SCM-01 Solar thermal collector

SCM10-01 SCM12-01 SCM16-01
SCM15-01 SCM18-01 SCM22-01
SCM20-01 SCM25-01 SCM24-01
SCM28-01 SCM30-01

INSTALLATION MANUAL

2018-1-2 STSM201801

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1.Important Information

Ensure all flow and return pipes are copper with no plastic connections
Always wear protective gloves and eyewear when handing evacuated tubes
The installation of the solar collectors should no compromise the structural integrity of the building.
Should the collector be located where is could be vandalized it may be necessary to install protective guards that do not detract from the collectors performance.

Be careful through when handling the evacuated tubes as they will break if knocked heavily or dropped onto the hard surfaces.

With the heat pipe installed in the evacuated tube, and good sunlight, the heat pipe condenser can reach high temperature in excess of 200C. at this moment touching the heat pipe will result in serious burns.

The evacuated tubes should be insert last after the system has been commissioned, if you wish to install them all at the same time then cover them up until the pump is on and the system commissioned.

1.1. Local standards

Installation must be completed in accordance with the relevant local standards and regulations.

1.2.Qualified Installer

Installation must be completed by qualified plumbing professionals.

1.3. Pressure and Temperature Control and Relief.

Solar loop should be designed for normal operation at <600kpa via use of a pressure limiting (pressure reduction) valve on the mains cold supply line. System design must provide mean for allowing pressure release at no more than 1000kpa (113psi) and hot water dumping from the solar loop or storage tank once the temperature reaches 99℃(210F). It is recommended that the lever on the pressure and temperature relief valve (PTRV) be operated once every 6 months ensure reliable operation. It is important to raise and lower the lever gently.

1.4. Water quality

Water in direct flow through the manifold header must firstly meet potable water requirement and in addition the following:

Total dissolved solids	<	600mg/litre or p.p.m
Total hardness	<	200mg/litre or p.p.m
Chloride	<	250mg/litre or p.p.m
Magnesium	<	10mg/litre or p.p.m

In areas with“hard”water (>200ppm), line scale may from inside in header pipe. In such regions, it is advisable to in stall a water softening device to ensure the long term efficient operation of the collector, or use a closed loop for the solar circulation loop. If using a glycol/water must meet the above requirements, and the glycol must be changed periodically to prevent the glycol from becoming acidic.

1.5. Metallic corrosion

Both copper & stainless steel are susceptible to corrosion when high concentrations of chloride are present. The solar collector may be used for heating of spa or pool water, but levels of free chorine must not exceed 2ppm.in addition the warranty provided on the header when using for spa or pool heating is 2 years, which is the standard for spa and pool heaters. Chloride level present in most reticulated pubic potable water supplies are safe for use in the collector provided there is no use of bore waters in the reticulated supply.

1.6. Freeze Protection

Freeze protection should be in corporate into the system by use of a "low manifold temperature" setting on the solar controller, which turns on the pump if the manifold drops below a preset level (eg5℃/41F). Alternatively a closed loop filled with a glycol-water mix may be used to provide freeze protection. Evacuated tubes are not susceptible to damage in cold weather, and heat pipes are protected against damage caused by freezing of the water inside.

7. Hail resistance

The glass evacuated tubes are surprisingly strong and able to handle significant impact stresses once installed. Testing and impact stress modeling proves that the tubes are able to withstand impact from hail up to 25mm/1'' in diameter when installed at angle of 40°or greater. The ability of the evacuated tubes to withstand impact from hail is greater influenced by the angle of impact and so installing the collectors at low angles do reduce their impact resistance. It is recommended that in areas prone to large hail (>20mm3/4'') the solar collector should be installed at an angle of 40"or greater to provide optimum protection. As many populated areas in the world fall within the latitude of±30-70°this angle is generally a common installation anyway. If in the unlikely circumstance that a tube should become broken it can be easily replaced in a matter of minutes. The solar collector can still function properly with one or more broken tubes, however a reduction in heat output will result (depending upon how many tube are broken).

1.8. System design and installation

Please read all installation instruction carefully before beginning system design or installation. The system configuration may need to be customized to suit the specific requirements of the installation. Please ensure that any system design meets local building, water quality regulations.

1.9. Lightning protection

The collectors should be done lightning protecting to avoid the lightning attacking. The lightning rod is necessary which should be 1.5m higher and 3 m far away from the solar collectors. For any problems that involve plumbing or electrical connections the services of a qualified professional must be employed.

2.Unpack and inspect

2.1. Tube inspection

Open the tube box(es), which contain both evacuated tubes and heat pipes. Check to make sure the evacuated tubes are all intact and the bottom of each tube is still silver. If a tube has a white clear bottom, it is damaged and should be replaced. Each evacuated tube contains a pair of metal heat

transfer fins. As soon as the evacuated tubes are removed from the box, please put on the rubber tube caps, which are located in the manifold box. This will protect the bottom tip of the glass tube from being broken if knocked. Do not remove the and/or expose the tubes to sunlight until you install them, otherwise the inner tube and heat transfer fin will become very hot. The outer glass surface will not become hot.

2.2. Heat pipes

If heat pipes are bent during handing, don't worry as they are not easily damaged. Just ensure they are relatively straight before insertion into the evacuated tube.

2.3. Frame

Unpack the standard frame kit that is packed together with the manifold, if a flat roof frame or low pitched roof frame is being used, those components will packed separately from the manifold. It may be necessary to purchase bolts or other fasteners to suit the installation surface.

3. Plumbing

3.1 Plumbing Connection

Once the frame has been mounted and the manifold attached, the manifold header may be connected to the system plumbing.

3.2 Choice of Piping Material

13mm OD, or 15mm OD copper piping is generally used for most solar collector installations. As the flow rate is slow, a large diameter pipe is unnecessary and will only increase system costs and heat loss.

3.3 Pressure Levels

Regardless of the installation configuration, pressure release values, expansion vessels and/or other pressure control devices must be installed. T he solar loop should be designed to operate at no more than 100kPa (PRV may be 1050kPa). (1000kPa =10bar=145psi) For installation where mains pressure water is used, the system should ideally be designed to operate at a pressure of <600kPa, achieved by use of a pressure limiting/reduction value.

3.4 Tempering value.

It is recommended, and may be required by regulations, that a temperature control device (tempering value) be fitted into the hot water pipe between the water heater and bathrooms and en-suites to reduce the risk of scalding. This is achieved by controlling the water temperature to below 50℃/122F (temperature may be adjustable).

3.5 Temperature Sensor Insertion

The solar controller's temperature sensor should be coated with a thick layer of thermal paste and inserted into the sensor port to the full depth. If the fit is too loose, slide a piece of copper plate or wire in beside the sensor, Seal the sensor port opening with silicone sealant to prevent water ingress. Ensure that sensors used on the collector are high temperature rated (up to 250℃/486F), in particular the cable.

3.6. Wind and snow load

When installing the collector please consider the issue of wind resistance and the resultant stress on the attachment points. the standard frame is designed to withstand wind speeds of up to 120km/h and 30cm snow accumulation without damage. For the areas with possibility for high

winds, additional reinforcement of attachment points may be required and can easily be supplied by your local installers.

3.7 Heat transfer fluid

In the cold area, we recommend you to use the glycol as the freezing protection. The mixture percentage of the glycol/water, please comply with the relevant local standards and regulations or consult it with the local professional plumbers.

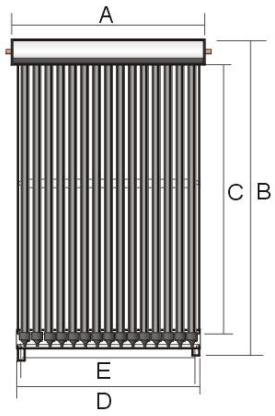
- Only use the food grade polypropylene glycol
- Ideally use glycol with additives that provide resistance to breakdown during the high temperature
- Glycol should be check (PH) and replaced periodically as specified by the glycol manufacturer

4 Stagnation and Overheating

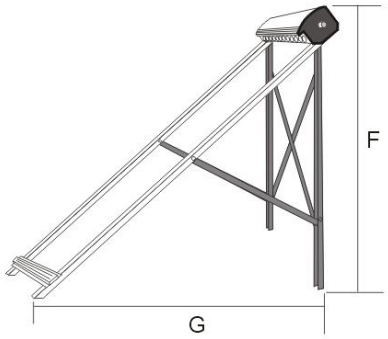
Stagnation refers to the condition that occurs when the pump stops running, due to pump failure, power blackout, or as a result of a high tank temperature protection feature built into the controller, which turns the pump off. If a PTRV is installed on collector inlet or outlet the collector will continue to increase in temperature until the limit of the temperaure relief valve is reached, at which point hot water will be dumped from the system. If a PTRV is not installed on the collector, steam will form in the header. Eventually some steam may feed back to the storage tank via the return line.

The PTRV on the tank will open to release pressure or heat as required. Under such conditions the manifold will normally reach a maximum temperature of around 160/320F.. Generally the heat returning from the collector in the form of steam is not enough to affect a continued increase in tank temperature (ie. Heat input <tank heat losses)Under normal use stagnation should rarely occur as a result of pump stoppage, since power blackouts normally happen during storms and not clear sunny weather. High tank temperature protection should only occur when hot water is notused for several days (when on holiday), and only during strong periods of sunlight (summer). If leaving the house for an extended period of time (more than 2-3days), it is advisable to cover the collector panel or design the system with a heat dissipation device or alternative use for the heat, thus preventing overheating of the system and collector stagnation. Stagnation of the solar collector will NOT damage the solar collector, however insulation used on the piping close to the manifold inlet and outlet should be able to withstand temperatures of up to 200℃/395F.(Eg. Glass wool or mineral wool-with an exterior wrap of aluminium foil, thus protecting against the elements).

5.Frame Installation



Slope roof bracket



"black" is flat roof bracket

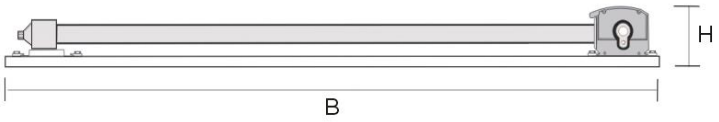
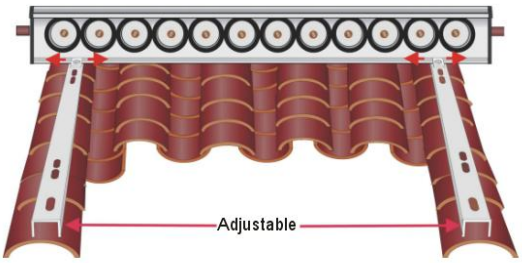
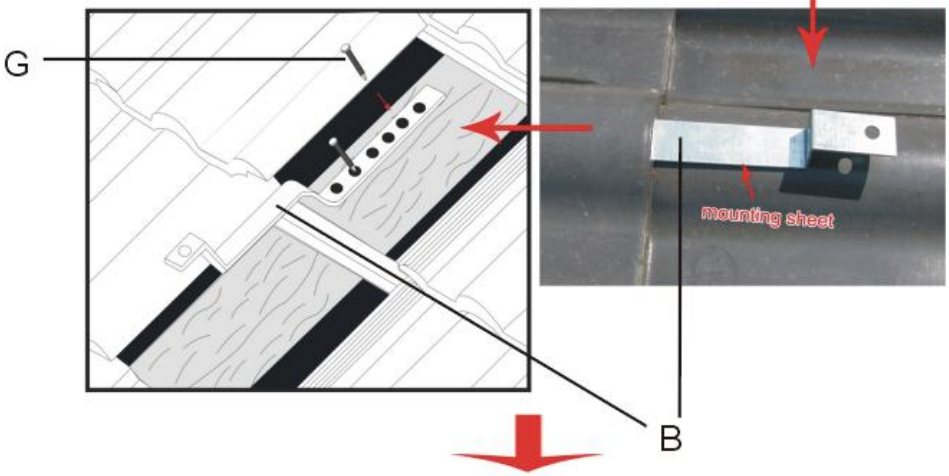


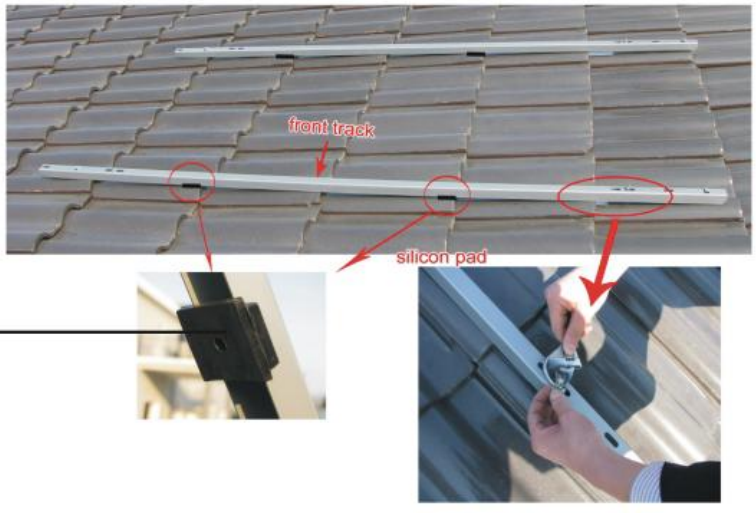
Figure size

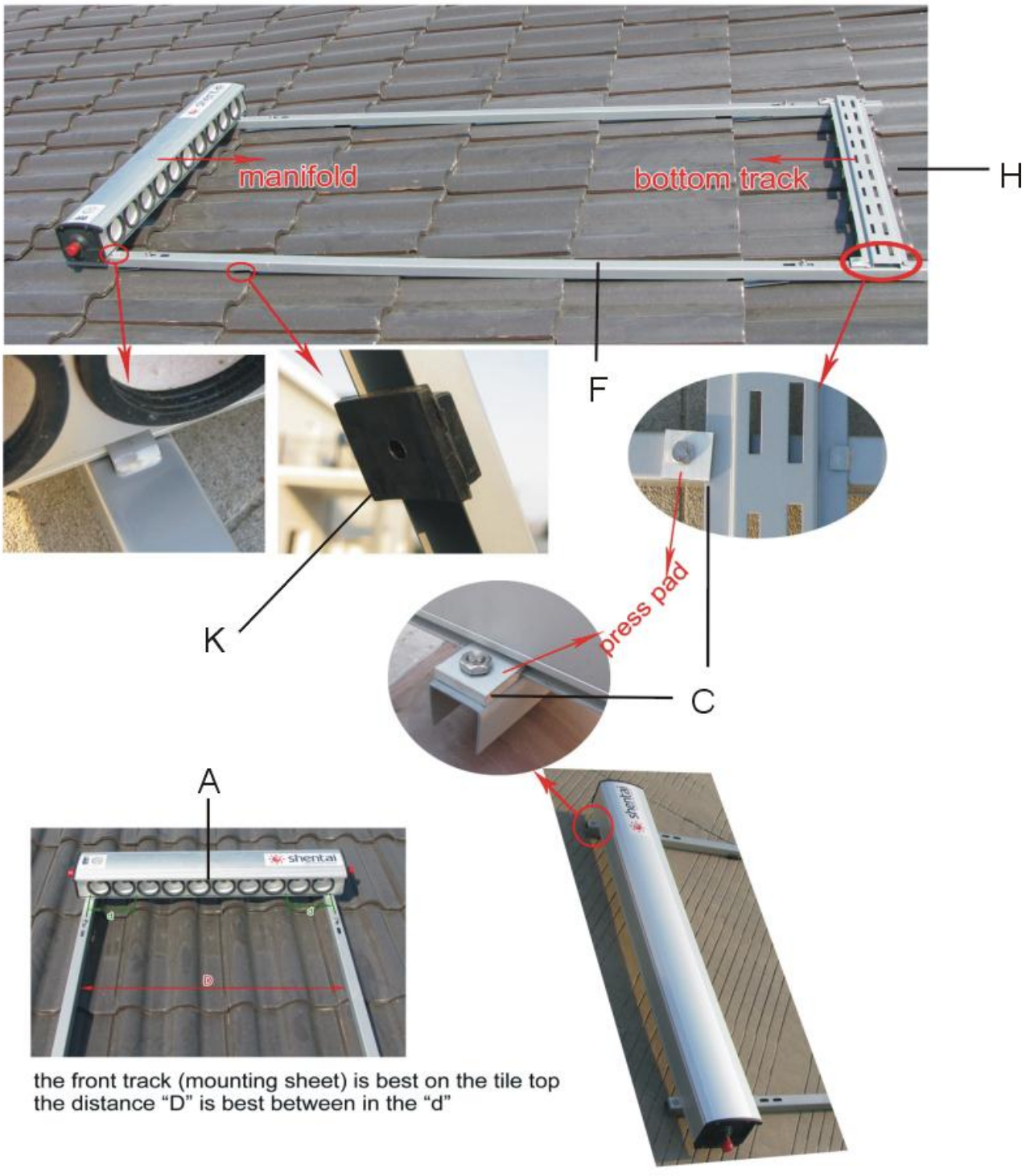
model	A (mm)	B(mm)	C (mm)	D(mm)	F (mm) angle	G(mm)	H (mm)
SCM10-01	815	1995	1716	760	1420/45°	1400	98
SCM12-01	965	1995	1716	1010	1420/45°	1400	98
SCM15-01	1190	1995	1716	1160	1420/45°	1400	98
SCM16-01	1265	1995	1716	1215	1420/45°	1400	98
SCM18-01	1415	1995	1716	1370	1420/45°	1400	98
SCM20-01	1565	1995	1716	1520	1420/45°	1400	98
SCM22-01	1715	1995	1716	1655	1420/45°	1400	98
SCM24-01	1865	1995	1716	1815	1420/45°	1400	98
SCM25-01	1940	1995	1716	1910	1420/45°	1400	98
SCM28-01	2165	1995	1716	2115	1420/45°	1400	98
SCM30-01	2315	1995	1716	2260	1420/45°	1400	98

Roof mounting



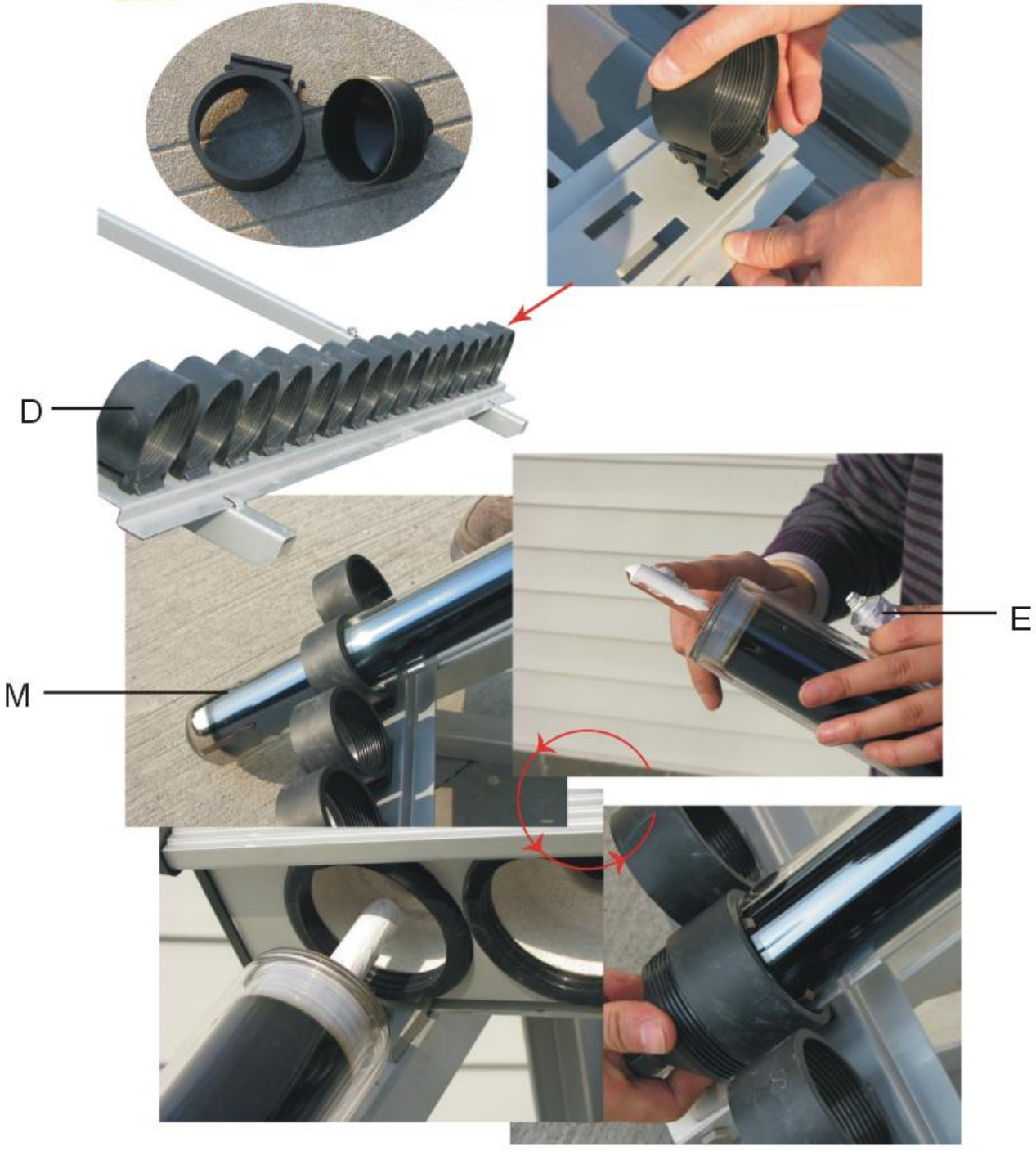




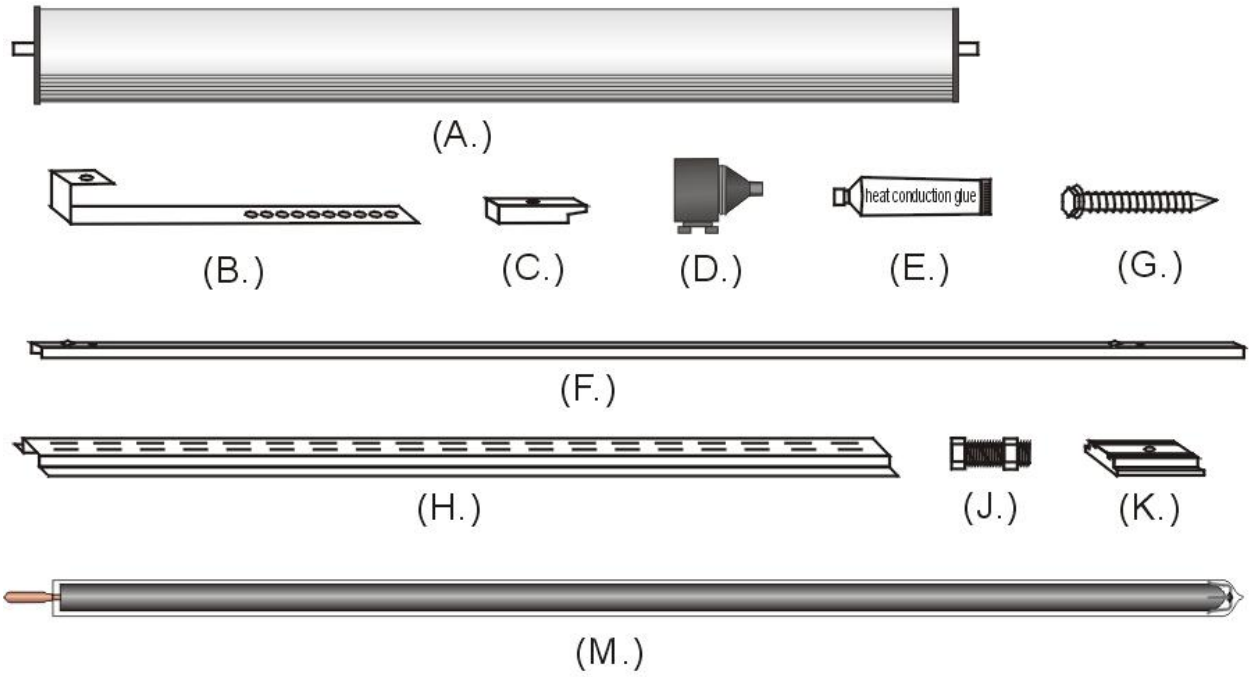


the front track (mounting sheet) is best on the tile top
the distance “D” is best between in the “d”

once the frame has been mounted and manifold attached,
it should test the system plumbing first to check if the system leakage or not.
In generally, the last step was to install the vacuum tubes.



6.Packing List



No.	Type	quantity	No.	Type	quantity
(A.)	Manifold	1	(G.)	Wood screws	4
(B.)	Mounting sheet	4	(H.)	bottom track	1
(C.)	press pad)	4	(J.)	Bolts	13
(D.)	Tube holder	12/15/20/30	(K.)	silicon pad	4
(E.)	Heat conduction glue	1	(M.)	heat pipe vacuum tube	12/15/20/30
(F.)	Front track	2			

Weight of collector (empty without water)

1. SCM10-01: 30KG SCM12-01:: 35KG SCM16-01: 46KG
2. SCM15-01: 43KG SCM18-01: 52KG SCM22-01: 63KG
3. SCM20-01: 57KG SCM25-01: 72KG SCM24-01:69KG
4. SCM30-01: 86KG SCM28-01: 80KG

Pressure drop : Collector pressure drop record(SCM30-01)

Flow rate [kg/s]	0.022	0.039	0.061	0.083	0.105
ΔP [Pa]	57	123	257	448	693

7.Installation collector

7.1. Collector Direction

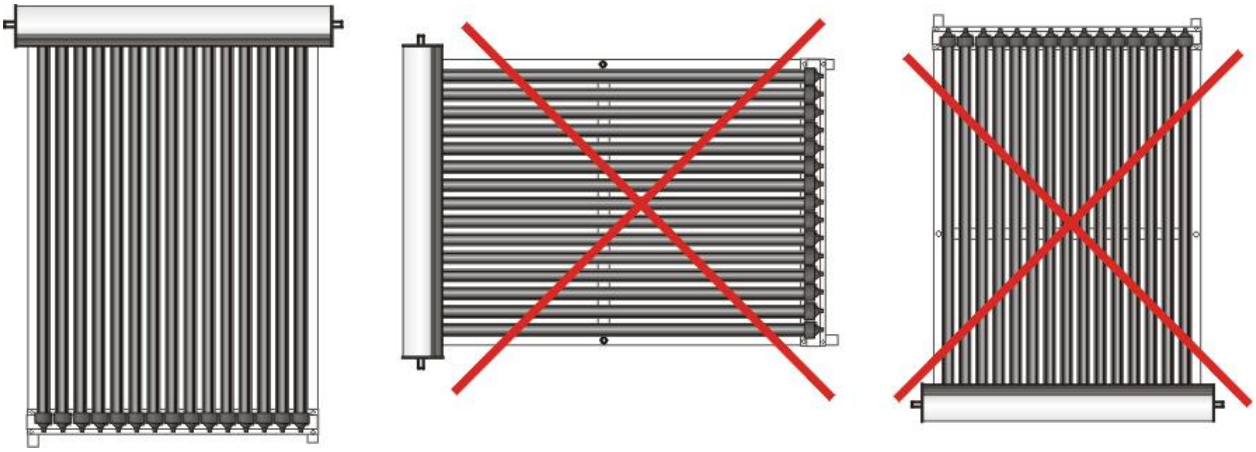
The collector should face the equator, which if in the Northern hemisphere is due South, and vice versa. Facing the collector in the correct direction and at the correct angle is important to ensure optimal heat output from the collector, however a deviation of up to 10°from due North or South is acceptable, and will have minimal effect
on heat output.

7.2. Collector Angle

It is common for collectors to be installed at an angle that corresponds to the latitude of the location. Installing at an angle less than 15° is not recommended as the heat pipes perform best in the range of 15-85 degree While adhering to this guideline ,an angle of latitude +/-10°is acceptable, and will not greatly reduce solar output. Angles beyond this range may be used, but a decrease in heat output will result. An angle lower than the latitude will enhance summer output, while a greater angle will enhance winter output.

7.3. Location

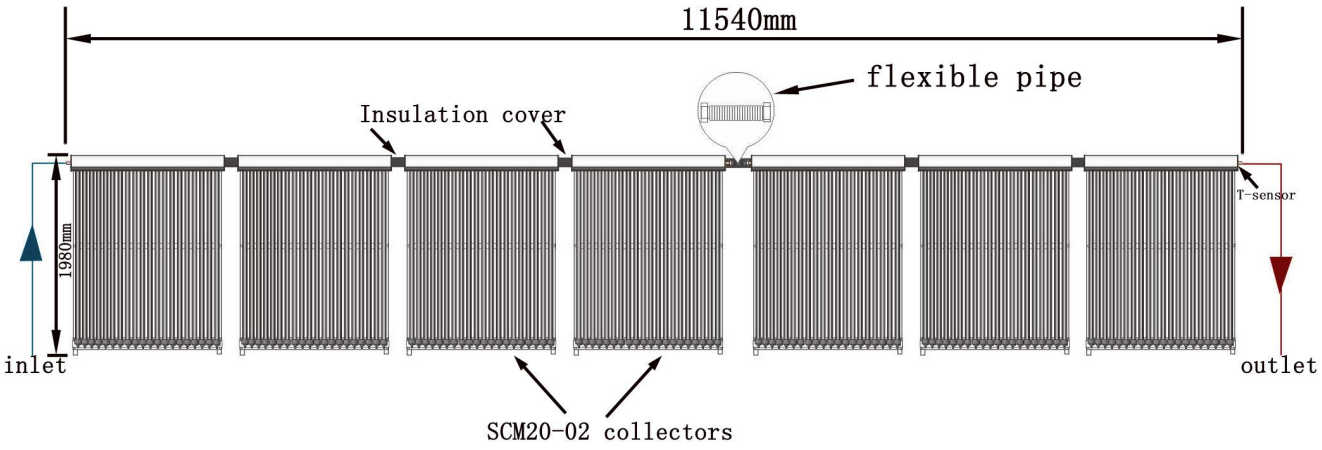
The collector should be positioned as close as possible to the storage cylinder to avoid long pipe runs. Storage cylinder positioning should therefore consider the location requirements of the solar collector. The storage cylinder should also be located as close as possible to the most frequent draw off pipe runs.



7.4 Collectors connection

1. Always use two opposing spanners when tightening the compression fittings. Do not twist the copper pipe (inlet/outlet) as the header maybe damaged.
2. Tighten with standard length spanners using moderate torque force. Do not overtighten the fittings.
3. Flood the circuit with water and check the for leaks at the compression fittings. If leaking then loosen the fitting completely, and wrap the Teflon plumbing tapes or a suitable sealing compound.
4. For several collectors connections, it is necessary to use the flexible pipes between two collectors because of the Expansion on heating and contraction on cooling.

5. Heat loss from the piping can be significant and should be taken to insulate any possible points of heat loss. Ensure the insulation material is tight against the pipeline, inlet and outlet.
   Using the silicone sealant to form a water-tight seal on the temperature sensor.
   The insulation foam should be protected against the UV. The circulation pump should be also insulated otherwise it could be a source of heat loss.
6. to 20 ㎡ group connection, it needs about 7 units of SCM20-02/01 collectors which could be linked in series. It is better to use the SS flexible pipe G1/2-G1size pipe and well insulation.The total installation area about 22.85 ㎡. See the drawing as below.



8. Maintenance

8.1. Cleaning

Regular rain should keep the evacuated tubes clean, but if particularly dirty they may be washed with a soft cloth and warm, soapy water or glass cleaning solution, If the tubes are not easily and safely accessible, high pressure water spray is also effective.

8.2. Leaves

During autumn, leaves may accumulate between or beneath the tubes. Please remove these leaves regularly to ensure optimal performance and to prevent a fire hazard.(The solar collector will not cause the ignition of flammable
materials)

8.3. Broken Tube

If a tube is broken it should be replaced as soon as possible to maintain maximum collector performance. The system will still operate normally even with a tube broken. Any broken glass should be cleared away to prevent injury.

9. precautions

9.1. Solar for Central Heating-Preventing Overheating

If a system has been designed to provide contribution to central heating, it will often provide much more heat in the summer than is required for hot water supply alone. In such cases it is advisable for the home to have a spa or pool that can use the heat in the summer period or a heat dissipation device be installed.

9.2. Metallic components

Always wear glove when handing the various solar collector components. All efforts have been made to make the metal components safe to handle, but there may still be some sharp edges.

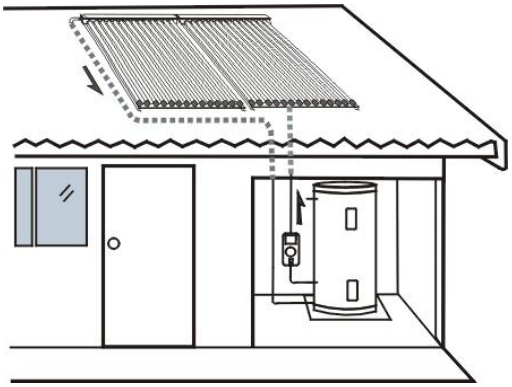
9.3. Evacuated tubes

Be careful when handing the evacuated tubes, as they will break if knocked heavily or dropped. Wear gloves if handing any broken glass.

9.4. High temperatures

With the heat pipe installed in the evacuated tube, and good sunlight, the heat pipe condenser can reach temperatures in excess of 200℃, At this temperature touching the heat pipe will result in serious burns, so please take care when

"experimenting" with, or "demonstrating" the evacuated tube and heat pipes. In an installed, fully plumbed system, if the pump is stopped during good sunlight, the collector header and plumbing pipe close to the manifold can reach temperatures of 160℃, and therefore caution should be taken when touching such components



10 Media liquid filling.

10.Medium Liquid Filling Inside the Pipeline

Pure water: 56%
Original anti-freezing liquid: 44%

Diving pump

Using diving pump
filling medium liquid

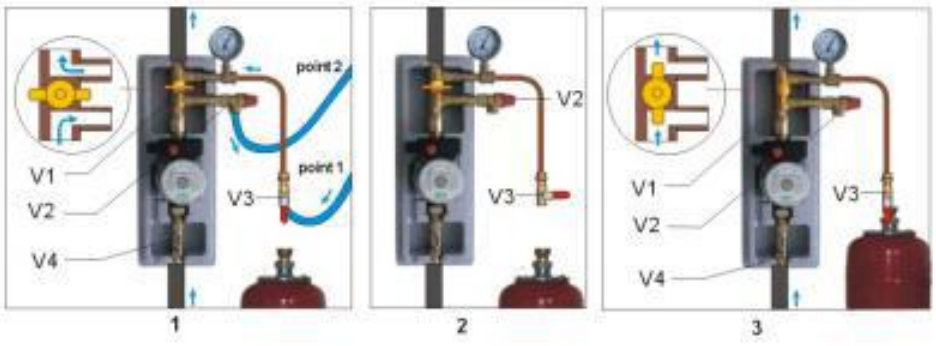
10.1. Air Purge

Once the inlet and outlet are connected to the plumbing system, the collector loop should be purged of air. If a direct mains pressure system is being used, opening up the hot water taps in the house and operating the pump at full speed should elimination all air from the system. For non mains pressure installations, the pump should be run at the highest speed settings, forcing air out of the manifold and back into the tank. If air is not fully eliminated from the collector manifold, it may be necessary to loosen the connection to the header outlet allow air to be released (auto-air vent may be used to vent air from collector manifold)

10.2.Plumbing Check

Once plumbing is confirmed as leak free and with all air have been purged, the heat pipes and evacuated tubes may be installed.

10.3.In proper order



Step1: open valve V3, close V1. V2 The security valve is in a state of openStart the diving pump to filling the medium liquid from point 1,until the liquid flow out from point 2. Let the circulation last for 2 minutes until exhaust all the air from the pipeline.

Step2: close the valve V3, then close the V2 and take off the diving pump.

Step3: Connect the expansion vessel onV3,open valve V1, it must be open forever. Starting the working station, observing the balancing valve(V4) to see if there is any air inside the pipeline. If