Installation Manual

AES Supremacy
1.5AR, 1.9AR & 2.5AR

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**Inclusions**

Included with this installation manual, attached separately, you will find:

- MCS Compliance Certificate
- On-Roof flat bracket mounting instructions OR In-Roof flashing kit mounting instructions
1. General Data

1.1 Health & Safety

Always assess risks prior to commencement of any work on the solar system. Take all necessary precautions to eliminate, or minimise to a safe level, any potential risks. Potential hazards can result from high temperatures of solar components (including escaping steam), working at height / roof work, electrical work, manual handling and working in confined spaces. Keep the solar collector covered during any works. Wear appropriate PPE at all times.

Safety precautions: All works should be carried out in accordance with current health and safety regulations and recommendations.

The failure to use proper fall prevention systems may result in serious or lethal injuries.

Prevention systems are to be certified and tested by relevant bodies. Systems are to be fixed above the users and to load bearing structures.

Be aware of live cables and connections.

Safety goggles should be worn when drilling and cutting during installation.

Wear cut-resistant safety gloves during installation.

Safety helmets should be worn on site during installation.

Safety boots should be worn on site during installation.
1.2 Delivery & Handling

The solar collector should be handled with care. Always store the collector in its original packaging and in the indicated upright position. The collector and packaging should be kept dry during transport and until installation and the packaging should not be exposed to water at any time. Water in combination with the chemicals in most paper and cardboard can cause discoloration of the AR glass. Placing anything on the front or back of the collector may cause damage. Proprietary lifting equipment should be considered where the collector is to be installed in generally less accessible positions. At least two persons should be in charge of the collector when manoeuvring about site.

1.3 Inspection

Before beginning the installation of the system examine the contents and determine that all components are correct and present, taking care when removing items from their packaging. The basic, standard AES solar system includes:

- AES Supremacy Collector(s)
- Pump Station
- Mounting Parts
  - Flat Bar Brackets
  - In-Roof Installation Kit
- Expansion Vessel 18L
- Expansion Vessel Connection Kit
- AES Deltasol SLL Controller
  - Sensor for Collector [FKP6]
  - Sensor for Cylinder [FRP6] x 2
- Safety Valve Discharge Container
- Connection and Interconnection Fittings
- Solaris PG20 Heat Transfer Fluid 20L
- Weather Slates, Pipe Flashing
1.4 Installer Information

Only competent person(s) should undertake the installation of the solar water heating system. Necessary skills are required in plumbing, electrical, roof work and access work. Installers should have a high level of technical knowledge, be familiar with tools of the trade and have experience in current best practice.

- Temperatures within the solar circuit can be in excess of 100°C, therefore suitable pipework, supports, fittings and insulation should be used, copper tubing is the most appropriate, or stainless steel flexi. For sizing see section 4.1 Pipe Sizing and Materials. Design to minimize pipe runs and bends in the pipework.
- Under no circumstances should plastic pipes or pipe clips, soft solder fittings or standard insulation be employed.
- We recommend the use of compression fittings, brazing or solar rated press fit within the solar system. Do not use soft solder.
- Insulation of the Domestic Hot Water cylinder should be at least equivalent to current best practice. All pipework should be insulated with high temperature insulation able to withstand temperatures up to 150°C.
- Use a fused switch for the electric wiring.
- The solar collector can reach very high temperatures when exposed to sunlight. Cover the collector during system installation. Do not remove covering until the system is ready for commissioning.
- The solar system should have adequate frost protection: Fill the system with a suitable solar antifreeze fluid with corrosion inhibitors. Always read the solar antifreeze fluid label; water should not be added to any premixed antifreeze fluid under any circumstances. The mains water supply should not be connected to the closed loop solar circuit.
- In hard water areas, the high temperatures experienced in solar cylinders can give rise to the accumulation of limescale. Using the differential controller the system can be set to a maximum store temperature of 60°C. Limescale build-up will not occur within the loop of the indirect solar circuit.
- Between 20°C and 46°C there is an increased risk of legionella bacterial growth within the DHW system. Solar water heating systems must have an auxiliary means of raising the temperature to at least 60°C during winter months or days with little solar availability.
- The solar water heating system must meet the requirements for electrical earthing and bonding in accordance with IEE Wiring Regulations.
1.5 Tools for the Job

To ensure a problem free installation of the system the following tools and equipment are recommended:

- Safety Equipment
- Pipe Bender, Cutter & De-burrer
- Claw Hammer & Adjustable Wrench
- Pliers and Screwdrivers
- Wire Cutters and Crimpers
- Stillson Wrench & PTFE Tape
- Measuring Tape
- Power Drill
- Slaters Hook
- Chalk Line
- Spirit Level and Ladder

Additional tools may be required for an in roof installation:

- Rivet Pliers
- Drill bit 4.2mm (included in kit)
- Cutter
- Torque Bit TX25 (included in kit)
- Angle Grinder
- Bit Holder
### 2. Technical Specification

<table>
<thead>
<tr>
<th></th>
<th>1.5 AR</th>
<th>1.9 AR</th>
<th>2.5 AR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gross Area</strong></td>
<td>1.5m²</td>
<td>1.9m²</td>
<td>2.5m²</td>
</tr>
<tr>
<td><strong>Height</strong></td>
<td>1300mm</td>
<td>1650mm</td>
<td>2150mm</td>
</tr>
<tr>
<td><strong>Width</strong></td>
<td>1150mm</td>
<td>1150mm</td>
<td>1150mm</td>
</tr>
<tr>
<td><strong>Thickness</strong></td>
<td>70mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Aperture Area</strong></td>
<td>1.38m²</td>
<td>1.76m²</td>
<td>2.31m²</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>23Kg</td>
<td>28Kg</td>
<td>35Kg</td>
</tr>
<tr>
<td><strong>Flow &amp; Return</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Connections</strong></td>
<td>Flow = 15mm copper pipe. Return = AES connection kit including external sensor pocket required – connection is to 15mm copper compression fitting.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fluid Content</strong></td>
<td>0.86L</td>
<td>1.03L*</td>
<td>1.29L</td>
</tr>
<tr>
<td><strong>Recommended Flow</strong></td>
<td>0.25 – 1 L/min/m²</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Transfer Fluid</strong></td>
<td>Premixed solar antifreeze with inhibitors. (100% Tyfocor antifreeze mixture recommended)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Max. Working Pressure</strong></td>
<td>10 bar (tested to 15 bar)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Zero loss Efficiency, η</strong></td>
<td>0.788</td>
<td>0.785*</td>
<td>0.781</td>
</tr>
<tr>
<td><strong>Heat loss coefficient</strong></td>
<td>$a_1 = 5.028, a_2 = 0.009$</td>
<td>$a_1 = 4.621*, a_2 = 0.014*$</td>
<td>$a_1 = 4.021, a_2 = 0.022$</td>
</tr>
<tr>
<td><strong>Peak Power Output</strong></td>
<td>1.082kW</td>
<td>1.372kW*</td>
<td>1.808kW</td>
</tr>
<tr>
<td>(at irradiance of 1000W/m²)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tilt angle range</strong></td>
<td>20° – 90°</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Stagnation</strong></td>
<td>170.1°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Maximum snow</strong></td>
<td>≤2.4kN/m²</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Maximum wind</strong></td>
<td>≤1.2kN/m²</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Testing</strong></td>
<td>ISO EN 9806 by CENER, Spain. Solar Keymark certification by DIN CERTO, Germany.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Certification</strong></td>
<td>Solar Keymark – registration number: 011-752383 F</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Life expectancy</strong></td>
<td>In excess of 25 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Warranty</strong></td>
<td>10 Years</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Applications</strong></td>
<td>Small to large domestic hot water systems, industrial process and swimming pool</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. Above Roof Work – 1st Fix:

3.1 Roof Mounting

Determine the position of the collectors on the roof, having regard for appearance and any potential shading. To maximise the solar gain of the system in the UK the preferred angle for fixing AES collectors is in the range of 15 to 50 degrees within the orientation of southeast to southwest, due south being the optimum. Installations outside these parameters are possible. Contact AES for advice.

Each collector is supplied complete with fixing brackets (flat bar as standard), which should be secured tightly to the main structure of the building. The number of fixings varies according to the size of the collector. Bracket requirements are recommended, as outline guidance only, for buildings of less than 15m height, in areas of insignificant topography and wind speeds, at an altitude below 300m. Any concerns regarding snow and wind loads please refer to ‘BS6399 Loading for Buildings’, or you can contact AES for further advice.

We provide two kit versions for mounting AES Supremacy collectors.

<table>
<thead>
<tr>
<th>Flat Bracket Kit</th>
<th>Universal In Roof Mounting Kit*</th>
</tr>
</thead>
<tbody>
<tr>
<td>For mounting AES collectors above roof</td>
<td>For seamless integration of the collectors within the roof</td>
</tr>
</tbody>
</table>

*The In-Roof mounting kit is suitable for all roof types; slate, tile, etc.

Depending on the kit you have ordered, attached to this document is either the roof mounting instructions for the flat bracket kit or the in-roof mounting instructions for our flashing kit.

**If you require mounting instructions for flat-roof or ground mount systems then please contact AES for guidance.
3.2 Collector Arrays

As a guideline, dependent upon pipe layout and pump design, collector arrays of up to 6m² can be connected in series, thereafter arrays greater than 6m² the collectors should be connected in parallel. In systems where collectors are plumbed in parallel, install a flow rate adjuster on the return feed to each collector. Observe slight rises in the pipework to remove air pockets in the system.
3.3 Running Pipework Through The Roof

Make a suitably sized hole through which to run the pipework and sensor cable.

The AES kit comes with 2 weathering slates made from Acrylead with black silicone sheaths. Place a weathering slate directly above the hole ensuring when positioning that the top edge is lapped under the tile above and dress to shape. Run the pipework and sensor cable through the silicone sheaths.

Fit the sensor pocket T-piece at the flow connection (normally highest connection on the array) and secure the temperature sensor into the sensor pocket, pushing it in as far as it will go and making sure it is secured tightly by tightening the locking nut. Fit the flow pipe to the T-piece using a 15mm male compression connection or short length of 15mm copper to female compression fitting or other fitting as appropriate. Fit the return pipe to the return 15mm pipe connection (usually the lowest array connection).

3.4 Lightning Protection

In most cases the number of thunderstorm days per year for a given installation location in the UK does not reach a level at which particular protective measures need to be applied. However where buildings or structures are considered to be at greater risk, for example very tall, or in an exposed location, the designer of the AC electrical system together with the designer of the solar thermal system, may choose to design or apply protective measures such as installation of conductive air rods or tapes.

In particular, it is recommended that you use an adequate lightning protection device should the assessed risk on the site be greater than 1 in 100,000.

If the building or dwelling is fitted with a lightning protection system (LPS), a suitably qualified person should be consulted. Where an LPS is fitted, solar thermal system components should be mounted away from lightning rods and associated conductors where reasonably practical (see BS EN 62305). Where there is a perceived increase in risk of direct lightning strike as a consequence of the installation of the solar thermal system, specialists in lightning protection should be consulted with a view to installing a separate lightning protection system in accordance with BS EN 62305.

**Note:** It is generally accepted that the installation of a typical roof-mounted solar thermal system presents a very small increased risk of a direct lightning strike. However, this may not necessarily be the case where the solar thermal system is particularly large, where the solar thermal system is installed on the top of a tall building, where the solar thermal system becomes the tallest structure in the vicinity, or where the solar thermal system is installed in an open area such as a field.
AES systems are easily integrated with all kinds of conventional heating systems. We provide schematics for various systems (e.g. swimming pool, heat exchanger, multiple store systems, etc.) If you require further assistance or information on a bespoke system please contact us.

The diagram below shows a standard system layout incorporating the AES Supremacy collector and kit components*

*With the exception of the cylinder which is not included and varies per job.

<table>
<thead>
<tr>
<th>Components</th>
<th>Pipework</th>
<th>Wiring</th>
</tr>
</thead>
</table>
| A – AES Supremacy Collector | Solar Flow 1 – Collector to Pump Station 2 – Pump Station to Cylinder | i – Collector Sensor to Controller  
ii – Cylinder sensor(s) to Controller  
iii – Controller connection to Pump Station |
| B – T-Valve with Sensor     | Solar Return 3 – Cylinder to Pump Station 4 – Pump Station to Collector |                                         |
| C – Pump Station            |                           |                                             |
| D – Controller              |                           |                                             |
| E – Expansion Vessel 18L    |                           |                                             |
| F – Discharge Container     |                           |                                             |
| G – Cylinder (varies by job)|                           |                                             |
4.1 Pipe Sizing and Materials

The following pipe diameters (mm) are outline guidelines for pipe sizes for collector arrays.

<table>
<thead>
<tr>
<th>Array Size*</th>
<th>Pipe Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to and including 8m²</td>
<td>15mm</td>
</tr>
<tr>
<td>Greater than 8m² up to 20m²</td>
<td>22mm</td>
</tr>
</tbody>
</table>

*For systems greater in size than this please contact AES for design assistance.

**As temperatures within the solar circuit can exceed 100°C we recommend the use of Copper or Stainless Steel tubing throughout the solar system circuit, do not use soft solder or plastic.

4.2 Suitable Fittings

The following fittings are deemed appropriate for use in the solar system circuit.

*Soldered or plastic fittings are not recommended:

- Brazed fittings
- Press fittings (rated to withstand temperatures above 150°C)
- Compression fittings
- Stainless Steel fittings

4.3 Sequence of Work

It is important when choosing the location of the equipment to keep the pipe runs as short as possible.

- Thoroughly flush out and refill the new cylinder, checking all connections for leaks.
- Connect the solar primary circuit components in the order shown in the layout drawing Section 4.0
- If necessary, the pump station and expansion vessel may be located in the attic space. A switched fused spur should be close to the controller.
- All pipework should rise to vent and fall to drain and be adequately supported with pipe clips (do not use plastic clips).
- It is recommended to fit a drain point at the lowest point of the circuit.
4.4 Notes on Solar Circuit Components

**Differential temperature controller** – To ensure that the customer can easily see the display, choose a convenient location. The sensor cables carry low voltage only and polarity is not important. The sensor cables may be extended using twin core flex / bell wire. Refer to the manufacturer’s operating and installation instructions for wiring connections.

**Expansion Vessel** - Refer to the manufacturer’s instructions. To be located on a 0.5m uninsulated falling spur.

**Fill valve** – Under no circumstances should this be connected to the mains water supply.

**Flow setter** – The recommended flow rate for a domestic hot water system is 0.25-1 litre/min/m² of collector absorber area. When the system is in operation, the flow rate should not exceed 1.0m/s, to ensure noise levels remain comfortable.

**Pressure Safety Valve** – Refer to the manufacturer’s instructions.

**Pump Station** – Refer to the manufacturer’s instructions. In most instances this unit will contain the flow setter for the system.

**Drain Valve** – To be located at the lowest point of the solar circuit.

**Connection and Interconnection Fittings** – Ensure that all fittings and seals are tightened sufficiently and do not leak.

**Safety Valve Discharge Container** – Ensure the discharge container is accessible and that the connection from the pump station safety valve is secure.

**Solar Fluid** – Do not dilute, the fluid is already pre-mixed and should not be diluted further.
5. Commissioning

Ideally, you want to fill the system when the collector is cold, due to the high temperatures that can be attained, be sure to cover the collector in any case. We recommend that the system is filled with a 40% antifreeze solution containing corrosion inhibitors, this is essential in climates where frost and freezing ambient temperatures can be encountered.

Before commissioning takes place it is important to flush the system fully with the anti-freeze solution to remove any impurities, contaminants or debris prior to the final fill:

1. On completion of the primary circuit pipework make sure of the following:
   a. All drain cocks are closed.
   b. Pump isolating valves are fully open.
   c. Caps on all automatic air vents are slackened one turn.
   d. Ensure the pressure on the gas side of the expansion vessel is reduced to:
      i. 0.5bar + (0.1bar x geodetic height i.e. height from expansion vessel & system high point m)
2. Connect the inlet of the fill valve to a pump filled with antifreeze. Unscrew the knurled knob on the underside of the fill valve and fill the system until a pressure of:
   i. 0.5bar + (0.1bar x geodetic height)
3. Check that all fittings are free from leaks.
4. Drain the system through the primary circuit drain valve.
5. Flush and back flush primary circuit until clean and clear.
6. Ensure all fluid is drained completely from the primary circuit (Note: De-activate any non-return valves).
7. Refill the system as previously to required pressure with antifreeze. Always read the solar antifreeze fluid label. Under no circumstances should water be added to premixed antifreeze fluid.
8. Switch on the electrical supply to activate the system. If there is insufficient solar energy the override switch on the controller should be activated. Any air in the primary circuit will now be dissipated through the automatic air vent.
9. The system should be re-pressurised.
10. The circulating pump should be set to operate at the lowest speed possible to achieve the required flow rate: 0.25 – 1 litres/min/m²
11. Once commissioned the DTC must be left on automatic operation and any automatic air vents isolated.
12. Pipework insulation may now be applied. It is essential to use only high temperature insulation (resistant up to 150°C). Secure in place with cable ties or insulation tape.

On completion of the solar water heating system, the installer must fully explain the function and operation of the system to the end user. The installation, commissioning and maintenance instructions should be passed on to the end user.

While a properly designed and installed heating system should be expected to give a service life comparable to that of other types of heating systems, some maintenance may be necessary to maintain the efficiency of the installation.

Periodically check the collector for dirt or grime. If required, clean using a soft cloth with a solution of mild soap and lukewarm water followed by rinsing with clean water.

**CHECKLIST** - A maintenance inspection should be carried out annually

<table>
<thead>
<tr>
<th>Item</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector for damage both to the glass and the absorber plate ensuring the glass seals are weathertight and sound.</td>
<td></td>
</tr>
<tr>
<td>Roof fixings are firm and the roof covering is free from cracks.</td>
<td></td>
</tr>
<tr>
<td>Flow and return legs to the collector circuit are free from air.</td>
<td></td>
</tr>
<tr>
<td>Weathering is still properly protecting the structure.</td>
<td></td>
</tr>
<tr>
<td>Insulation is firmly attached.</td>
<td></td>
</tr>
<tr>
<td>No condensation or damp spots are apparent, particularly around the pipes and fixings in the roof.</td>
<td></td>
</tr>
<tr>
<td>Circulating pump is operating without undue noise or vibration.</td>
<td></td>
</tr>
<tr>
<td>Electrical controls are operating correctly to manufacturer's instructions.</td>
<td></td>
</tr>
<tr>
<td>All sensing devices are firmly and properly in place.</td>
<td></td>
</tr>
<tr>
<td>All air eliminators, non-return valves, and solenoid valves and motorised valves are operating correctly.</td>
<td></td>
</tr>
<tr>
<td>Unions and glands are free from weeps.</td>
<td></td>
</tr>
<tr>
<td>Ensure that the operating pressure is not dropping below 0.5 bar.</td>
<td></td>
</tr>
<tr>
<td>Correct solar fluid volume is maintained.</td>
<td></td>
</tr>
<tr>
<td>All covers are in place.</td>
<td></td>
</tr>
<tr>
<td>Anti-freeze solution should be replaced at least once every 5-years.</td>
<td></td>
</tr>
</tbody>
</table>
7. Warranty

AES warranty covers the solar collectors against faults in manufacture or material failure up to 10 years, providing that the solar collectors were installed in accordance with the AES Installation Manual and the Microgeneration Installation Standard 3001.

No liability can be assumed by AES for improper use or unsanctioned alterations to the system.

8. Notes for the User

You have just become a user of the most important energy source of the future - and yet the oldest one in existence. Correctly installed, it will provide many years of reliable service. The system revolves around the lightweight yet highly efficient AES collector. AES has more than 30 years of experience in this specialist field and selects only the highest quality components for their systems. The solar system contains fluid which transfers heat from the solar collectors to the hot water storage cylinder. The pipework circuit is subject to a small pressure and should be fitted with all the necessary safety features i.e. expansion vessel and pressure safety valve to discharge container. Fully automatic control is by a controller. This unit measures the temperature in the solar collector and, when this is (typically) 6°C hotter than the temperature in the lower half of the cylinder it switches on a circulating pump in order to transfer the heat. When the temperature difference has fallen to 4°C the pump is switched off. The collectors are protected and solar benefit will be had all year round because the fluid in the system contains anti-freeze. The controller automatically controls the operation of the circulating pump and, at the same time, provides a digital temperature read-out. Please refer to the controller instruction manual for operation of the controller.

For satisfactory operation of the system the following points should be observed:

- The system should always be left switched on even when the house is unoccupied. This will ensure that the fluid in the collectors does not boil and evaporate, which will possibly result in a service call.
- Periodically check the pressure gauge. When installed, the system is pressurised. This will vary continually according to the temperature in the collectors, if there is zero pressure, a service call will be required.
- To maximise solar gain, it is advised that auxiliary heating (e.g. gas boiler) is switched off during daylight hours.

Important Information:

Limescale

In hard water areas the high temperatures experienced in solar cylinders can result in the accumulation of limescale. As a means of control, the differential controller can be set with a maximum store temperature of 60°C. Limescale build-up will not occur within the closed loop of an indirect solar circuit.
**Legionella**

At temperatures between 20°C and 46°C there is an increased risk of legionella bacteria growth within the domestic hot water system. In order to combat the risk of legionella bacteria growth, the water temperature needs to be raised to at least 60°C once per day. For days with little solar availability and for winter months there needs to be an auxiliary means of raising the temperature of the domestic hot water to at least 60°C. This form of sterilisation should be accurately controlled by time and temperature to maximize solar gain e.g. the electric immersion or boiler should operate during non-daylight hours or periods of peak domestic hot water draw-off.

The following formula is used to determine the minimum time of operation for the auxiliary heating to ensure sterilisation:

\[
\text{Minutes} = \frac{(\text{Cylinder capacity in litres} \times 4.2)}{\text{kW}}
\]

**Temperature Controls**

A solar system can at times produce scalding water or even high pressure steam. For your safety within the primary circuit a suitably sized expansion vessel and pressure relief valve are fitted. The secondary circuit safety features include a dedicated solar volume of no less than 25 litres per 1m² of solar collector aperture and a maximum store temperature on the differential temperature controller, factory preset at 60°C. A further safety feature for vulnerable groups, such as children or the infirm, is the use of a thermostatic mixing valve either at or within 450 mm of the point of use set no greater than 46°C or at the hot water cylinder set at 55 - 60°C.

**General**

The solar water heating system should meet the requirements for electrical earthing and bonding in accordance with IEE Wiring Regulations.

Only competent person(s) should undertake any maintenance, decommissioning or repair work. Necessary skills are required in plumbing, electrical, roof work and access work. Individuals should have a high level of technical knowledge, be familiar with tools of the trade and have experience in current best practice.
9. Decommissioning

- Cover the collectors.
- Switch off the electricity supply to the differential controller and pump.
- Release the pressure in the solar circuit loop. This can be done by manually releasing the pressure relief valve.
- Remove the air vent.
- Drain system from the drain valve, located at the bottom of the solar circuit loop.
- The system is now decommissioned. Decommissioning the system in the early morning or late evening is recommended as the panel will not have had the chance to heat up fully, so there will be less chance of burning yourself on steam or pipe work. If this cannot be done then take great care, and be aware that there could be a burst of steam when you take any component off.

*Remember that the non-return valve will have liquid above it so it will not naturally drain. You will need to remove / bypass / disable it, too fully drain the system. Even after the solar water collector(s) has been drained, residual hot water or steam may still come out, sometimes in sudden bursts, for hours or days afterwards, more so on particularly in bright or sunny weather. Pipes connected to the collector may get very hot, up to and above 100°C. The solar collector(s) should remain covered with the air vent(s) removed.