubes of the solar circuit must be connected to the main potential equalization bus by means of a conductor (green/yellow) with a cross- section of at least 16mm² CU (H07V- U or R). It is possible to ground the collectors to a ground rod. The grounding line must be laid outside the house. The ground rod must also be connected to the main potential equalization bus by a line with the same crosssection as above.

Connections (compression connection fittings)

Connect the collectors using the certified solar compression connections supplied with your kit.
Precautions must be taken to protect the connection pipes against temperature fluctuations caused by heat expansion (expansion bends/flexible piping). In this case, no more than 6 collectors may be connected in series.

Larger collector arrays must be assembled with expansion bends or flexible members inserted in the links (**IMPORTANT:** check the pump design). When tightening the connections, always apply counter pressure with a wrench or another spanner to prevent damage to the manifold connections.

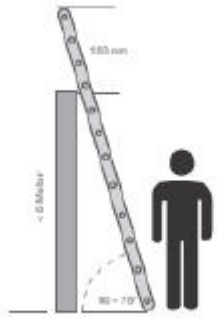
Collector inclination / General notes

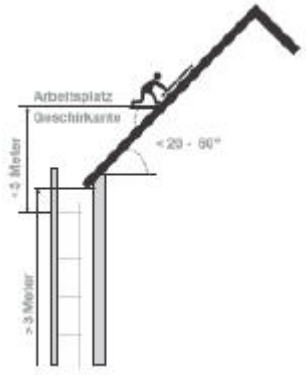
The collector is suitable for installation at an angle of between 15° - 75° Steps must be taken to ensure that water and other contaminants such as dust, etc. are prevented from getting into the collector connections and ventilation holes.

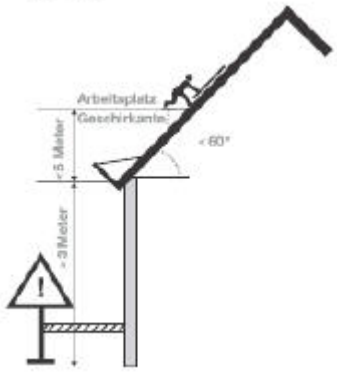
Warranty

Warranty claims can only be made if an appropriate specification of antifreeze is used and maintenance is carried out correctly.

Ladder and scaffolding assembly







Safety Precautions

Before commencing mounting work on roofs, it must be ensured in all cases that the non personal fall protection and fall- arrest systems required by DIN 18338 (Roof Covering and Roof Sealing Works) and DIN 18451 (Scaffolding Works) are in place. See also Builders' Protection Ordinance

If non- personal fall protection or fall- arrest systems cannot be installed for technical reasons, all personnel must be secured by means of suitable safety harnesses!

Only use safety harnesses (safety belts, lanyards and straps, shock absorbers, fall arresters) that were tested and certified by authorized testing bodies.

If non- personal fall protection or fall- arrest systems are not provided, working without the use of suitable safety harnesses may lead to falls from heights and therefore cause serious or lethal injuries!

Ladders not properly secured against sinking in, sliding or falling over may lead to danger- ous falls!

Whenever you are near live overhead electric cables where contact is possible, only work if:
- it is ensured that they are voltage- free and this is secured for the duration of work.
The live parts are secured by the ESB by covering them or cordoning them off. And are deemed safe by ESB transmission supervisor. Or advised safety distances are maintained.

Voltage radius:
1m with .....voltages up to 1000V 3m with .....voltages from 1000V to 11000V 4m with .....voltages from 11000V to 22000V 5m with .....voltages from 22000V to 38000V
> 5m in case of unknown voltages

The manufacturer hereby guarantees to take back products identified with an eco- label and to recycle the materials used.
Only the heat transfer medium specified may be used!

Safety harnesses should be fixed above the users whenever possible. Safety harnesses should only be fastened to sufficiently load bearing structures or fixing points!

Never use damaged ladders (e.g., wooden ladders with split runners or rungs, or bent or buckled metal ladders). Never try to repair broken runners, rungs or steps on wooden Ladders!

Ensure that ladders are put up safely. Ob- serve the correct leaning angle (68° - 75°).
Prevent ladders from sliding, falling over or sinking into the ground (e.g. using wider feet, feet suited to the ground or hooking devices).

Only lean ladders against secure points. Secure ladders in traffic areas by suitable Cordoning.

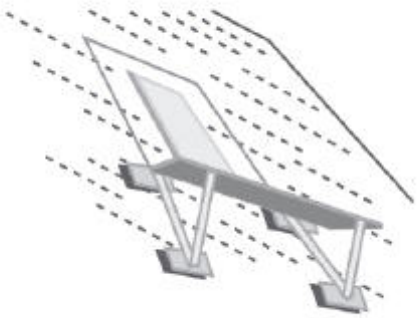
Contact with live electric overhead cables can be lethal.

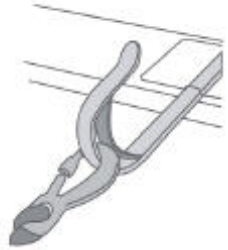
Wear protective goggles when drilling and handling solar collectors evacuated tube collectors have a danger if damaged of implosion !

Wear safety shoes when carrying out installa- tion Work!

Wear cut- proof safety gloves when mounting collectors and handling evacuated tube collectors (danger of implosion)!

Wear a helmet





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Prior to installation

Check the proposed collector siting is suitable. The collector is suitable for flat roof, tiled roof, cement and concrete roof structures. The installation should be carried out by able and qualified persons only. Its is the responsibility of the end user to adhere to local planning and conservation regulations.

The collectors must be fixed only to a load bearing roof structure and substructures. A structural survey may be required to calculate the permitted load. Do not mount the collector if you are unsure the structure will carry the load.

The location of the collector should be positioned at least 1 meter from any edge or ridge. A pre assessment of the location should take into account any additional factors that could lead to additional loads, ie, wind, air jets and snow. The collector arrays must be mounted in a way as to avoid snow piles reaching the collectors.

Use the correct mountings. The collector can be sup- plied with the correct fixings for both slopping roof and flat roof types. Not using the recommended fixings as outlined in this manual will invalidate any warranty. Please note - metal straps are not a recommended method of fixing.

Lightening protection

Non metal structures

Lightening protection is not required for collector arrays mounted to non metal structures, although it is recommended that protection diodes for the temperature sensors are installed. Lightening protection diodes protect the control unit from over voltage in the event of a lightening strike.

Metal structures

For installations mounted and fixed to metal structures a lightening protection specialist must be consulted.

Connection of collectors in series

The collector manifold inlet and outlet is 3/4" male. Soldering onto the collector manifold is not permitted and will invalidate any warranty claim. Connections can be of either copper tube or flexible metal pipe. When using copper tube precautions must be taken to account for temperature fluctuations caused by heat expansion. Do not connect more than 6 collectors (SZ10-20) or 4 collectors (SZ30) in series without the use of expansion connectors.

Transport and Handling

All Micoe SZ series collectors are packed in cartons, are easy to assemble and can be transported to the site before any assembly is required.

Extreme caution should be adhered to when transporting evacuated tubes. Tubes are made from very strong glass, but will break if handled incorrectly.

All cartons must be stored on a flat level surface. Cartons must not be stacked more than 5 high. Cartons must not be stored upright. Due to their weight and fragile nature two people are required to lift all cartons. Please dispose of all packaging sensibly. Cardboard can be recycled.

Solar collector carton contents

a) Manifold	1x per collector
b) Tail stock	1x per collector
c) Front leg	2x per collector
d) Horizontal bar	As per collector
e) Evacuated tubes	As per collector +1
f) Anti dust circle	1x per tube opening
g) Nuts / bolts	Supplied quantity as per mounting
h) Heat transfer paste	1x per collector

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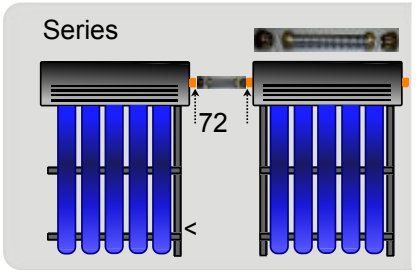
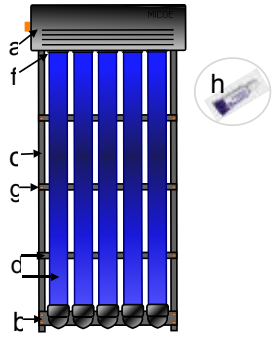




The Heat pipe condenser can become very hot at the top end from diffused sun radiation (>200 °C). Therefore, the pipes should be covered before assembly and also to be protected against impact.

1 With the manifold upside down. Align the pre drilled holes on the front leg over the bolts attached to the manifold.

2 Insert the two bolts on the manifold through the holes on the leg. Secure them together using 2x M8 nuts provided.

3 Repeat steps 1& 2 to mount the left & right leg Following this turn the manifold right side up.

4 Place the tail stock over the bottom of the legs. Align the holes and secure tightly using x4 M8 nuts and bolts.

5 Align the horizontal cross bars against the holes on the legs and attach securely using the M8 nuts and bolts.

6 Insert the silicon sealing rings into the manifold openings. One seal per opening

7 Unscrew the tail stock end cap. If this is done on the roof care should be taken to prevent it rolling off.

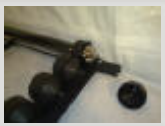
8 Slide the tube through the tail stock up to the manifold. Pull the heat pipe from the glass tube to expose 200mm

9 Smear heat transfer paste evenly over the condenser surface. Insert the condenser firmly into the manifold.

10 Apply a covering of soapy water onto the end 100mm of the glass tube

11 Using a twisting motion insert the tube firmly into the manifold.

12 Replace the end cap onto the tail stock. Repeat steps 7 - 12 for the remaining tubes



It is advisable to mount the collector onto the roof &fill and flush the system (see page 7) before continuing to point 7 - installing the evacuated tubes

System

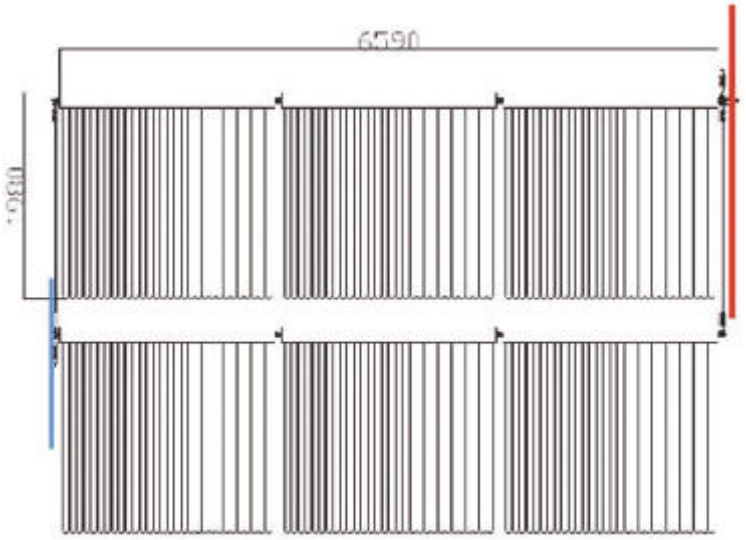
Please note the maximum allowable heat pipes in series is 90 = to (3*E-tube 30 modules)

For high flow systems, the recommended flow rate for a heat pipe system is 60 litres/m2 /hour

Example 1
HP 65-30 =3.m2*60 = 180Ltr/hour
Required Flow meter setting = 3 litre/minute

Example 2
3*HP 65-30 =9m2*60 = 540Ltr/hour
Required Flow meter setting = 9 litre/minute
Large collector field flow rate calculations are dependent on layout design

Example 3 (Low flow system)
6 *HP65-30 collectors mounted 3+3as diagram below
3*HP 65- 30 =9m2*60 = 540Ltr/hour Required Flow meter setting = 9 litre/minute



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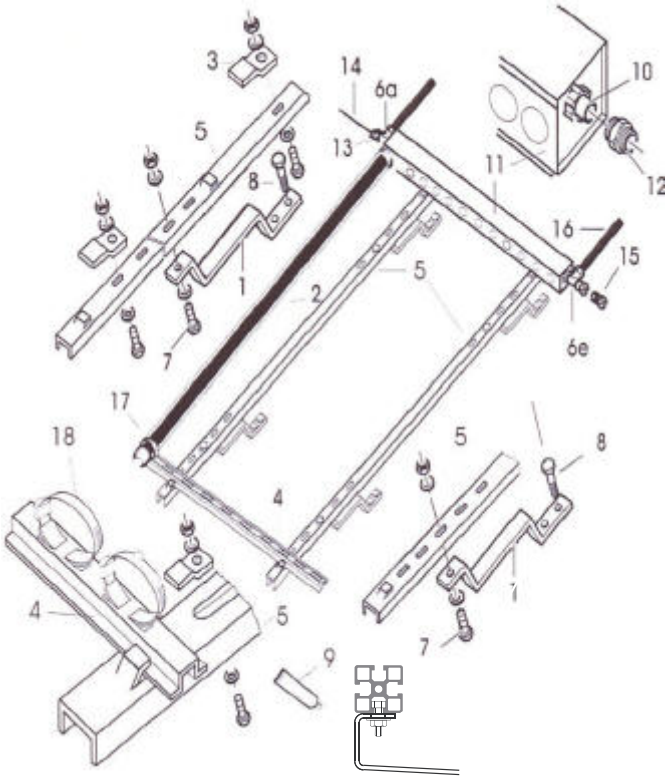
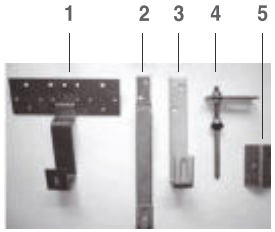


	Descript
1	Roof hook
2	Collector pipe
3	Brackets
4	Base support
5	Side rails
6	T- or cross piece (6a,
7	6b) Screws M8 x 25
8	Wooden screw
9	Heat conductive
10	paste Manifold
11	Manifold case
12	Fitting for additional
13	collectors Sensor
14	pocket
15	Temperature sensor
16	De- aeration valve
17	Flexible metal tube
18	Tube holder
	Clamp

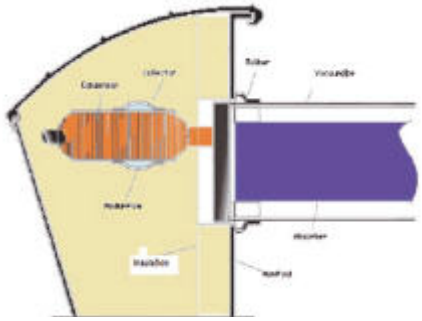


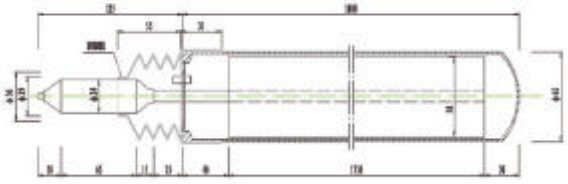
Tile roof
Natural slate roof
Slate roof
Corrugated sheet iron roof or slate roof Clamp for rolled steel joist

Mounting and assembly

Mechanical data

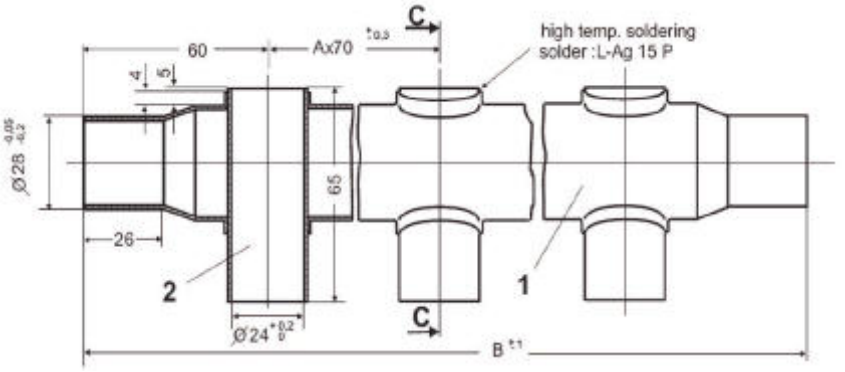
Working pressure	Max. 6bar
Recommended flow rate	3.5 - 8 Litres/M²h
Manifold tails	3/4” tapered thread
Tube size	58mm x 1800mm
Wall thickness of tube	1.8mm
Glass material	High quality
borosilicate glass	
Vacuum tube	QB-AL-N/AL -
metalic	
Stagnation Temperature	200.3°C
Emission co-efficiency	<0.06 for 80°C
Solar absorptions	94% to 96%
Heat output	69W per tube @
solar radiant intensity 1000w/m²	
Manifold Powder coated aluminium	
alloy Frame	

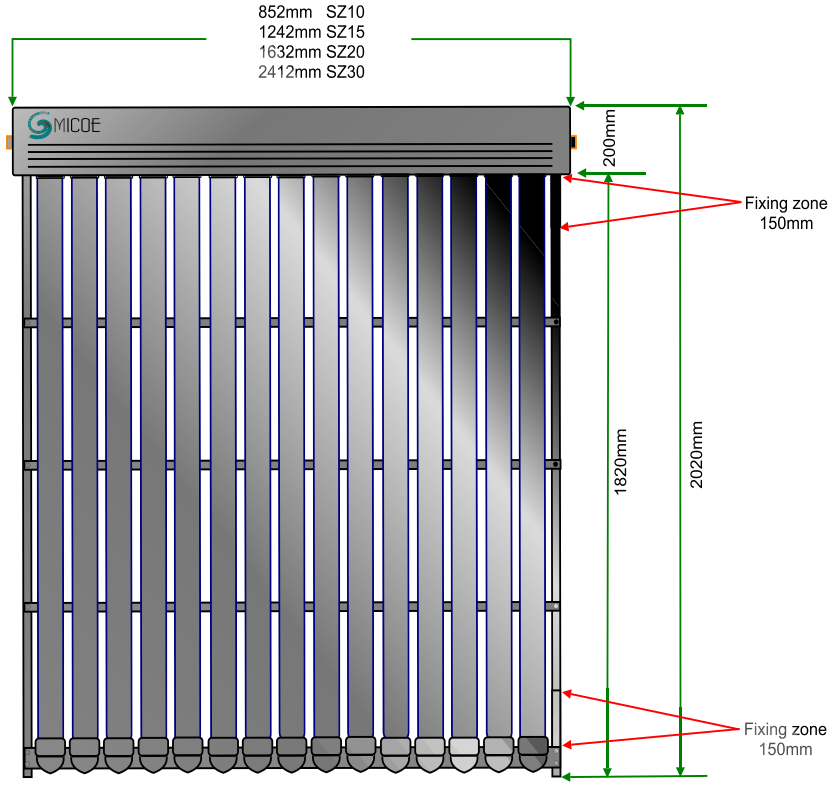




Heat pipe

Manifold





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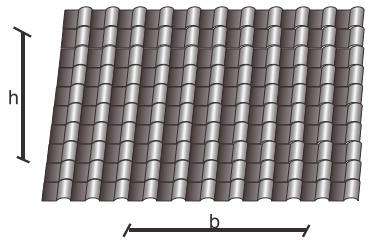
On Roof Mounting

1. Measure and mark out the position of the collector field
2. Remove roof tiles to expose rafter
3. Offer up bracket to rafter. Reinforce rafter with additional timbers to a width of 90 mm always bolt additional timbers Never nail.
4. Note bracket fixing position
5. Mark the tile underside with chalk and cut a 6-8 mm groove to sit neatly over tile when re fixed to the roof
6. Repeat procedure for remaining brackets

1



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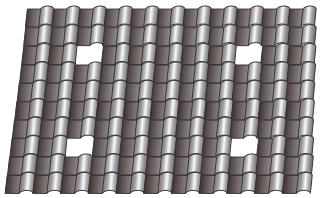

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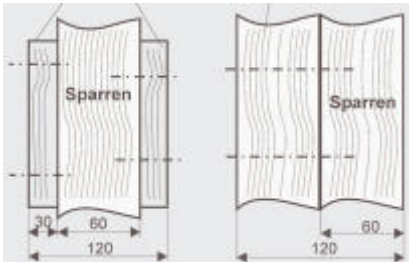
Screw in additional grounds to



Locate and remove tiles where the roof

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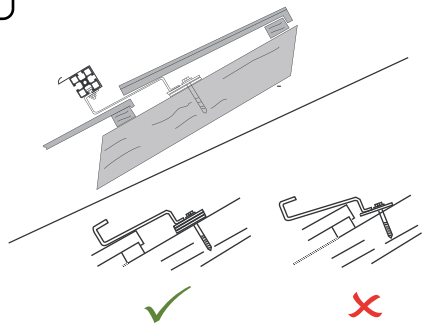

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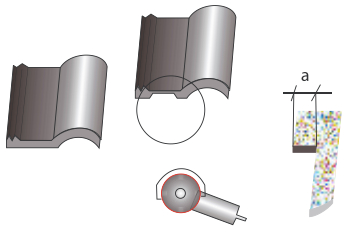

Ensure the roof bracket is fitted to the lowest point of the tile to assist drain off of rain from the roof. Relieve the rear of each roof tile with an angle

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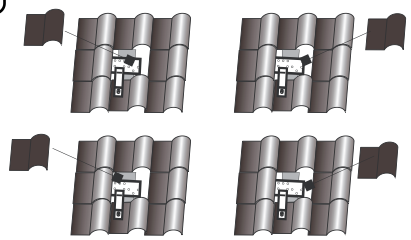

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Tile mounting FIG 7
Select the rafters so that the collector juts out 30 cm at the right and left side. It is therefore recommended to measure first the distance of the rafters and determine a centre line before fitting in the collector. Start with roof hook - above left. Take out tile from rafter and screw roof hook to rafter with screws. Then replace tile to roof.

Mounting of additional roof hooks:
Mount the other 3 roof hooks of the module in the same manner and ac cording to the measures. The hooks must be mounted horizontally and vertically in alignment. If necessary, mount further hooks for additional modules.

Mounting of side rails: FIG 10
Screw the side rails at the roof hooks.
Fixation of manifold case

Slide manifold case with the profile rail into the hook of the side rail. Screw the bracket on the side bar.

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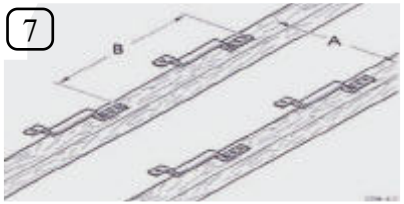

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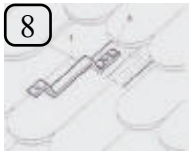

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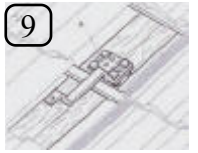

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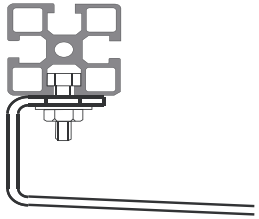

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System

Filling the system

It is advisable to fill and flush the system prior to installing the evacuated tubes. If this is not possible cover over the tubes to block out the sunlight.
The system should be filled with a glycol based anti-freeze with anti corrosion inhibitors. Tap water must not be used. The system can be filled with a hand fill pump or a pressure fill pump and must be bled to eradicate any air bubbles from the solar circuit.
Do not operate the air vent if the system is hot. There is a high risk of scalding. Only bleed the system if the temperature of the heat transfer fluid is less than 55°c

Operating pressure

Operating pressure 1.5bar cold.
The maximum operating pressure is 6 bar.
The maximum test pressure must not exceed 10 bar.

Good tube
Silver base. Vacuum present.

Heat transfer media

The system must be filled with a glycol based anti-freeze with added corrosion inhibitors. The fluid must be checked once in every two years in respect to its antifreeze and ph value. Antifreeze is to be checked with a tester. The target value to be -20°c. If the target level is not reached, replace the heat transfer fluid. Ph levels are to be checked with a pH indicator rod. The target value to be pH7.5. If the target level is not reached, replace the heat transfer fluid.

Temperature sensor

The collector has a built in sensor sleeve. If there are two or more collectors mounted in series the sensor is to be inserted into the collector sleeve nearest the return flow back to the hot water store. Optimal contact can be achieved between the manifold and sensor by way of smearing the sensor with heat paste prior to insertion.
An optional lightening protection device can be istalled to protect the sensor from over voltage.

Maintenance

The collector and arrays must be checked periodically. An annual close up inspection must be performed to check for damage, leaks, contamination and tube failures.

Problem	Cause	Remedy
Low working performance from heat pipe solar collector	a) less solar isolation in you	Calculate correct collector size & adjust accordingly, or install additional heat source. i.e. Gas boiler.
	b) solar collector is shaded from sunlight.	Where possible re- move source of shade or relocate collector.
	c) Failed vacuum tube	Replace failed vac- uum tube with new.
	d) Poorly installed heat pipe	Refit the heat pipe. Apply heat paste to condenser surface.
	e) Incorrect instal- lation angle	Reposition collector to an angle 51° +/- 10% (UK only)
	f) High heat loss due to poorly insulated pipe lines.	Insulate all pipes with high tempera-

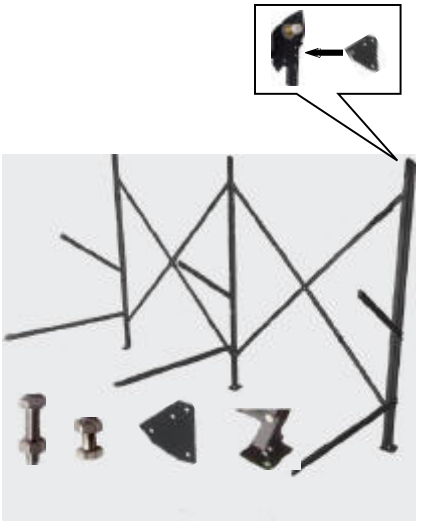
Free standing planning prior to deciding

Wind load on roofs can create suction forces on the solar collectors. In order to minimize suction forces, the mounting frame must be installed as follows.
The subsurface must be sufficiently sustainable and appropriate for the weights to be installed. Upon it is therefore important to verify in advance that the roof structure is suitable to withstand the distributed load.
If the mounting frame will not be connected with the subsurface (structure, roof sub-construction), a loading of at least 200 kg per collector is required (see fig 1). Additionally, the mounting frame can be connected with wire ropes at fixed hold points. Support elements and fasteners must be provided by the installer. Moreover, in order to avoid wind noise to a large extent, the mounting frame must be installed at least 1 m from the roof edge. In areas with high wind speed or high construction heights, the loading must be calculated by a structural engineer.
Please refer to lightning protection and bonding to the structure.

Installation of the mounting frame on large open surfaces of galvanised or trapezoidal sheet roofs.

This types of installation should be specified only by a qualified structural engineer in accordance with current building regulations for such roofs.

The frame can be bolted through these roof structures using oversized washers and rubber grommets to seal the roof however the sheets mustbe loaded with pebbles or substrate to equivalent weight.



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Free standing planning prior to deciding Mounting

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This types of installation should be specified only by a qualified structural engineer in accordance with current building regulations for such roofs.

The frame can be bolted through these roof structures using oversized washers and rubber grommets to seal the roof however the sheets must be loaded with pebbles or substrate to equivalent weight as in figure 1

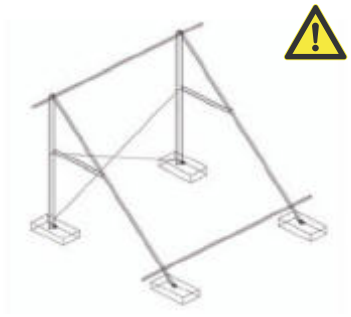


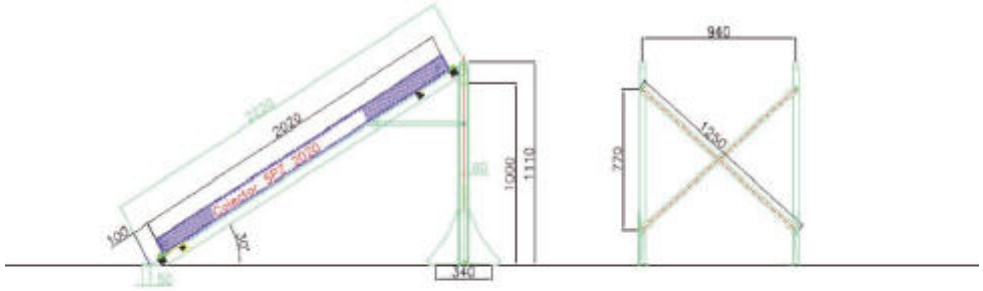
Fig 1 Loading per collector

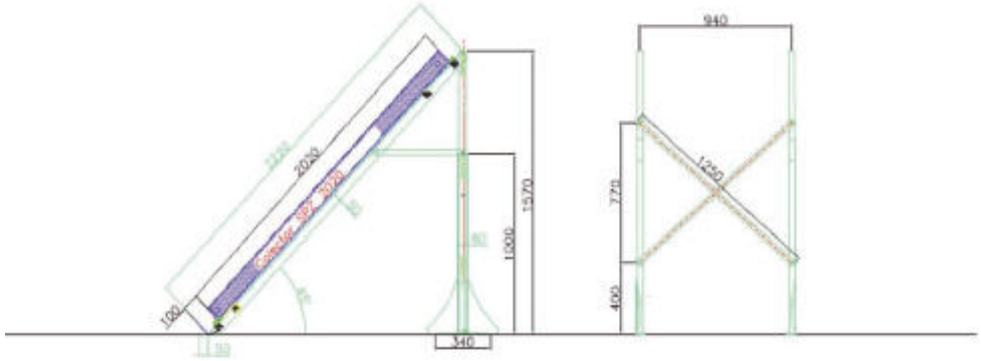
The collector field can be mounted at different angles according to individual applications.

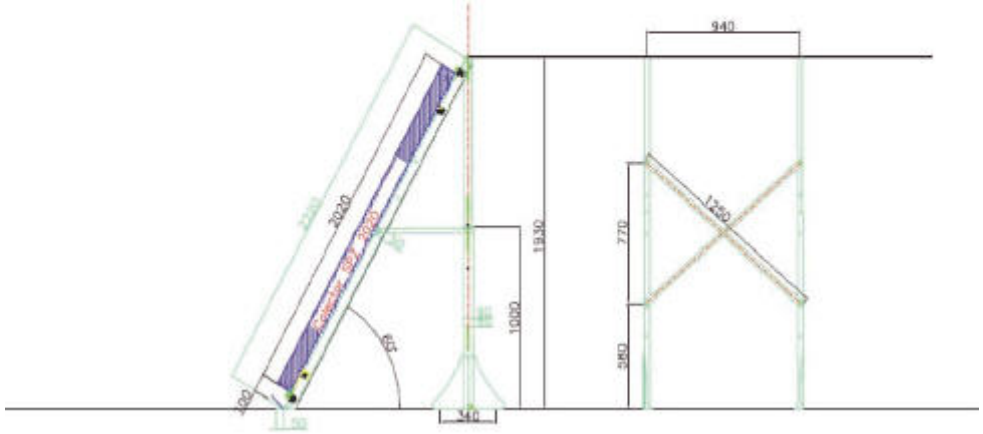
For example larger systems used for heating support require a 60 degree angle in winter time , to maximise solar gain, this reduces the system efficiency in sum- mer when the system is not required for heating.
Systems that require all year coverage such as hot water require 45 degree angle to maximise summer winter gain.
Systems that are predominantly used in summer are most efficient at 30 degree angle.

Install the profile rails in the in the pre drilled holes in the hypotenuse of the bracket insert the clamp and hanger brackets on the lower and upper profile rails mount the collector on the hanger brackets and clamp down each collector one at a time connecting the compression fittings to each collector as you install the next collector.

mint renewables

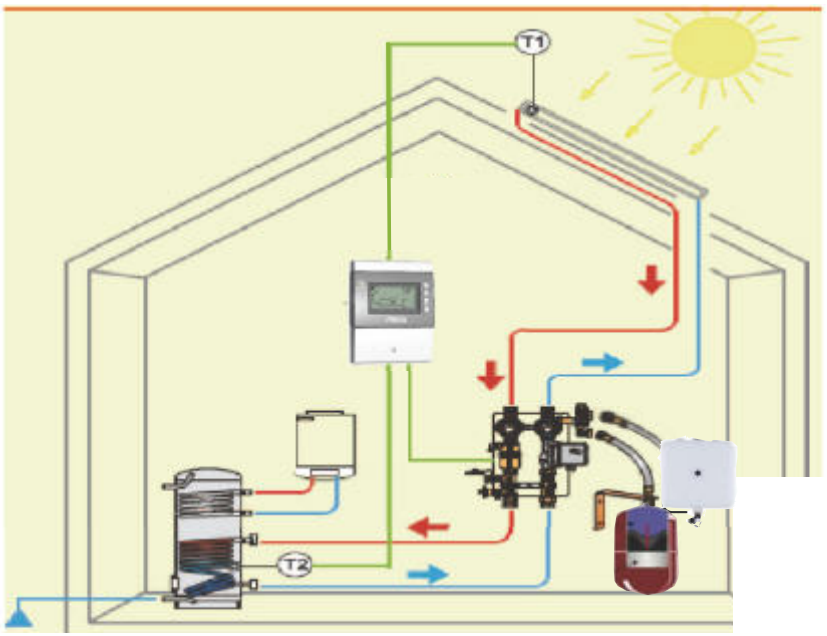




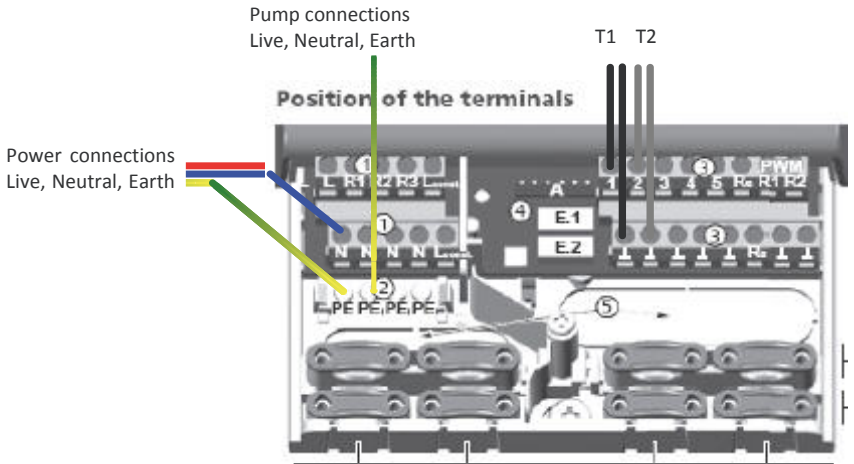


System Installation Schematics

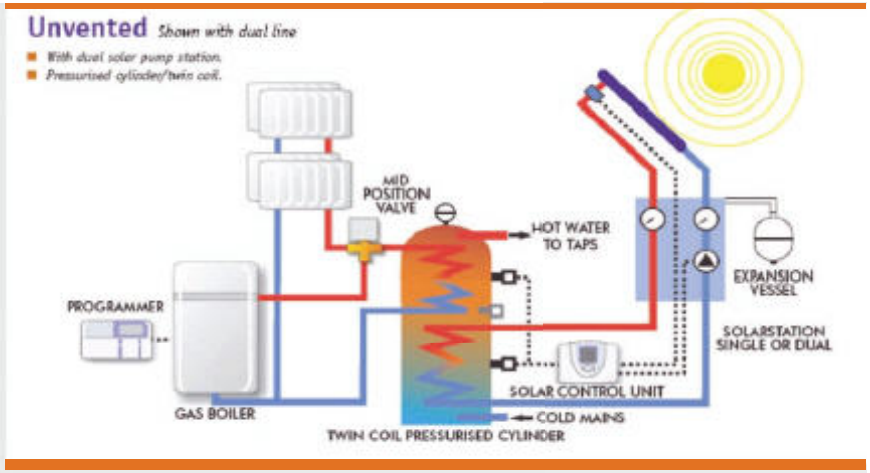
mint renewables

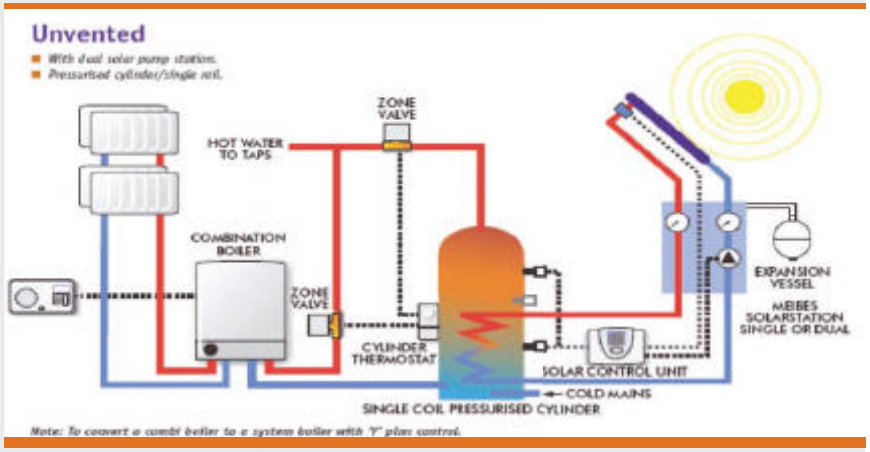


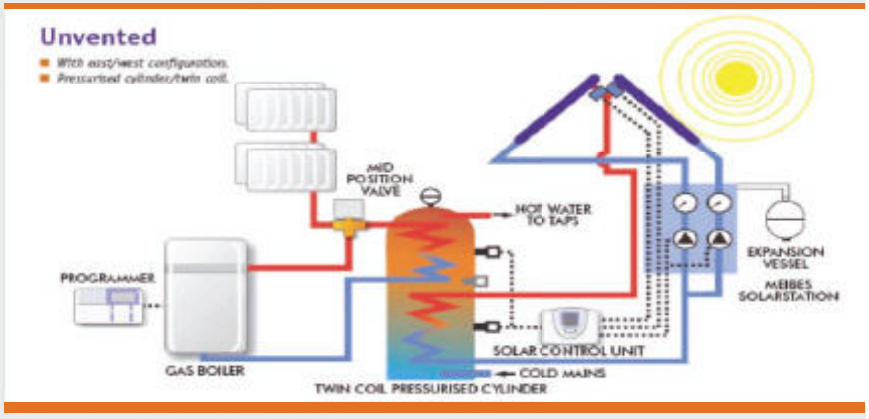
Steca Wiring Connections



Refer to controller user manual for time, date, and system configuration set up







mint renewables

Installing the temperature sensor

The solar collector temperature sensor should be installed in the sensor sleeve nearest to the collector array flow. To ensure optimal contact between the temperature sensor and the surrounding environment, the gap between the sensor sleeve and the sensor element should be filled with a suitable conducting compound. All materials used for installing temperature sensors (sensor element, conducting compound, cables, sealing and insulating materials) must be suitably temperature resistant (up to 250°c).

Operating pressure

The maximum operating pressure is 10 bar.

Removal of air from the system (bleeding)

The system should be properly bled at commissioning to remove as much air as possible from the system. We would recommend that after 2 to 4 weeks of operation the system is bled again .

Warning! - When bleeding the system there is a risk of scalding due to steam and hot transfer fluid and appropriate care must be taken.

Only operate the bleeding valve if the temperature of the heat transfer fluid is below 60°c. When bleeding the system the collectors must not be hot! Cover the collectors and, if possible, bleed the system in the morning.

Checking heat transfer fluid

The heat transfer fluid must be checked at least every four years with regard to its antifreeze content and pH value.

- Check the antifreeze with an antifreeze tester and replace or refill if necessary. We would recommend a target protection of -25°c.
- Check the pH value with a pH indicator rod. If the limit pH value is less than 7.0 then replace the heat transfer fluid.

Collector maintenance

The solar collectors should be inspected visually, once a year, for any signs of damage, leaks or contamination.

Design and survey report

Date:

Reference:

Completed by:

Surveyor contact no.:

Client details:

Name:

Address:

Tel.:

Mobile:

E-mail:

1.	System type:	Domestic hot water (DHW)	☐
		DHW plus space heating	☐
		Swimming pool heating	☐
2.	Building type (if house record whether detached, semi-detached or terraced):	House	☐ .....
		Block of flats	☐
		Sheltered housing	☐
		Commercial (describe)	☐ .....
3.	Number of storeys		.....
4.	Approximate age of building		.....
5.	Is building listed?		Yes/No
6.	Is building in conservation area?		Yes/No
7.	Solar fraction:	Low (circa 50%)	☐
		Medium (circa 60%)	☐
		High (circa 70%)	☐
8.	No. of occupants:		
9.	Approximate daily hot water usage (at 50°c) per occupant:	Low (30 litres)	☐
		Medium (50 litres)	☐
		High (70 litres)	☐

Design and survey report (continued)

10.	Type of fuel used for water heating (and approximate annual consumption in kWh)	Gas	☐	.....kWh
		Oil	☐	.....kWh
		LPG	☐	.....kWh
		Electricty	☐	.....kWh
		Solid fuel	☐	.....kWh
11.	Hot water storage type	Vented	☐	
		Unvented	☐	
12.	Does property have combi-boiler?	Yes/No		
		If yes, type:		.....
13.	Proposed location for solar collectors	Pitched roof	☐	
		Flat roof	☐	
		Ground mounted	☐	
		Frame mounted on wall	☐	
14.	Roof orientation			
15.	Roof pitch			
16.	Type of roof covering (eg. Slate, flat tile, pan-tile etc.)			
17.	Roof condition			
18.	Any shading (eg. none, from a tree, from a structure, part of the day, a lot of the day)			

19.	Available roof space	Width	.....m
		Height up roof	.....m
20.	Any roof obstructions (e.g. Dormer, sky-light, chimney stack)		.....
21.	Please sketch the proposed location of the solar collec-tors relative to the roof plan of the building		
22.	Are there any access restrictions for erecting scaffold? (if so, draw on sketch in 21)		.....
23.	For pitched roof, collectors are to be:	Mounted on-roof	☐
		Roof-integrated	☐
24.	Space for solar cylinder(s) in airing cupboard/plant room	Height	.....m
		Width	.....m
		Depth	.....m

Design and survey report (continued)

25.	Proposed solar cylinder type	Volume	.....litres
		Number of coils	.....
		Vented	☐
		Unvented	☐
26.	Please note and special cylinder fittings required (e.g. shower fitting, pumped secondary fittings)		.....
26.	Proposed number of Asis One collectors		.....
27.	Proposed mounting configuration	Portrait/vertical	☐
		Landscape/horizontal	☐
28.	Proposed solar circuit type	Fully filled, pressurised	☐
		Drainback	☐
29.	Approximate distance between proposed solar collector location and solar cylinder(s)		.....m

30. Please note recommendations for solar circuit pipe-route and note any complications or special features

.....

Additional information for swimming pools

31.	Pool dimensions	Length	.....
		Width	.....
		Average depth	.....
32.	Pool location	Indoors	☐
		Outdoors	☐
		In-ground	☐
		Above ground	☐
33.	Is a pool cover used when pool is not in use?		Yes/No
34.	Type of fuel used to heat the pool	Gas	☐
		Oil	☐
		LPG	☐
		Electricity	☐
		Solid fuel	☐
		None	☐

35. If pool room (where appropriate) roof has not been described in 14 to 20, please provide dimensions and notes on structure

System commissioning checklist:

Customer details:

Name:

Address:

Telephone number:

Mobile number:

E-mail address:

Installer details:

Company name:

Address:

Telephone number:

Mobile number:

E-mail address:

Web-site:

MCS number:

System summary:

Number of Asis One 1A collectors

Type and volume of cylinder

Type of pump-station and controller

Type of solar circuit fitted

Commissioning date:

Solar collector serial numbers

Solar collector mounting brackets and clips inspected and secure ☐

Solar collector connections inspected and properly fitted and tightened ☐

Type of weatherproofing of roof penetrations (for in-let and outlet pipe-work and sensor cable) .....

Penetration weatherproofing inspected and properly fitted ☐

Collector sensor probe securely fitted into collector sensor pocket ☐

Primary pressure limit of weakest component .....bar

System pressure when cold .....bar

Fuse rating for fused-spur supply to controller and pump .....

Controls and sensors checked and operating correctly ☐

Δt setting for controller for switching system on .....^{0}c

Δt setting for controller for switching system off .....^{0}c

Maximum cylinder temperature setting in controller .....^{0}c

Cylinder temperature sensors secured and sensor cable tied neatly ☐

Expansion vessel capacity .....litres

Expansion vessel pre-charge pressure .....bar

System commissioning checklist (continued:

Volume of drain-back vessel (if drainback circuit): used)	.....litres
System flow-rate	.....litres/min
Primary circuit volume	.....litres
Type of heat transfer fluid used	.....
Earth bonding present	☐
Direction of non-return valve checked	☐
Position and type of air-vents used	.....
Air-vent(s) isolated after commissioning	Yes/No
Type and thickness of insulation used	.....
Pipe-work all insulated (apart from tee off to expansion vessel and air-vent)	☐
Pump operation and checked and pump running quietly	☐
Pump speed setting	.....
Method of anti-scalding in DHW circulation	.....
Location of fused isolation switch	.....
Location of pressure gauge	.....
System explained to customer	☐
System documentation provided to customer	☐

Declaration (to be completed by the commissioning engineer):

I confirm that the system described in this commissioning checklist has been installed at the address stated.

The system design is in line with best practice and the system has been installed to comply with the Microgeneration Certification Scheme Standard MIS3001 and with all legal requirements. All notifiable works have been carried out by suitably qualified personnel and have been notified to the relevant authorities.

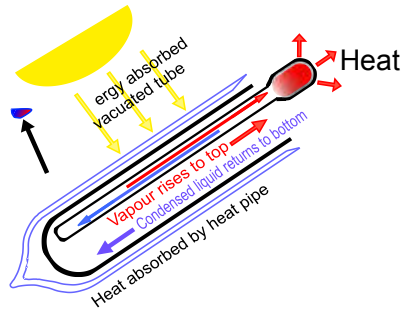
Signed: Print name:

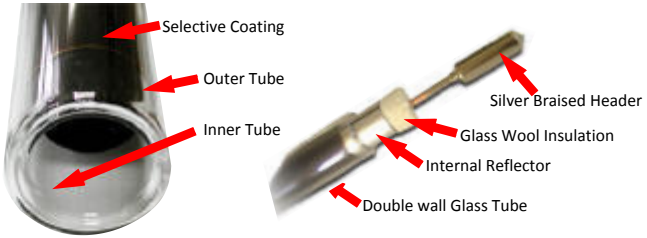
Date of commissioning:

Evacuated tube heat pipe collector

E-tube

- On roof
- Flat roof





E-tube evacuated tube heat pipe technology

Our E-tube range of evacuated tubes are designed to offer excellent performance efficiencies at the most competitive prices possible for high quality evacuated tubes. The evacuated tube collectors use a vacuum space within each tube's borosilicate glass shell to offer very high efficiency and heat loss protection in any climate. In the unlikely event of a tube breaking, it can be removed and the entire system will continue to function, ensuring a heating source that will not fail. There are three unique heat pipe evacuated tube models; E-tube 15 (15 tubes), E-tube 20

- Ultra-high performance evacuated tubes
- Low profile contoured manifold
- Latest selective surface coating
- Silver brazed condenser riser head
- Solar keymark certified
- Multiple mounting and

E-tube technical data	E-tube 15	E-tube 20	E-tube 30
Zero loss collector efficiency	73.4%	73.4%	73.4%
Heat loss coefficient	1.529	1.529	1.529
Overall area	2.42m^2	3.18m^2	4.70m^2
Aperture area	1.40m^2	1.87m^2	2.79m^2
Length x width	1950mm x 1242mm	1950mm x 1632mm	1950mm x 2412mm
Max. operating pressure	10 bar	10 bar	10 bar

Warranty

Conditions for Eco pipe Vacuum tube and flat plate collectors.
All deliveries and services are carried out according to our general terms and conditions of sale.
1. The warranty period for the collector function amounts to 5 years for vacuum tubes and 10years for Manifold & plates. Within that period, all parts proven to be useless or considerably reduced in their usability due to production or material defects are repaired or replaced ex works, at expiration of the legal warranty period, we have the choice between rectification or replacement.
2. The warranty begins with the delivery of the collectors to the end user and under condition, that the system has been installed and setup by a specialised company according to our installation and operating instructions as well as the locally valid current building regulations.
Further, the warranty is dependent on a carefully completed installation and maintenance record which must be filled out by the installer and kept by the system owner.
3. The guaranteeing implies that
- The collectors are transported, installed, operated and maintained according to our installation and operating instructions,
- the collector system is exclusively operated with our solar liquid. (or approved equivalent product)
4. The guaranteeing does not refer to damages due to-
- wear and tear , excessive wear, inappropriate operation or inappropriate use,
- use of and unsuitable solar fluid or results of corrosion caused by a solar fluid, chemical or electro-chemical influences, incorrect system layout.
5. Moreover, the warranty does not apply for damages as a result of an inappropriate storage of the collectors prior to installation and damages that are ascribed to force adjure, The warranty regarding the safety glass refers to its condition, and here only to manufacturing and material defects. The cover security is examined in the context of the inspection requirements for collectors and ensured only according to these requirements.
6. The warranty expires
- if arising and obvious defects are not notified in writing within 10 days after receipt or hidden defects immediately after emerging. In case of hidden defects it is only valid for the warranty exceeding the legal warranty period,
- if the collectors are changed or maintained by not-specialised persons or companies or undertaken without or prior agreement,
- if the possibility to inspect the entire system is not guaranteed or if the collector are removed without or agreement - if original components are exchanged by other components or if inappropriate installation material and system components as well as non authorized solar fluid are used,
- if the annual inspection is not realized within the time limit. The proper execution is to be documented by the specialized company in the appropriate page is this manual
7. Transport damages are to be notified immediately, stipulated on the delivery note and signed by the sub-contractor.
8. After the expiration of the legal warranty period, the warrantee must provide the necessary aid in case of reparation work and is obliged to assume the necessary services like transport, installation etc. In the event of warranty, we recompense
- for on-roof installation max. 200,00€ + VAT for the first collector and max. 80,00€ + VAT for each additional collector, incl. All consumables.
- for in-roof installation max. 300,00€ + VAT for the first collector and max. 90,00€ + VAT for each additional collector, incl. All consumables.
9. This warranty does not justify claims exceeding the legal liability for physical or personal injuries that have been caused by thedefects of the purchased object.
Retrospective actions and abatements exceeding legal regulations are not justified either.
10. Other legal claims for warranty and damages in respect of bad installation remain untouched by this warranty. 11. The exchange or rectification of the collectors or other parts of the solar system must be carried out by the installer and only after having consulted Eco pipe Otherwise an entitlement to compensation does not exist.
12. Notifications of claim are to be announced in writing to H2 Solar Shop Limited and by presenting the installation and maintenance record as well as the respective proofs immediately after the damage has occurred. 13. Solar accessories are subject to the warranty as specified by their Manufacturer.

TÜVRheinland®
DIN CERTCO

Fraunhofer Institut Solare Energiesysteme

Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate
Kurzfassung EN 12975 Test Ergebnisse, Anlage zum Solar KEYMARK-Zertifikat
Synthèse des résultats d'essais selon EN 12975, annexe au certificat Solar KEYMARK

Registration No. / Registernummer / Numéro d'enregistrement: 011-7S726 R
Date / Datum / Date: 3/18/2009

Company / Firma / Société	Beijing sp. Incoe solar energy technology co. Ltd	**Country**/Land/Pays	PR China
Street / Straße / Rue	Changping park, Zhongguancun technology zone	**Website**	
Postal Code, Place / PLZ, Ort / Code postal, Place	102200 Beijing	**E-mail**	
		Tel. / Fax	

Collector Type / Kollektorbauart / type de capteur: Evacuated tube / Vakuumröhrenkollektor / Capteur à tube sous vide
To be roof integrated / im Dach eingegliedert zu sein / pour etre intégré dans le toit: No / nein / non

Product name / Produktbezeichnung / Modèle	Aperture area Aperturfläche Superficie d'entrée	Gross length Länge(Außenmaß) Longueur hors tout	Gross width Breite (Außenmaß) largeur hors tout	Gross height Höhe (Außenmaß) épaisseur hors tout	Gross area Bruttofläche Superficie hors-tout	Power output per collector unit Leistung je Kollektormodul Puissance fournie par le capteur (note 1) G = 1000 W/m² Tm-Ta :				
						0 K	10 K	30 K	50 K	70 K
	[m²]	[mm]	[mm]	[mm]	[m²]	[W]	[W]	[W]	[W]	[W]
SZ 58-1800 10H	0.94	1 950	852	189	1.66	690	674	633	590	546
SZ 58-1800 12H	1.12	1 950	1 008	189	1.97	822	803	755	692	614
SZ 58-1800 14H	1.31	1 950	1 164	189	2.27	962	939	883	809	719
SZ 58-1800 15H	1.40	1 950	1 242	189	2.42	1028	1004	943	865	768
SZ 58-1800 16H	1.49	1 950	1 320	189	2.57	1094	1068	1004	920	817
SZ 58-1800 18H	1.66	1 950	1 476	189	2.88	1233	1205	1132	1037	922
SZ 58-1800 20H	1.87	1 950	1 632	189	3.18	1373	1341	1260	1155	1028
SZ 58-1800 24H	2.24	1 950	1 944	189	3.79	1644	1606	1509	1383	1229
SZ 58-1800 26H	2.33	1 950	2 022	189	3.94	1710	1671	1570	1438	1278
SZ 58-1800 28H	2.61	1 950	2 256	189	4.40	1916	1872	1758	1612	1432
SZ 58-1800 30H	2.79	1 950	2 412	189	4.70	2048	2001	1880	1723	1531

Collector efficiency parameters related to aperture area / Kollektorleistungsparameter bezogen auf die Aperturfläche / Paramètres de performances thermiques rapportées à la superficie d'entrée (note 1)	η_{0a}	0.734	-
	a_{1a}	1.529	W/(m²K)
	a_{2a}	0.016	W/(m²K²)
Stagnation temperature / Stagnationstemperatur / Température de stagnation (note 2)	θ_{stg}	260.3	°C
Effective thermal capacity / Effektive Wärmekapazität / Capacité thermique effective	$c_{eff} = C/A_a$	15.6	kJ/(m²K)
Max. operation pressure / max. Betriebsdruck / pression d'opération de maximum (note 3)	p_{max}	1000	kPa

Incidence angle modifiers $K_{\theta}(\theta)$ / Einfallswinkelkorrekturfaktoren $K_{\theta}(\theta)$ / Facteur d'angle d'incidence $K_{\theta}(\theta)$	G_{dif}/G_{TOT} min	G_{dif}/G_{TOT} max	θ_T / θ_L	50°	10°	20°	30°	40°	60°	70°
	0.077	0.139	$K_{\theta}(\theta_T)$	1.37	1.00	1.03	1.11	1.25	1.36	1.11
			$K_{\theta}(\theta_L)$	0.92	1.00	1.00	0.99	0.96	0.84	0.59

G_{dif}/G_{TOT}: min&max while measuring / min&max während messen / min&max pendant qu'essayant — Optional values / Angaben optional / Données

Testing Laboratory / Prüflaboratorium / Laboratoire d'essais	Fraunhofer ISE, PZTS
Website	www.kollektortest.de
Test report id. number / Prüberichtsnummer / numéro d'identification de rapport des essais	kth-2007-07-at-en-k2
Date of test report / Datum des Prüfberichts / date de rapport des essais	18.03.2009
Perf. test method / Leistungstestmethode / méthode d'essai de performance	EN 12975-2:6.1.4 (outdoor/außen/extérieur)

Comments of testing laboratory / Kommentare des Prüflaboratoriums / commentaires du laboratoire d'essais :
English
Deutsch
Francais

Note 1	**Test conditions** Prüfbedingungen conditions d'essais	**Fluid** Flüssigkeit Liquide	Water Wasser Eau	**Flow rate** Durchfluss Débit	0.014 - 0.042	kg/s per m²
Note 2	**Irradiance** / Bestrahlungsstärke / Irradiance G=1000 W/m² **Ambient temperature** / Umgebungstemperature / Temperature ambiante: t_a=30 °C					
Note 3	**Given by manufacturer** / Herstellerangaben / donnée par le fabricant					

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A reliable hand for expert advice and support

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