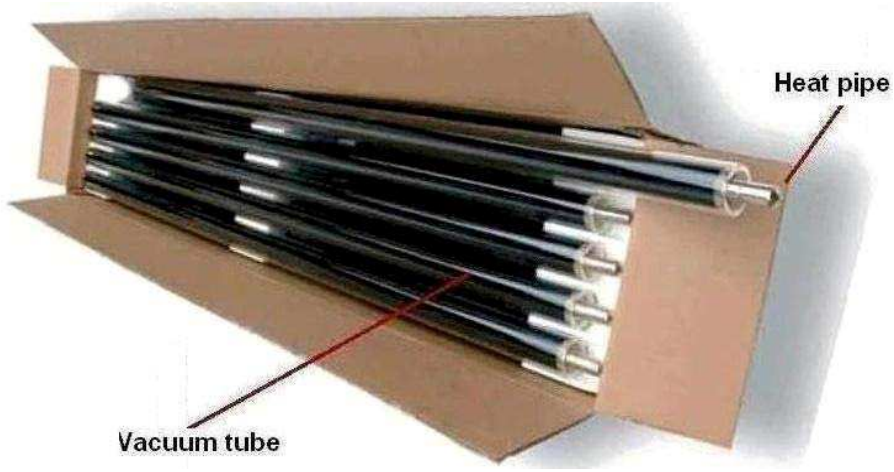
CONTENTS

COMPONENTS

Vacuum Tubes



Manifold (1)

Retaining Footer (1)

Heat Conductive Paste

Anti Dust Retaining Cups
(same as tube quantity)

Vertical Strut (3)

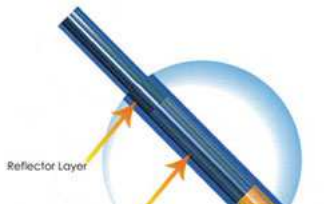
Horizontal Bar (3)

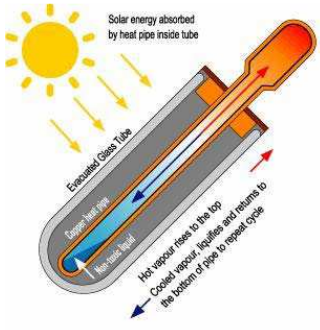
Assorted Fittings

C-Mc Energy recommends the installation of evacuated tube solar collectors in Ireland. Evacuated tubes are best suited to our climate in Northern Europe as they are designed to absorb diffused light (i.e. through cloudy skies) as well as direct sunlight. The C-Mc Energy solar collector is well designed and offers impressive efficiency levels.

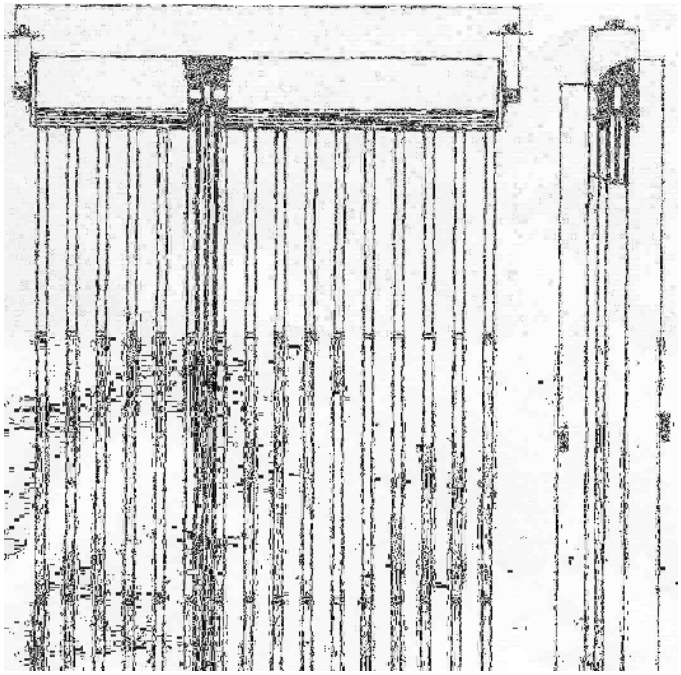
There are 2 sizes of collectors. Choose from 20 or 30 tubes per collector.

- The C-Mc Energy award winning vacuum tubes adopt an advanced coating technology which maximises the light to heat conversion. The infra red reflector layer reduces the radiant emissions enabling the tubes to withstand very cold temperatures.
- During manufacture, the tubes endure 36 different procedures to ensure durability, quality and longevity.
- The collectors are certified to European Standard EN12975 , qualify for the SEI Greener Homes Grant Scheme and the Reheat grant scheme .
- Light weight and easy to handle. Tubes are connected to manifold after collector is mounted. Similarly tubes can easily be disconnected from collector and replaced without affecting the operation of the system.
- Well suited to the Irish/UK climate. The tubes provide a large aperture area.
- Excellent Value for money. A 40 tube system for example will provide an approximate annual energy yield of 2104KwH.
- Each tube houses a heat pipe which is temperature resistant from -40C to 300C, making them very durable.
- East/West configuration available
- Minimum maintenance required.
- If a tube is broken it can be replaced with very little cost.
- Tubes are sealed with non corrosive parts.
- The manifold and frame are black in colour which blends well with most rooftops.





SPECIFICATIONS



No. of Tubes	Aperture Area	Appx Energy Yield	Heat Output Kw	Gross Area
20	1.867 m²	1052 Kw hrs	1.72	3.21 m²
30	2.791 m²	1578 Kw hrs	2.58	4.79 m²
40	3.734 m²	2104 Kw hrs	3.44	6.42 m²
60	5.582m²	3156 Kw hrs	5.16	9.58 m²

No. of Tubes	L mm	W mm	H mm	Weight kg	Max Operating Pressure	Stagnation temp.	Angle of Collector	Flow Rate
20	2020	1700	140	77	6 bar	200°C	15°-75°	0.5-1.5ltrs per min per m² aperture
30	2020	2520	140	114	6 bar	200°C	15°-75°	0.5-1.5ltrs per min per m² aperture

The C- Mc Energy solar collector has been certified by Din Certco, conforming to EN12975-1:2006-06 and EN12975-2:2006. Registration No: 011 – 7S1280R.

The quality management system of the manufacturer conforms to GB/T 19001-2000 and ISO 9001:2000 Standard. Registration No: 03508Q10113R2M (Jan 2008).

The stainless steel fastening system is made from stainless steel grade 1.4404, which has a "tensile strength" of 530 to 680 MPa.

Registered with Sustainable Energy Ireland

SEI Product ID: SEI-ST-288-T Model: TZ 58 1800

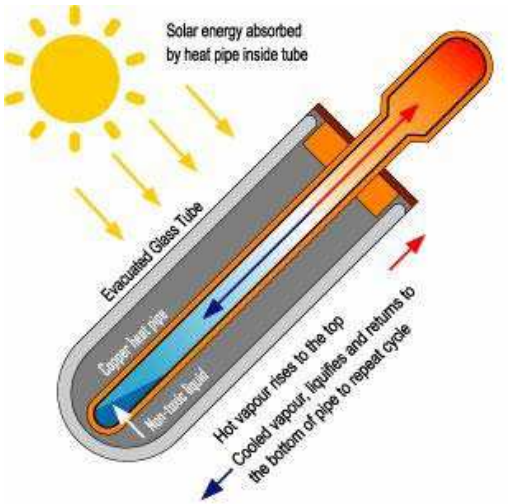
WORKING THEORY

The working theory 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 CO_2 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 selectrive to infra-red refraction for the absorption of solar energy.



Heat pipe working theory

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),

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 rise to the top of the heat pipe (condenser). When the heat pipe condensor 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 condensor diameter(D)is 24mm, length(L) is 90mm
2. Heat pipe condensor surface is nick-coated, silver color, preventing the heat pipe welding with the solar collector manifold copper pipe.
3. Temperature resistant from -40℃ to 300℃
4. Add copper powder inside the heat pipe to anti-freeze.
5. Heat Conductivity grease on the surface of the heat pipe condensor, can increase the heat pipe's energy transfer performance

PRE- INSTALLATION NOTES

Prior to installation and commissioning of the solar system, the following components of 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)

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. This also enables the heat pipe to operate more efficiently.
-Only hard-soldered connections, high temperature gasket fittings, 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. Filling and Flushing Stations are available from C-Mc Energy.
-The pipe insulation on the solar flow and return pipes must be resistant to 150 degrees Celsius and be UV-resistant.

Safety Notes

Do not expose the tubes to sunlight prior to installation. Tubes should not be fitted until collector system has been installed, flushed and filled with heat transfer fluid. **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!

Do not exert any mechanical pressure on the tubes. They are made of glass, so please take care when transporting and handling.

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 protective clothing i.e. gloves, protective eyewear, mask, hard hat, boots when installing a solar system.

-Working places on steep roofs must be secured

-Health and safety regulations and fire protection regulations must be observed when soldering.

Final Pre – Installation Checks

Do I have all the components required to complete an installation
Is there enough space on the roof to fit the required number of collectors
Is the orientation of the panels optimizing exposure to the sun. (As close to true south as possible)
Are there any obstructions that may hinder exposure i.e tall trees, buildings etc.

Have I read the Instruction Manual?

COLLECTOR INSTALLATION

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

-Assemble struts to manifold and tube retainer

-Attach collector to brackets by putting 90 degree twist in strap, drill hole in side of vertical strut (see Fig 1 on following page) and use 40mm stainless steel bolt to secure the strap to the collector frame

-Connect solar pipework to collector

-Connect collector temperature sensor

-Flush system with antifreeze

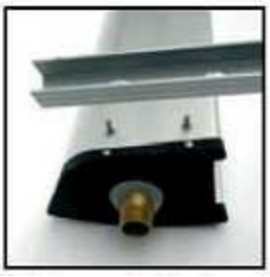
-Fit solar vacuum tubes

-Pressure test

-Commission the solar system

-Instruct home owner how to operate the system controller.

Assembling the Collector



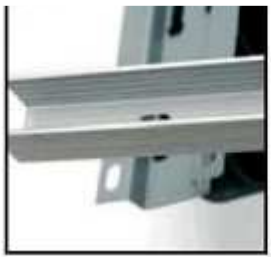
Unscrew nuts from Manifold header and align vertical struts

Tighten nuts to secure Vertical Stuts to Header

Install horizontal struts using 6mm bolts provided

Tighten nuts between horizontal and vertical bars

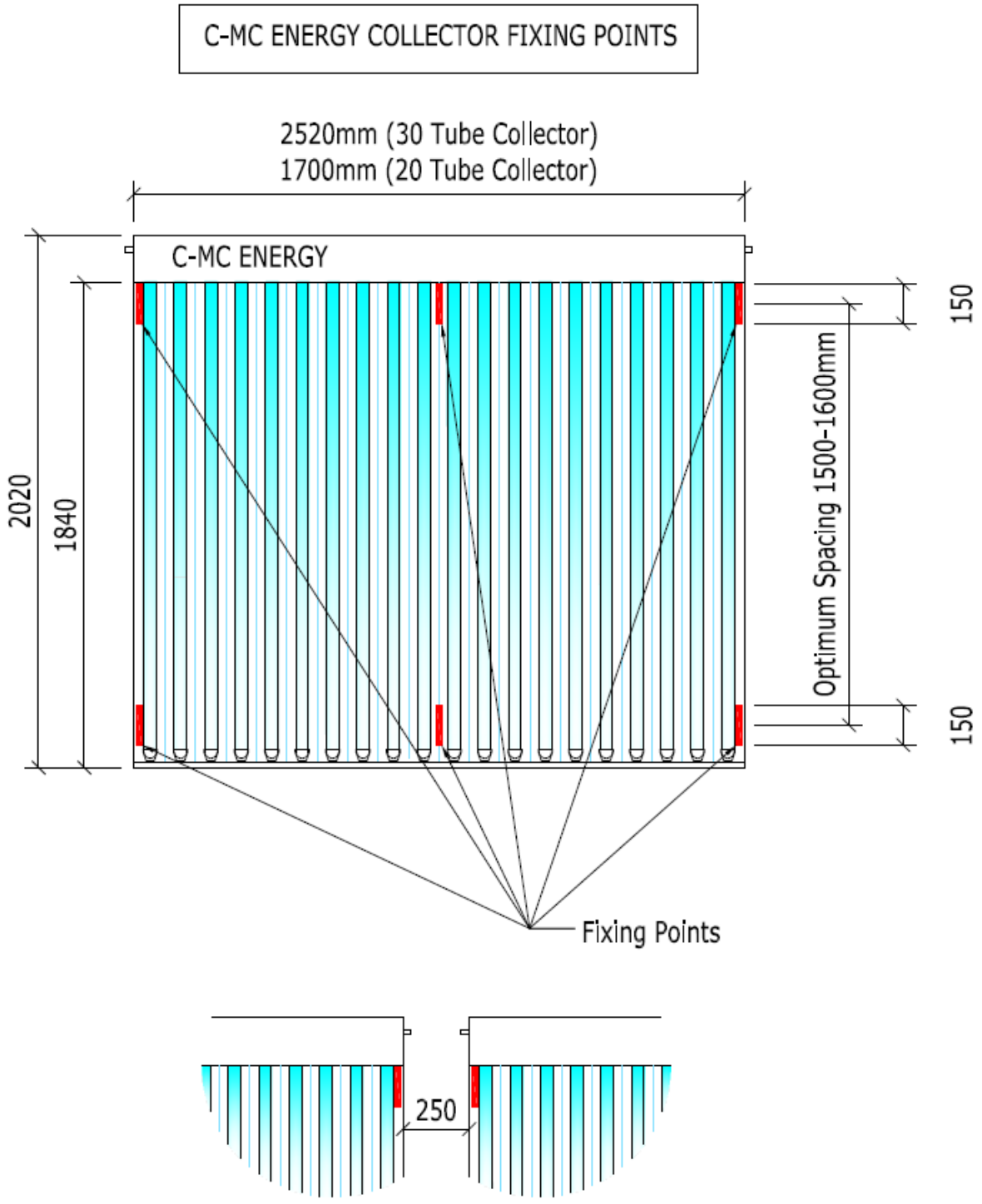
Complete horizontal bar installation



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.


C-MC ENERGY COLLECTOR FIXING POINTS
2520mm (30 Tube Collector)
1700mm (20 Tube Collector)
C-MC ENERGY
2020
1840
150
Optimum Spacing 1500-1600mm
150
Fixing Points
250

ROOF FIXING

Fitting the Collector to slate/tiled roof with Fixing Bolts

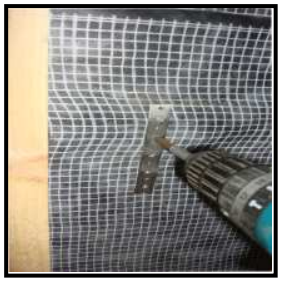
1. Locate all fixing positions on roof in accordance with 'fixing points' marked in red on page 8.
2. Carefully drill the roofing material with a masonry bit 2mm larger in diameter to the bolt being used.
3. If the hole drilled is not directly into a rafter, install noggin pieces between the raffter at the bolt locations.
4. Drill a pilot hole in rafter/noggin, 2mm smaller in diameter to the bolt being used. Ensure that the hole is at right angles to the rafter.
5. Screw the roof bolt into position, ensuring that there is minimum 100mm thread into the rafter/noggin.
6. Put seal onto bolt and gently tighten against roof material **(Do not over tighten)**
7. Fit collectors onto the bolts using the locknuts provided

Note: If installing multiple collectors a series, long mounting rails can be supplied, minimising the number of bolts required and also enabling bolts to be located in convenient positions (i.e. into the rafters)

Fitting the collector to slate/tiled roof with fixing Straps

Slide stainless steel straps up between roofing material. See spacings pg 8.

From attic cut a neat line in felt above holding batten to feed strap through



Bend strap over batten and screw fix top strap securely. Lower straps should be secured inside after collector has been mounted

If batten is too light for fixings install a noggin between rafters and screw fix securely

Put a 90° twist in each strap

Drill 6.5mm holes in vertical struts in required locations (within parameters indicated in red on page 8

Place collector over straps and secure with 40mm bolts, lower straps in attic can now be secured ensuring even tension on each strap

Roof mounting complete!

***Note**: Step 1 can also be done in reverse; strap can be fed out between teh roofing material from inside the attic.*

Fitting the collector to tiled roof with brackets


Step 1


Step 2


Step 3


Step 4


Step 5


Step 6

Step 7


Step 8


Step 9


Step 10


Step 11


Step 12

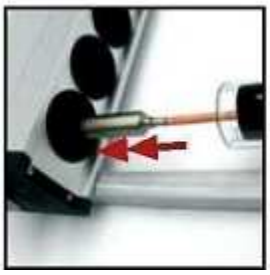
Fitting the Tubes


Unscrew all retaining cups from footer


Extract heat pipe appx 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!

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.

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.

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

Expansion Tank
Membrane pressure compensators must comply with DIN 4807 and 4757.

MAINTENANCE

It is recommended that the system is checked annually by a registered installer.

Exchanging Individual Tubes

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

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

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.

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.

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

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 sin 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.

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.

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

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

Lightening Protection
If a lightening protection system is already installed on the house, the collector system must be included in the lightening protection system. The local lightening protection regulations must be observed.

5 year warranty validated from receipt of commissioning report, which must be submitted to C-Mc Energy within 10 days of installation.