

Manual

















Installation Manual



FHWFC 7000 Series
Version 2009.07

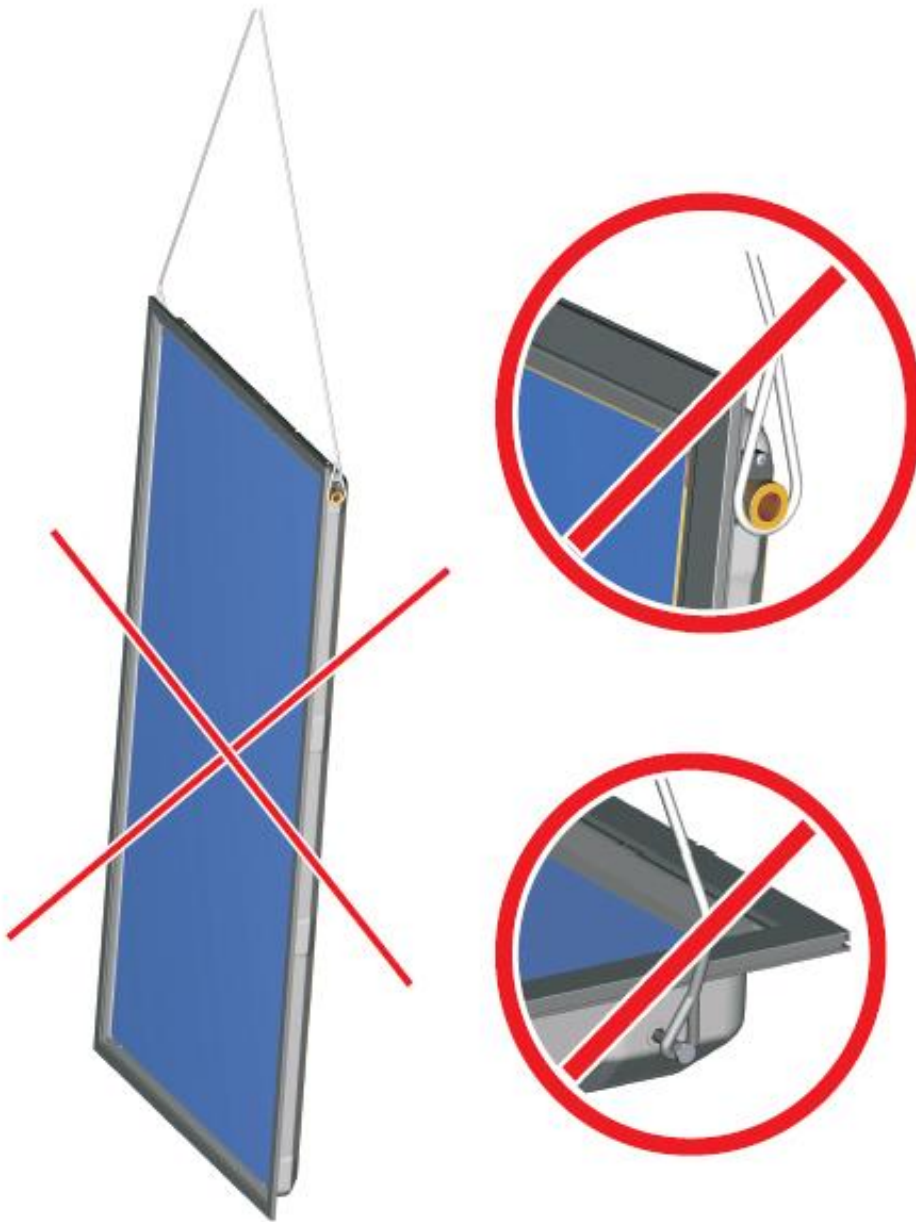
Content

Safety information.....	3
Transport note	4
Assembly instructions - Collector	5
Overview of tools	6
Overview of materials	7
Attachment points.....	8
Mounting parallel roof bracket attachment system	9
Technical data - Collector.....	12
Operating tips - Solar power system	13
General Information.....	15

	<p>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 [Bauarbeiterschutzverordnung], Federal Law Gazette 340/1994, paragraphs 7-10! Other country-specific regulations must be observed!</p>		<p>Safety harnesses should be fixed above the users whenever possible. Safety harnesses should only be fastened to sufficiently load-bearing structures or fixing points!</p>
	<p>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!</p>		<p>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!</p>
	<p>Only use safety harnesses (safety belts, lanyards and straps, shock absorbers, fall arresters) that were tested and certified by authorized testing bodies.</p>		<p>Ensure that ladders are put up safely. Observe 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).</p>
	<p>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!</p>		<p>Only lean ladders against secure points. Secure ladders in traffic areas by suitable cordoning.</p>
	<p>Ladders not properly secured against sinking in, sliding or falling over may lead to dangerous falls!</p>		<p>Contact with live electric overhead cables can be lethal.</p>
	<p>Whenever you are near live overhead electric cables where contact is possible, only work if:</p> <ul style="list-style-type: none"> - it is ensured that they are voltage-free and this is secured for the duration of work. - the live parts are secured by covering them or cordoning them off. - the prescribed safety distances are maintained. <p>Voltage radius:</p> <p>1m withvoltages up to 1000V 3m withvoltages from 1000V to 11000V 4m withvoltages from 11000V to 22000V 5m withvoltages from 22000V to 38000V > 5m in case of unknown voltages</p>		<p>Wear protective goggles when drilling and handling evacuated tube collectors (danger of implosion)!</p>
			<p>Wear safety shoes when carrying out installation work!</p>
			<p>Wear cut-proof safety gloves when mounting collectors and handling evacuated tube collectors (danger of implosion)!</p>
	<p>The manufacturer hereby guarantees to take back products identified with an eco-label and to recycle the materials used.</p> <p>Only the heat transfer medium specified may be used!</p>		<p>Wear a helmet when carrying out installation work!</p>

Attention

Do not lift the collectors by the connections and or the screw threads

**General Assembly instructions**

General and transport instructions

The mounting system is suitable for flush installation on tiled and composition roofs. The following describes a composition roof installation. For tile installation you will need to use the FHW tile brackets. Installation must only be carried out by qualified personnel. The entire information in these instructions is intended exclusively for such qualified personnel. Only the supplied material should be used for the installation. Prior to starting installation and operation of the solar collector system, please inform yourself about the applicable local standards and regulations. The use of a carrying strap is recommended for transporting the collector. The collector must not be lifted at the connections or on the threading. Avoid impacts and mechanical influences on the collector, in particular on the solar glass, the rear panel and pipe connections. If the aluminum tray collectors have a protective coating, this must be protected from sunlight and removed just before installation.

Statics – tiled / composition roofs

The collectors may only be mounted on sufficiently load-bearing roof surfaces and substructures. It is imperative that the static load bearing capacity of the roof or substructure is checked in terms of local and regional conditions prior to installation of the collectors by the customer, if necessary through the involvement of a structural engineer. Particular attention should be paid to the quality of the (timber) substructure in terms of the stability of the screw connections necessary for fastening the collectors. The checking of the entire collector structure by the customer as per DIN 1055 part 4 and 5 or as per the applicable country-specific regulations is particularly important in areas with heavy snowfall (note: 1 m³ powder snow ~ 60 kg / 1 m³ wet snow ~ 200 kg) or in areas exposed to high wind speeds. The assessment should also take into account any particular circumstances at the place of installation (foehn wind, air jets or eddy formation etc.) which can lead to increased loads. When selecting the installation site it should be ensured that the maximum load is not exceeded either by snow or wind forces. As a rule, collector arrays must be installed such that any possible collection of snow is prevented from reaching the collectors by snow barriers (or through special forms of installation). The distance to roof ridges/edges must be at least 1 m.

Note: Installing a collector array signifies an intervention into an (existing) roof. Roof coverings, e.g. tiles, shingle and slate, especially in the case of converted and inhabited loft spaces or roofs with less than the minimum slope (with regards to the covering) require additional measures by the customer, e.g. sarking membranes, as security against water penetration caused by wind pressure and driving snow.

Lightning protection

For safety reasons, we recommend connecting the collector array to the building's lightning protection (country specific regulations must be observed). For installations on metal substructures at the installation site, authorized 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 (H07 V-U or R). The system may be grounded by means of a grounding rod. The earthing conductor must be laid outside the building. The grounding electrode must also be connected to the main potential equalization bus with a conductor with the same cross-section as specified above.

Connections

Depending on the design, the collectors must be connected with one another and/or the connection pipes using screw fittings (1" internal/external thread) with flat-face sealing. Ensure correct placement of the flat gaskets. Connect the collectors using the cutting ring screw connections. If flexible pipes are not used as connectors, precautions must be taken to protect the connection pipes against temperature fluctuations caused by heat expansion, e.g. expansion bends and flexible piping (see Connecting the collectors to one another/Operational recommendations). Larger collector arrays must be assembled with expansion bends or flexible members inserted in the links. (IMPORTANT: check the pump design). When tightening the union nuts, always balance (counter) the torque with a pipe wrench or another spanner to prevent damage to the absorber.

Collector angle / General notes

The collector is suitable for angles between 15° (minimum) and 75° (maximum). The collector connections and the ventilation openings must be protected against the penetration of water as well as against contamination through dust etc.

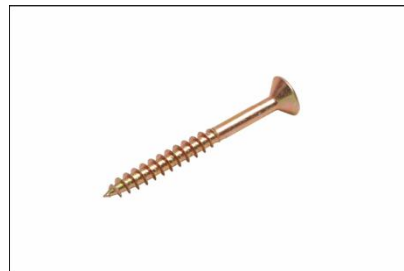
Legal guarantee

Legal guarantee claims can only be made if the supplier's own antifreeze has been used and maintenance has been carried out correctly. Installation by qualified personnel with absolute adherence to the instructions is a prerequisite

Tools Needed



Brackets, hooks, bolts etc.



Collector Specs

Collector Technical Data					
Gross Area	Sqft	27.50	Weight (Dry)	Lbs	96.8
Net Area	Sqft	23.45	Content	Gallon	0.42
Aperture	Sqft	24.52	Max Pressure	PSI	147

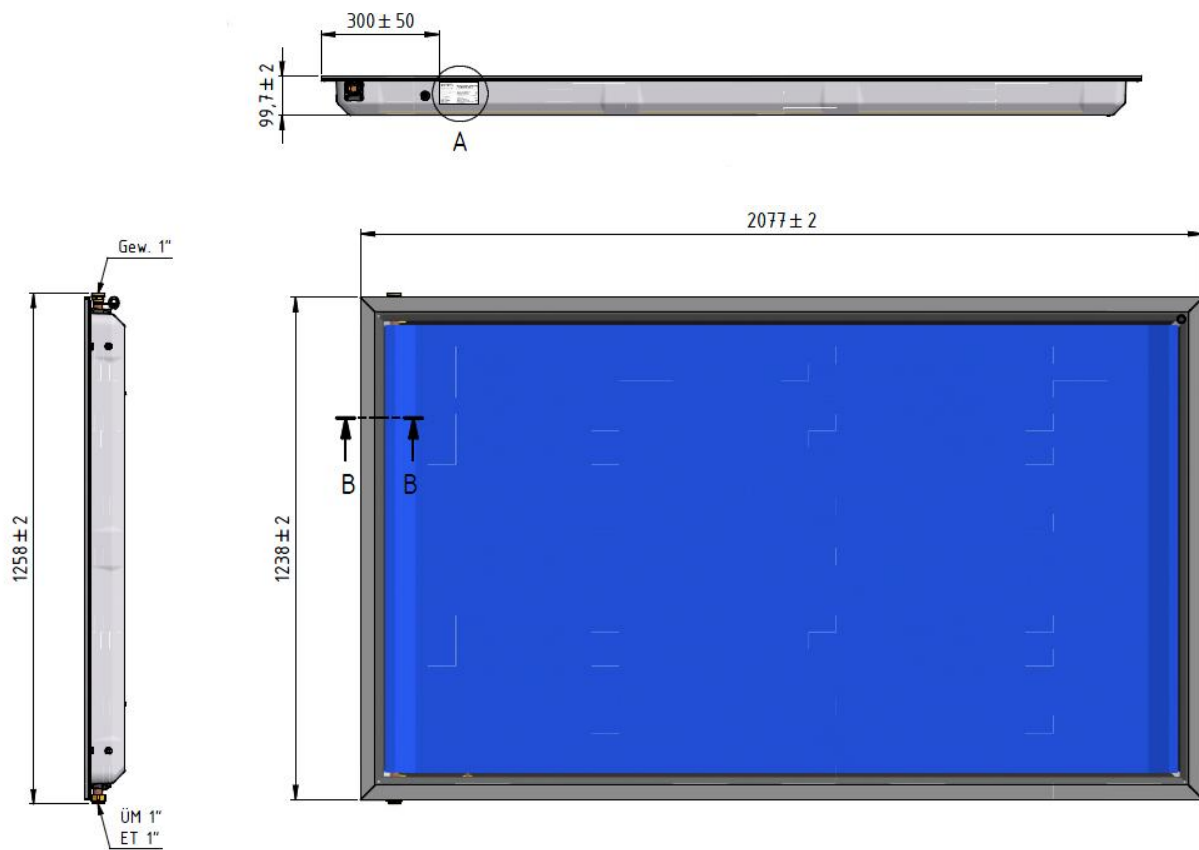


Fig 1.0

Installation Steps for Pitched Roof Mounting

1. Locate and mark the roof rafters into which the solar collector mounting brackets will be mounted (one way to find rafters is to see the “tails” at the edge of the roof).
2. To create a set point for plumbing and level installation, measure the distance from the edge of the roof to the desired mounting points and mark the points where the collector mounting brackets will be installed (fig 1.2).
 - *Note: you need to install a screw into one of the holes in the mounting bracket, not both holes (fig 1.1).
 - * **Note:** for collector model 7000 upper and lower mounting bracket should be 78” apart measured from top of top bracket to bottom of bottom bracket.
 - * **Note:** both the bottom and the top mounting brackets should be placed as per figure 2.0 from each other as possible in the width dimension.

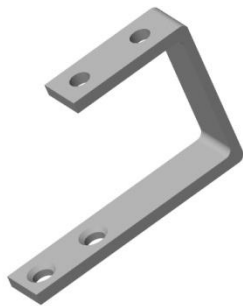


Fig 1.1



Fig 1.2

3. Determine where penetration will be to connect the solar hot water collector with the storage tank and/or the water supply (use 2 pre-insulated $\frac{3}{4}$ ” steel flex hoses or 2 insulated $\frac{3}{4}$ ” copper pipes for that connection).
 - Note:** *For a two-collector system that will be elevated above the roof surface, a good location for this penetration is directly between the two collectors.
4. Holes should be slightly overlapping to form a sideways “8” shape (see illustration 1.3). Mark the penetration before making holes. If you are installing on a composition shingle roof make holes 5” below the bottom of the shingle above the penetration.

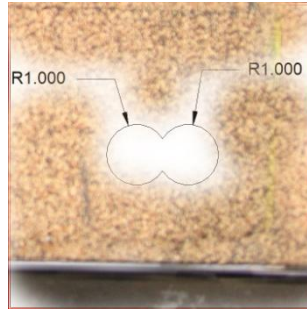


Fig 1.3

5. Using a hole saw, cut the hole (penetration) for the 2 hoses or pipes from step 3.
6. If using flex hose: before connecting the hose, measure, cut, and lay out the hose, including enough length for 8' of hose above the roof. Pull the hose through the hole.
7. Begin mounting bracket installation with bottom bracket. Mark a straight chalk line between the 2 bottom bracket mounting points.



Fig 1.4

8. For composition shingle roof, **DO NOT PENETRATE THE COMPOSITION SHINGLE.** Before installing screws, lift the composition shingle at the install point and slide the mounting bracket in, beneath the top composition shingle. Place the bracket so that the top surface composition shingle clears the bracket when folded (lifted) up or down and mark an outline of the mounting bracket where the mounting bracket will be fastened to the roof rafter or other appropriate mounting substrate. The marked area should be 1.5" wide and 2.5" high.
9. Next, using a cutting tool, cut out a piece of the roof material beneath the top layer of the composition shingle (the top layer will NOT be penetrated for the mounting brackets) as marked 1.5" X 2.5" in the shape of the mounting bracket. Cutting out a piece of roofing material will provide for a flush-mounted roofing bracket.



Fig 1.5



Fig 1.6



Fig 1.7

10. Pre drill mounting bracket screw holes into rafter or other appropriate mounting substrate (one hole per bracket) using a 7/16" drill bit.
11. FOR ONE BOTTOM BRACKET ONLY, apply Solarflex in bracket screw holes, on roof surface where bracket will be placed, and on bracket surface that will be facing down. Fasten first bottom bracket only to rafter or substrate using 1/2" screw.
Note: *begin installing second bottom bracket only after confirming level installation.
12. Follow Steps 8-11 for the second bottom bracket BUT DO NOT YET FASTEN THE SECOND BRACKET WITH SCREW.
13. WITHOUT TIGHTENING IT COMPLETELY, place the bottom profile on the bottom brackets using the clamps and 1/2" bolts.
14. Using a 4' level, make sure the profile is level.
15. Once the profile is level, remove it and fasten the second bottom bracket to the roof using 1/2" screw.



Fig 1.8

16. Apply AT 302-60 (FHW-AA 60050) to 1/2" bolts for clamps. Fasten Clamps to brackets using 1/2" bolts and washers. Attach profile to clamps, tighten completely.
17. Follow steps 1-16 for top mounting brackets.
18. Place collector on profiles, checking to make sure it fits and lines up appropriately.
19. Once collector fits and lines up appropriately, apply AT 60 to 1/2" bolts for collector and fasten collector to profiles using 1/2" bolts and washers.
20. If installing more than one collector, cut flex hose or copper pipe in length necessary to connect collectors. On all plumbing connections use Anti Leak (part # FHWM-AA-72050)

21. Connect collectors with each other (if installing more than one collector) and with storage tank, using flex hose or copper pipe and compression fittings.
Note: * Tighten compression fittings gently by hand and then 1.25 turns with a wrench.
Avoid over-tightening as this can damage the flex hose or copper tubing.
22. Cap unused collector connections with cap
23. If not already labeled, install hot and cold water in and out labels to collector and storage tank.
24. Test system, checking for any leaks and for performance.

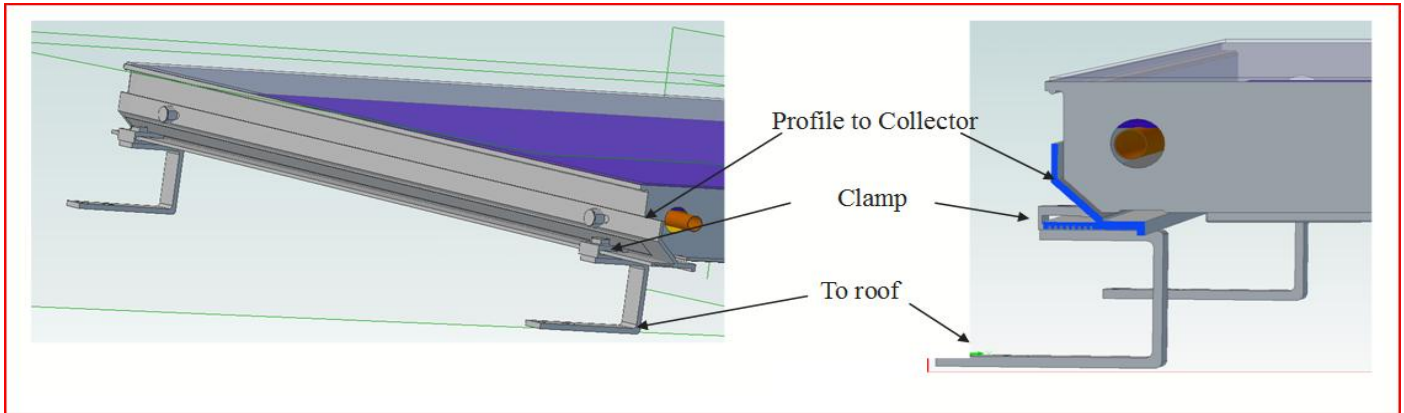


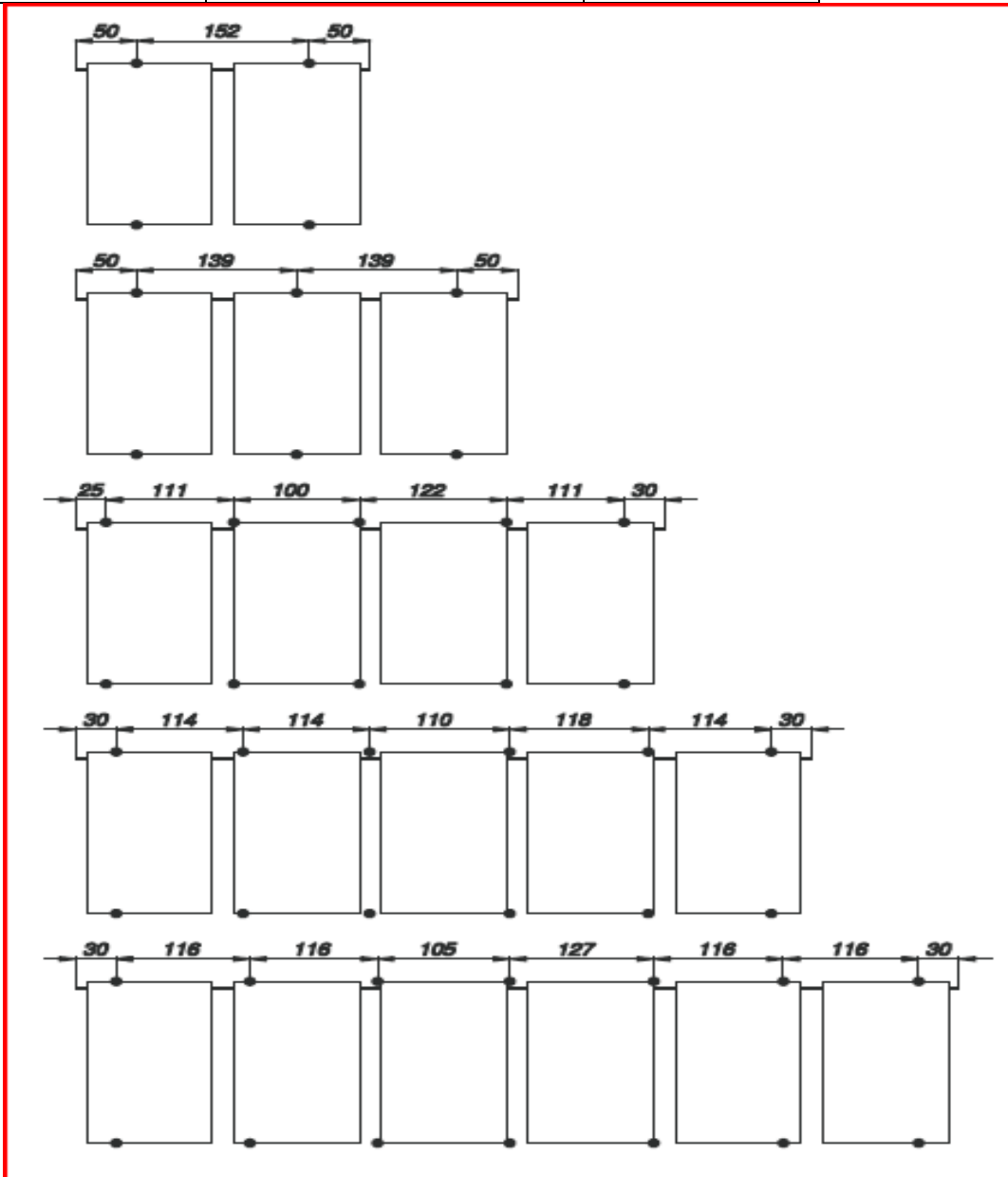
Fig 1.90



Fig 1.91

Recommended Anchor points for FHC-7000 Series

Collectors	Total Length - inch / ft	Attachment points
2	103" 9'	4
3	154" 13'	6
4	204" 17'	10
5	257" 21'	12
6	309" 26'	14



Installation Steps for Flat Roof Mounting

1. Locate and mark the roof rafters into which the solar collector mounting Frame will be mounted (one way to find rafters is to see the “tails” at the edge of the roof).
2. To create a set point for plumbing and level installation, measure the distance from the edge of the roof to the desired mounting points and mark the points where the collector mounting frame (fig 2.2) will be installed (fig 2.1).

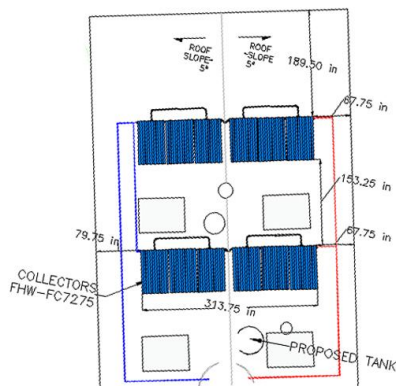


Fig 2.1



Fig 2.2

3. Follow the plumbing connections (**Blue** for Supply and **Red** for return) Determine where penetration will be to connect the solar hot water collector with the storage tank and/or the water supply (use 2 pre-insulated stainless steel flex hoses or 2 insulated copper pipes for that connection).
4. Once the frame(s) are attached to the roof, install the profiles as per fig 2.3

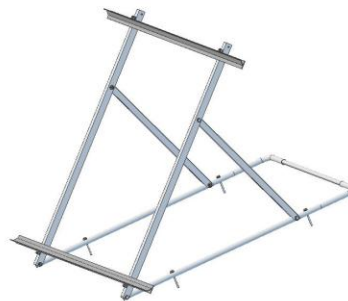


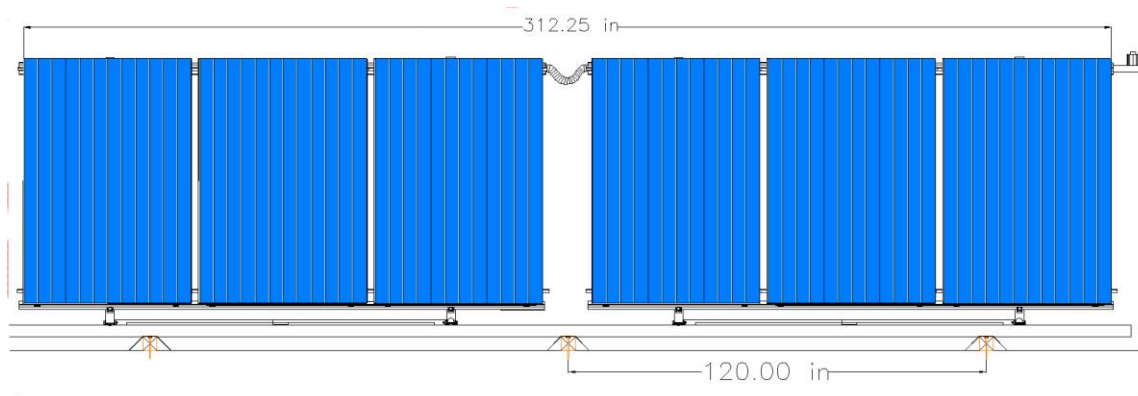
Fig 2.3

- Proceed installing the collectors using the M8 screws provided with the frame kit as per the illustrated in fig 2.4

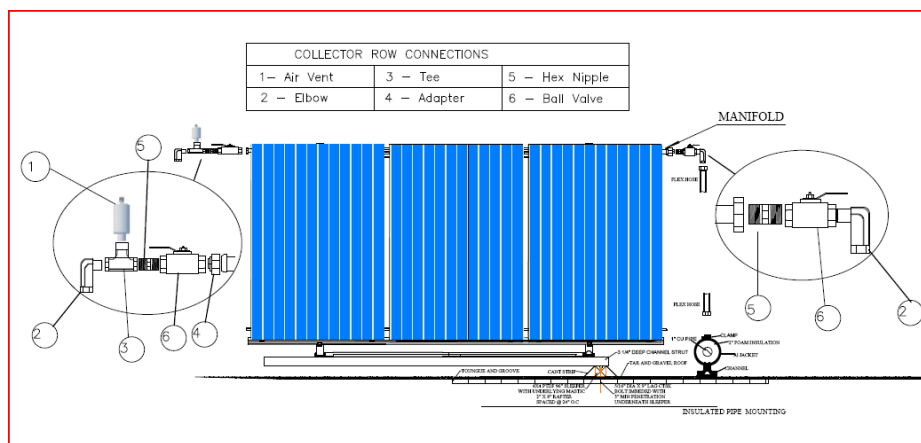


Fig 2.4

- If you have more than one bank of 3 collectors you will need to use the FHW expansion band as illustrated in fig 2.5



- At the end of every bank please connect to the main as described in fig 2.6



8. If you install a Close Loop system, please follow the enclosed connection illustration

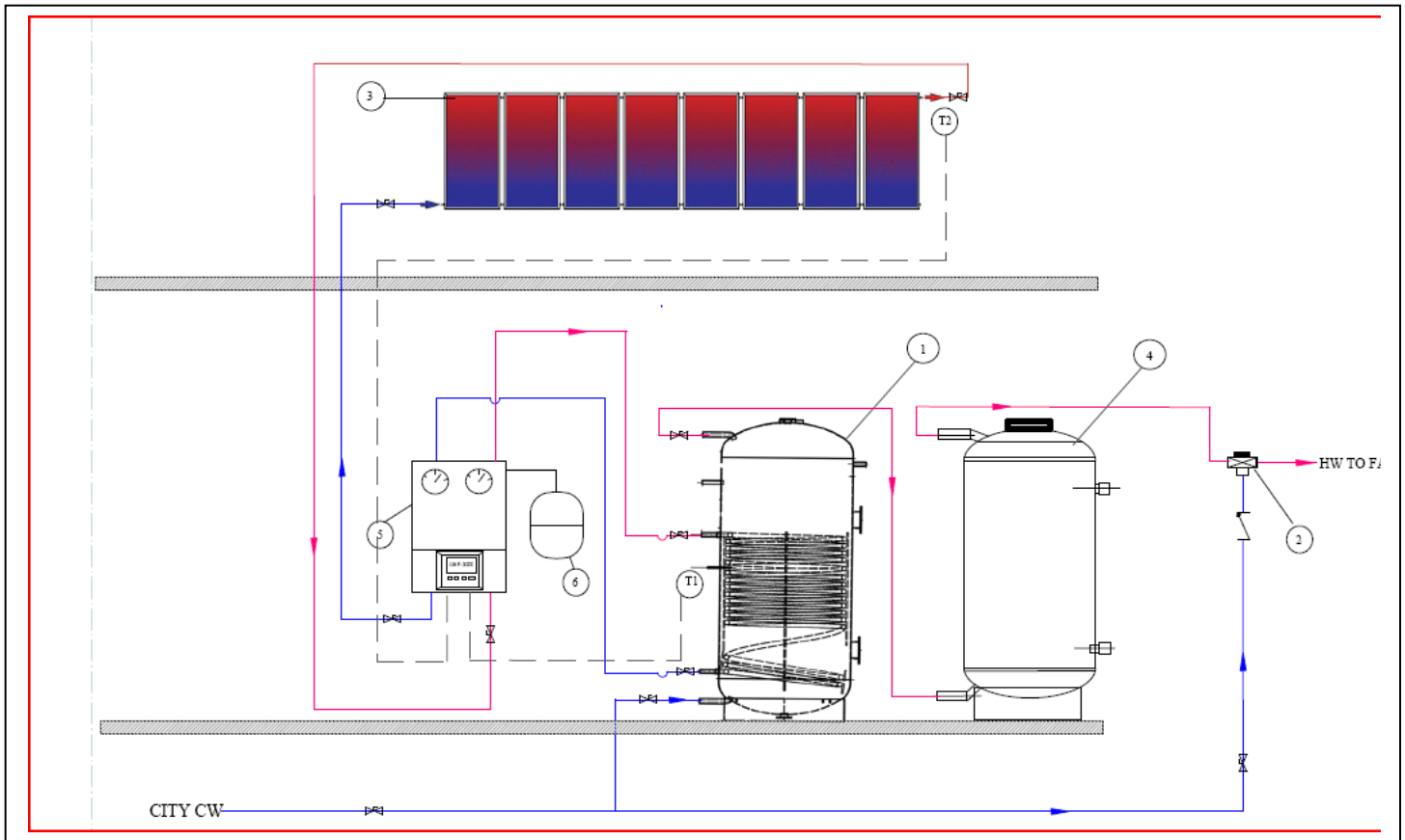


Fig 2.7

Flushing and filling

For safety reasons you should only fill the collectors when there is no direct irradiation from the sun (covering the collectors can be an option). Especially in regions exposed to frost, for flat plate collectors you should use a mixture of anti freeze with water (40% anti freeze). The solar thermal system should be filled and commissioned within one week of installation, because heat build-up in the collector array can damage the flat gaskets in empty systems. If this is not possible, the flat gaskets should be replaced before commissioning to prevent leakage.

Attention : Anti freeze that is not premixed must be mixed with water prior to charging the system.

Recommended antifreeze for flat plate collectors – FHWM-GY-50005

- 25% antifreeze / 75% water mix - freeze point -10°C
- 40% antifreeze / 60% water mix - freeze point -22°C
- 50% antifreeze / 50% water mix - freeze point -32°C



It may not be possible to completely empty collectors once they have been filled. For this reason collectors exposed to frost should only be filled with a water/antifreeze mixture, also for pressure and function tests. Alternatively, the pressure test can also be carried out using compressed air and leak detection spray.

It is recommended to use the Free Hot Water filling station (FHWA-CC)

Installing the temperature sensor

The temperature sensor should be installed in the sensor sleeve nearest to the collector array flow. To ensure optimal contact between the 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.

Bleeding

The system must be bled:

- when commissioning the system (after filling the collectors)
- 4 weeks after commissioning
- when necessary, e.g. if there are malfunctions

Warning: Risk of scalding due to steam and hot heat transfer fluid!

Only operate the bleeding valve if the temperature of the heat transfer fluid is **< 60° C**.

When bleeding the system, the collectors must not be hot! Cover the collectors and, if possible, bleed the system in the morning.

Check heat transfer fluid

The heat transfer fluid must be checked every two years with regard to its antifreeze and pH value.

- Check antifreeze using antifreeze tester and replace or refill if necessary!

Target value is ca. - 25° C and - 30° C depending on climatic conditions.

- Check pH value with a pH indicator rod (target value approx. pH 7.5):

If the limit pH value is less than \leq pH 7, replace the heat transfer fluid.

Maintenance of the collector

The collector or the collector array must be inspected visually, once a year, for any damage, leaks and contamination.

Additional recommendations on operation and maintenance can be found in the supplier's general documentation and instructions on commissioning and maintenance.

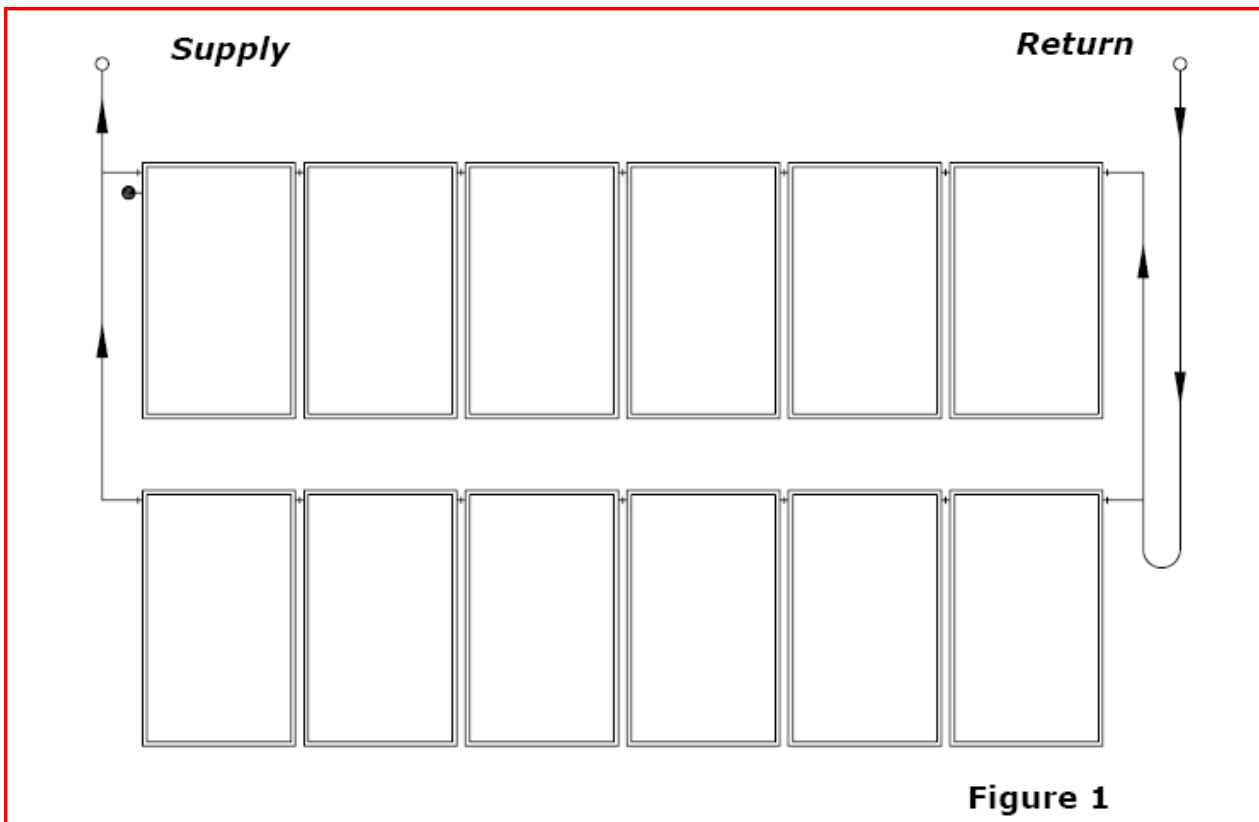
Connecting the collectors to one another

The collectors must be connected to one another and/or to the connection pipes using the supplied connectors. When tightening the union nuts and/or compression fittings, always balance (counter) the torque* with a pipe wrench or another spanner to prevent damage to the absorber. Do not run the solar collector(s) without safety valve in the system to avoid over pressure in the solar circuit. *torque in Nm is available in certain countries from the data sheet attached to the collector

Collector angle

It is recommended to keep the solar collector angle within the range of minimum 5° and maximum 75°.

The following diagram below is an example of how the collectors can be connected to one another. However, the actual connection may be different depending on structural conditions. A maximum of 6 collectors may be connected in a series! If a collector panel is made up of more than 6 collectors, the panel must be connected several times in parallel



Mass flow rate

To ensure the performance of the collector, a specific flow rate of 30 l/m²h is to be selected up to a collector panel size of approx. 25m².

Pipe diameters

Dimensions table with a specific flow rate of 30 l/m²h

Collector Size (m²)	5 Collectors	8 Collectors	12 Collectors	25 Collectors
Pipe Diameter / Cu (mm)	10-12	15	18	22
Pipe Diameter / SS (mm)	12		22	

Pressure loss collector for anti-freeze / water mixture (40% / 60%) at a thermal conducting temperature of 50° C.

Pressure loss curve: $\Delta p = 0,0001443x^2 + 0,0270143x$

Flow Rate (kg/h)	50	100	150	200	250	300	350	400	450
Pressure Loss (mbar)	1.7	4.1	7.3	11.2	15.8	21.1	27.1	33.9	41.4

Guarantee and Warranty

No liability will be assumed for use other than for the intended purpose or for inadmissible alteration of installation

components or consequences thereof; likewise for failure to observe the installation instructions correctly.

All information and instructions in this manual refer to the current state of development. Please always use the respective assembly instructions supplied with the collectors. Figures and illustrations used.

Due to the possibility of setting and printing errors, and to the need for continuous technical change, please understand that we cannot accept liability for the correctness of the data. The most current version of the General terms of Business would always prevail.

**All photographs used are for illustrative purposes only.
 These assembly instructions contain proprietary information protected by
 copyright laws.
 All rights and changes to these assembly instructions are reserved.**