



CONTENTS

1. General

System Components
Certification

2. Installation Instructions

Fitting Operation
General Notes on Installation
Safety Notes

3. Collector Installation

- 3.1 Sequence for fitting of collector
- 3.2 Position of collector
- 3.3 Inclination of collector
- 3.4 Fitting of collector

4. Roof fitting on a tiled/slatted roof

Fitting of retaining brackets
Fitting of cross members ,bolts and collector

5. Sensor Connection

Location of sensor
Fitting of Collector sensor

6. Pipework to the collector

Conditions for the installation of the solar circuit
Hard soldering
Dirt in the pipelines
Expansion Tank

7. Exchanging Individual pipes

How can faulty pipes be recognised?
Exchanging individual pipes
Health and safety precautions while changing tubes
Dismantling the pipes
Fitting individual pipes

8. Start-up

Frost protection
Filling, Pressure test and Flushing
Maximum pressure
Commissioning
Decommissioning
Lightening protection/regulations

9. Instruction

10. Maintenance

Cleaning of collectors
Check and top up Solar Liquid
Dismantling



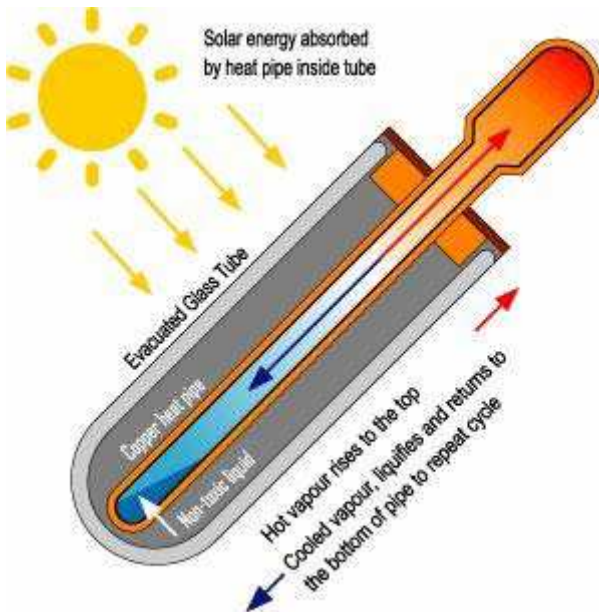
Utilising Solar Energy

The working principle of a solar heating system can be easily explained. A collector receives the solar radiation, and as a result heats up. This heat produced is channelled in the greatest possible quantity to a hot water tank. No fuel is used during this process, and so there are no CO₂ emissions, thus no environmental pollution. The quality of solar energy that the collector is able to transfer into the house depends mainly on its capacity to absorb light, but also on its insulation from the external environment, which prevents the dispersion of energy from the collector itself.

Vacuum tube

The creation of a vacuum by removing the air from a glass container achieves excellent insulation, a principle which has been known for a century now and applied in the form of the thermos. By using this type of insulation, the collectors can improve the conversion of solar energy even in between seasons and in the winter period.

A special multi-layer metallic paint, made from recyclable products, called CERMET, is applied to make the internal space especially selective to infra-red refraction for the absorption of solar energy.



Heat pipe working theory

Heat pipes are not a new concept. Their earliest use was in the aviation industry, where scientists used a heat pipe to balance the temperature of the aircraft by transferring high temperatures thus keeping the aircraft safe.

Now the heat pipe is commonly used in computer manufacturing. Laptop computers usually use small heat pipes to conduct heat away from the CPU, and in air-conditioning, a heat pipe is used for heat conduction.

As we know, at sea level water's boiling point is 100 °C, but when you are on the top of a high mountain, the boiling point is less than 100 °C, water can boil at 60 °C at high altitudes (The higher you are above sea level the lower the boiling point), this is why people must use a pressure cooker to cook food on the top of high mountain. A heat pipe uses this principle of water boiling at a lower temperature with decreased air pressure. We evacuated the heat pipe and introduce a small volume of purified water inside. The water can boil at 30 °C. When the vacuum tube absorbs solar energy and heats the heat pipe to 30 °C, the water vaporizes and rises to the top of the heat pipe (condenser). When the heat pipe condenser meets cold water and cools down, the water will liquify and return to the bottom of the heat pipe, and so the process is repeated over and over.

1. Heat pipe condenser diameter(D) is 24mm, length(L) is 90mm
2. Heat pipe condenser surface is nickel-coated, silver color, it can prevent the heat pipe from being oxidized by the solar collector manifold copper pipe.
3. Temperature resistant from -40°C to 300°C
4. Add copper powder inside the heat pipe to anti-freeze.
5. Daub grease equably on the surface of the heat pipe condenser, which can increase the heat pipe's energy transfer performance





1. General

10-30 series vacuum tubes are assembled together in a collector module. At the top ends, the collector tubes are connected to the collector distribution pipe through which the solar liquid flows. All collector tubes are permanently connected to the distribution pipe, however any tube can be exchanged without draining the system. This is a major advantage of vacuum tube collector.

1.1 Certification

The solar collector conforms to

DIN EN 12975-1:2006-06 / DIN EN 12975-2:2006-06

The collector has been tested by technical inspection authorities and qualification approved.

Installation

2.1 Fitting Operation

The installation and initial commissioning may be carried out only by an authorised specialist. They shall be responsible for the correct installation and initial commissioning. Check the system regularly.

Caution: Due to the possible very high temperatures in the collector there is a risk of burning from the exposed piping and from the hot solar liquid.

Prior to installation and commissioning of the solar system, the following components connected to the solar system must be available in line with the system design:

- Storage tank with internal or external heat exchanger
- Solar circuit (flow and return pipe)
- Bleeding valves on the flow and return pipe

- Ducts through the roof for connecting the collector piping
- Solar station (circulation pump, overflow valve, controller, compensator)

2.2 General Notes on Installation

- In-roof fitting is not possible with vacuum tube collector.
- The manifold should be mounted to the top.
- For on-roof and flat-roof fitting. Minimum inclination of 15 degrees for self-cleaning, also enabling the heat pipe to operate.
- Only hard-soldered connections or compression fittings to be used in the assembly of the solar heating circuit.
- When filling the solar system, air must simultaneously be flushed out of the system.
- The pipe insulation on the solar flow and return pipes must be resistant to 150 degrees Celsius and be UV-resistant.



2.3 Safety Notes

With solar radiation and diffuse global radiation, the collector tubes at the top end of the pipe reach temperatures of 200 Degrees Celsius.

2.3.1 Work on the roof

Appropriate accident prevention action should be taken when working on roofs. The following points must be observed for the safe installation of the solar components:

- Protection against falling should be used when working at a height
- Safety regulations must be observed when using simple ladders.
- It is essential to wear a dust mask if drilling asbestos cement.
- Working places on steep roofs must be secured
- Health and safety regulations and fire protection regulations must be observed when soldering.

Vacuum tube collectors can reach a standstill temperature of 200 degrees Celsius caused by incoming light during fitting and operation. There is a risk of burning on the connections of the flow and return pipes. Tubes should not be fitted until collector system has been flushed and filled with heat transfer fluid.

2.3.2 Steam formation in the collector

Danger!

Even in normal daylight, there is a possibility that the liquid in the collector may evaporate. This steam exists from the collector connections. There is a risk of scalding!

2.3.3 Caution Glass

Danger!

Do not exert any mechanical pressure on the glass vessels. There is a risk of cutting yourself on the glass splinters.

Wear gloves and protective goggles when installing the vacuum tubular collector in order to prevent any injuries in the event of damage.

Collector Installation

Make sure the vacuum tube collector and fittings are attached securely so the fixings can safely withstand high wind and snow loads.

3.1 Sequence for installation of a vacuum tube collector

- Find space for the components of the solar system
- Fit solar working station and controller
- Lay solar pipework from the controller location to the collector
- Mount roof fitting brackets for collector (fig 1)
- Assemble struts to manifold and tube retainer (see following page)
- Attach collector to brackets by putting 90 degree twist in strap, drill hole in vertical strut and use 40mm stainless steel bolt to secure the strap to the collector frame (fig 2)
- Connect solar pipework to collector
- Connect collector temperature sensor
- Flush system with antifreeze
- Fit solar vacuum tubes
- Pressure test with frost protection
- Commission the solar system
- Instruct home owner how to operate the system controller.



fig 1



fig 2



fig 3

3.2 Position of the collector

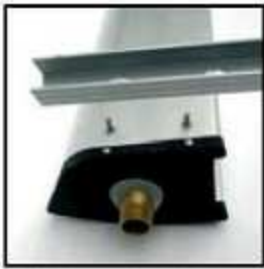
- The collector manifold must always be on top.

3.3 Inclination of the collector

- For on-roof and flat-roof fitting, a minimum inclination of 15 degrees for the purposes of self-cleaning and for the heat pipe system to operate.

3.4 Fitting the collector

Install the hanging straps/fixing brackets through the roof material, either slate or tile. Bend straps over baton and screw fix. Add additional support to underside of baton if required. Attach collector to straps using stainless steel bolts provided Tubes can be fitted once system is filled



Unscrew nuts from Manifold header and align vertical struts



Tighten nuts to secure Vertical Struts to Header



Install horizontal struts using 6mm bolts provided



Tighten nuts between horizontal and vertical bars



Complete horizontal bar installation



Fix footer to vertical struts using 8mm bolts provided



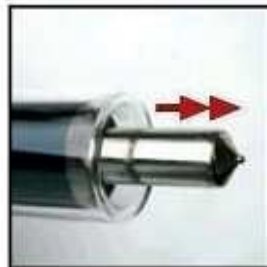
Frame assembly complete. Check square, by measuring diagonally



Install rubber seals into header. Lubrication recommended when installing tubes.



Unscrew all retaining cups from footer



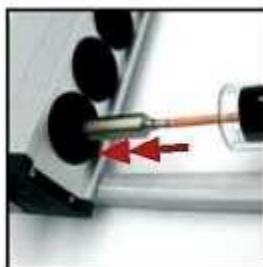
Extract heat pipe approx 200mm from the glass tube



Apply heat conductive paste to condenser for better heat transfer



Slide vacuum tube through cup retainer



Insert condenser into manifold ensuring the condenser is fully inserted to manifold



Insert glass tube through lubricated rubber into header



Re-install the retaining cups



Collector Installation complete!



Pipework to the collector

4.1 Conditions for the installation of the solar circuit

- The solar system must be configured as an enclosed system, as the inhibitors of the anti-freeze would be used up more quickly if oxygen from the air were to enter the system.
- The system may not be treated with heat exchangers, heat stores or containers on the on the primary side, as zinc can be removed by 1.2 propylene glycol.
- Make sure that all sealing and connecting materials are resistant up to the maximum standstill temperature (approx 200deg C)
- Metal hoses should preferably be used as flexible connecting elements.
- All lines must be laid so that no circulation disruptions can be caused by gas cushions or deposits.
- The circuit system must be permanently filled to the highest point with the heat carrier liquid. At the highest point a bleeding point must be fitted to trap the gases, alternatively an air scoop valve can be used.
- When laying the pipework for the collectors, the flow and return pipes are fed through the roof membrane into the roof space. The flow to the cylinder should be on the same side as the probe pocket on the collector.

4.2 Hard soldering

- Solder connections with Ag or Cu hard solder should be used.
- No fluxing agents containing chloride should be used.
- Important: if soft solders are used, all guarantees are nullified.

4.3 Dirt in the Pipelines

During fitting and prior to filling, the system and its components must be protected against the entry of dirt and water. After the system has been built, it must be cleaned inside (flushed) in order to remove solids (metal chips, packaging residue, sawdust etc.) and fitting aids.

4.4 Expansion Tank

Membrane pressure compensators must comply with DIN 4807 and 4757.

Exchanging Individual Tubes

5.1 Exchanging Individual Tubes

- Tools and material needed:
- Spanner, possibly a bucket and broom for shards, soapy water, spare tube.

5.2 Resources for your protection

- Caution: When replacing faulty or damaged tubes, always wear gloves and protective goggles**
- risk of burning!**

5.3 How can a faulty pipe be recognised?

Vacuum tubes are permanently vacuum sealed. If a tube is damaged by external impact or if it is leaks it must be replaced. A damaged tube cannot always be recognised by broken glass. But a faulty tube can always be recognised by the fact that the silver coloured mirror (barium getter) in the foot area of the tube changes to a whitish tinge caused by incoming air.



5.4 Dismantling the pipes

In the case of mechanically damaged tubes:

Carefully remove glass shards without damaging the manifold rubber. Remove glass waste from the collector box. Then unscrew the tube holder.

In the case of non-mechanically damaged tubes:

Firstly, unscrew the tube holder at the bottom end. Lift the tube slightly and turn slightly around the longitudinal axis pull out downwards in a straight line. If there is not enough space to pull the tube out completely downwards, e.g. if fitted on a flat roof, proceed as follows:

Important: Protect the end of the tube by holding it with a glove and pull it down to the ground, then pull the tube end in a straight line along the ground. Make sure that the copper tube is not pulled out of the collector level by more than 20degrees, because of a risk of bending.

5.5 Fitting an individual pipe

Make sure that the silicone ring in the collector box is sitting cleanly. If the silicone ring was damaged when the old tube was being removed, it should be replaced by a new silicone ring. The silicone ring is available as a spare part.

Coat the upper tube end with soapy water so the tube can simply pushed through the silicone ring on the collector box. Now, steadily push the new tube over the heat conducting area in the same way as the tube was removed, making sure that the 8mm copper tube and the heat conducting sheets cannot be lifted from the collector level by more than 20 degrees. Protect the tube end by holding it with a glove (**Caution: Risk of scalding!**). Push the tube into the collector box by turning it slightly through the silicone ring. Screw on the bottom cap.



Start-Up

6.1 Frost Protection

Antifreeze must be used as the heat transfer fluid from the collector to the heat exchanger.

6.2 Filling, Pressure Test and Flushing

The system may not be filled if the collectors were previously exposed to direct sunlight, or are even still being exposed to the sunlight or if the sky is very bright. Individual tubes could be damaged by the temperature shock and bleeding would be made extremely difficult because of many “steam islands”.

If the solar system has been completely installed in accordance with the Fitting Instructions, make sure that the solar radiation is low during filling. In strong sunshine or with strong diffuse radiation, there can be a temperature shock, causing damage to individual tubes. It is also possible for steam areas to form in the collector tube, making good bleeding difficult (cover tubes!).

The solar system can be filled with a motorised filling pump or with a simple hand-operated pump.

Make sure that the gravity brake in the solar/feed pipe and reverse pipe are open.

Filling with a motorised filling, flushing and pressure station with pressure-reducing valve and filter is to be preferred, which combines all the necessary stages. This achieves not only considerable time advantage, but also bleeds the system well. After filling make sure that there are no more air pockets in the system.

Then flush the solar circuit thoroughly. In this connection, filter the solar carrier liquid after exit from the system and before filling again. After carrying out all of the necessary work, set the solar system to operating pressure.

6.3 Maximum Pressure

The idling pressure of the system (in a cold state) must be 0.5 bar above the admission pressure in the solar expansion tank. This means that with a MAG admission pressure of 1.5 bar, the system idling pressure must be 2.0 bar.

6.4 Commissioning the Solar System

Switch on the control unit and check the correct function of the system. Aerate again if necessary.

6.5 Decommissioning

Unclamp controller. Drain heat carrier. Dispose of the heat carrier by means of recovery facilities

6.6 Lightning Protection

If a lightning protection system is already installed on the house, the collector system must be included in the lightning protection system.

The local lightning protection regulations must be observed.



Specifications for Solar Collector Roof Mounting

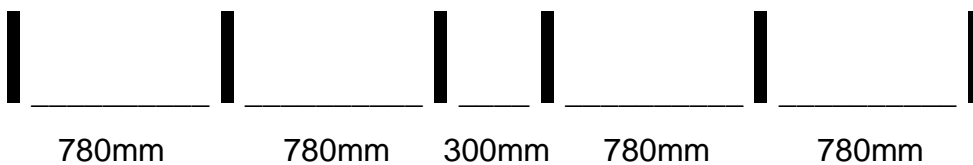
20 Tubes



30 Tubes



40 Tubes (2x20)



60 Tubes (2x30)

