Nu-Heat
UNDERFLOOR & RENEWABLES

Solar Thermal
installation manual

UNDERFLOOR HEATING
HEAT PUMPS
SOLAR THERMAL

working with you before, during & after your project

Nu-Heat Know-How

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System Ref: _____

Installation manual for Nu-Heat EnergyPro™ solar thermal flat panel systems

The warranty period will commence from the date of commissioning (see page 18 of the *Solar User Guide* for more details). The *Solar Commissioning Checklist* must be completed and returned to Nu-Heat as proof of commissioning and to activate the solar panel warranty.

This manual gives the information needed to install your Nu-Heat solar thermal system. In order for the process to be achieved quickly and easily the principle of solar thermal should be understood. A useful reference is produced by the Energy Saving Trust, entitled:
Solar water heating systems – guidance for professionals, conventional indirect models (CE131).

This manual follows the requirements of Microgeneration Installation Standard MIS3001, however the installer must be familiar with that document, in respect of those points not covered by this manual.

The following pages have comprehensive diagrams showing the purpose of each major system component and its position in the overall scheme. Parts shown in colour are supplied by Nu-Heat and those shown in outline are generally supplied by others.

Attention to the advice given in this manual will help to ensure a trouble-free and effective installation. The requirements of the relevant British Standards, Water Bye-laws and other regulations should always be met.

If there is any aspect of the installation that you do not understand, please contact Nu-Heat Technical Support, quoting your system reference number, for advice.

In line with the company policy of product development, Nu-Heat reserves the right to supply different components to those shown.

Checklist

Planning permission and Building Regulations

Please ensure that any necessary planning permissions are in place prior to commencing work. In the case of notifiable works it shall be made clear to the end customer as to who shall be responsible for notification

Assessment of roof structure

It is the installer's responsibility to assess the static and dynamic loads that may be imposed upon the equipment and roof structure (as set out in MIS3001) and ensure that those loads can be withstood. Details of the equipment can be found on the data sheets linked to the quotation, also supplied with the *Handover Pack*.

Metering

Please note that the document MCS Domestic RHI Metering Guidance states a need for all systems wishing to be applicable for the RHI should be 'meter ready', i.e. space for meters should be left. Please see the relevant docking drawings for details.

Mains water supply

Check that the performance of the mains supply matches the requirements of the household.

Boiler

If using a Nu-Heat EnergyPro cylinder in conjunction with underfloor heating then the heat loading is indicated on the *A3 System Information*. Please refer to the boiler manufacturer's recommendations for installing and commissioning the boiler. Check the boiler installation requirements with the manufacturer as in some cases a by-pass valve may be recommended between flow and return pipework.

Insulation of pipework

It is necessary to insulate the solar pipework, as well as the 'primary' system pipework. Nu-Heat supplies pre-insulated stainless steel flow and return pipework for solar thermal installations as an optional extra.

Domestic hot water pipework should also be insulated, particularly on a pumped loop. Ensure that the incoming cold main is separated from any hot pipework to prevent heat transfer. See Microgeneration Installation Standard MIS3001 for further detail.

Taking delivery

Please check your delivery against the delivery note and report any discrepancies within 7 days of receipt.

Warranty

In order to activate the warranty the *Solar Commissioning Checklist* must be completed and returned to Nu-Heat as proof of commissioning – this will also be required by MCS in order to claim RHI payments.

Recommended installation sequence

The general sequence of installation is as shown in this manual. Before starting, check the positions of the main components such as the cylinder and pump station as discussed at quotation stage.

Please note that if the position of the cylinder has changed with respect to the position of the panels then the length and possibly the diameter of the connecting pipe will change also – please contact Nu-Heat if purchasing stainless steel flow and return pipework with your system. **Full dimensions of the components supplied are given in this manual.**

1. Fit the panels to the roof as part of the roofing work to make the property weather-tight. Pass flexible hoses and sensor cable through the roof. Note: **The panel must be covered during installation to prevent solar irradiation.** NOTE THE PANEL SERIAL NUMBER(S).
2. Complete the first fix wiring in accordance with the diagrams in the handover pack.
3. Fit the cylinder. The other major plumbing works will need to be completed in order to fill the cylinder with domestic water, and heating primary water if applicable.
4. Fit solar pump station and expansion vessel.
5. Complete the connection pipework between the cylinder and panel array.
6. 2nd fix the wiring of the solar equipment.
7. Fill and flush the solar circuit.
8. Commission the system in order to allow heat to be drawn from the panels. **Only uncover the panels once this has been done.**

Solar docking schematics must be read in conjunction with the system docking drawing which will show the boiler/heat pump mechanical pipework layout.

Fitting the solar panel

Safety Information

Please read these instructions carefully before starting the installation and assess the safety risks involved.

Whilst it is possible to self-install solar panels it may be safer and more practical to employ professional roofing contractors. The National Federation of Roofing Contractors is able to provide details of its members who are trained in the fitting of solar collectors. See www.nfrc.co.uk for details.

Working at Height

Working at height can be dangerous and must only be done with the correct equipment and after a Risk Assessment has been performed.

- For proper guidance on safe practice see the Health and Safety Executive information on Health and Safety in Construction, section entitled Working at Height. Other relevant standards are listed in appendix 6.
- The fitting of solar panels generally requires the use of scaffolding or at least a scaffold tower and eaves-level boards to provide a safe platform on the roof. Scaffolding must be erected by a Competent person.
- If work involves erection of scaffolding on a public highway then the Local Council and the Highways Agency must be consulted.
- Protection from falling should be provided either by the use of guard rails or fall arrest/fall restraint equipment.
- If the danger of falling material is considered a significant risk then the area beneath must be made safe either by being cordoned off, or if this is not possible then alternative safety provisions should be made.
- In order to get the panel up to roof height a crane or hoist may be necessary.

Risk of Burning

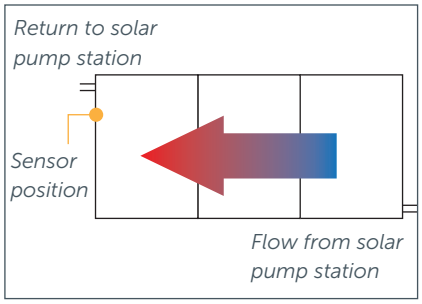
It should be borne in mind that the actual solar panel, including connections, may reach temperatures of 150–350°C within minutes when on the roof even with no circulation through it. A suitable cover (e.g. a tarpaulin) should be temporarily placed over the panels to protect anyone on the roof from being burnt.

Only remove this once the system has been commissioned.

Other important notes

Storage of Equipment

It is important that the collectors are stored in a dry environment before installation. They must be stored in either an upright portrait position or laid flat facing upwards, taking care not to damage the glass. Failure to follow the storage instructions may cause damage to the collectors. Often, water ingress into the collector only results in condensation; whilst this may affect appearance it will not significantly affect the performance of the collector.



Always fit in this orientation

Roof Loading

The weight of each EnergyPro panel is 31kg. However consideration of additional loads from wind and snow must also be taken – see MIS3001 for guidance. Consult a structural engineer if there is any doubt as to the ability of the roof to support the additional load of the solar panel.

On-roof lead working

The on-roof mounting kits fixing brackets are suitable for both tile and slate however the reduced profile of slate means some lead work is required around the fixing brackets to ensure weather proofing.

Proprietary solutions are available that limit the amount of on-site forming that is required. A good example of such products can be found at: www.geniusroofsolutions.com

Lightning Protection

The requirement for lightning protection is only necessary when the assessed risk is greater than 1 in 100,000 according to BS 6651.

Installation of Sensor

Before finishing work on the roof the solar panel temperature sensor must be installed. It should be located in the last panel before the return to the cylinder (i.e the hot outlet, which is the hottest part of the collector array).

To install the sensor:

1. Remove the rubber bung.
2. Feed the sensor through the hole in the bung and apply some heat conduction paste.
3. Insert the sensor into the pocket.
4. Refit the bung.

It is possible to extend the sensor up to 50m using a 0.75mm twin core cable such as is integrated into the flexible stainless steel flow and return pipe work (optional).

Serial Number

The panel's unique serial number must be noted whilst the roof is accessible.

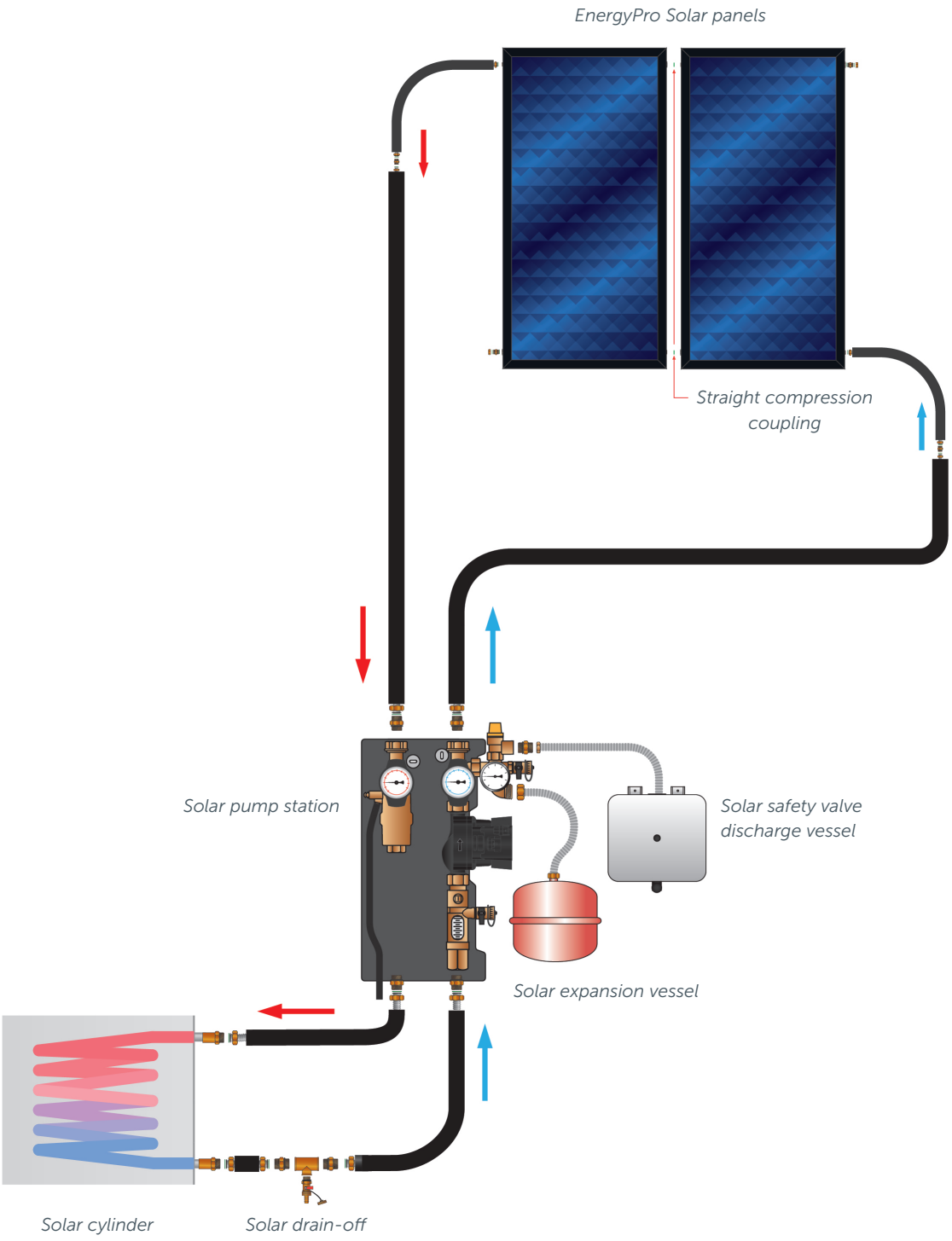
For detail on mounting the panel as well as dimensions, please see the separate *Solar Panel Installation Manual* in the roof mounting assemble box.

Note: The system should ideally be commissioned as soon as possible after the panels are fitted to prevent them experiencing temperatures higher than necessary. Covering the panels will protect them to some extent from solar irradiation.

Components – the solar circuit

The solar circuit is shown in the diagram below. The following pages further detail on various components and connections.

Please read this in conjunction with the *Solar* or *Heat Pump Docking Drawing*.

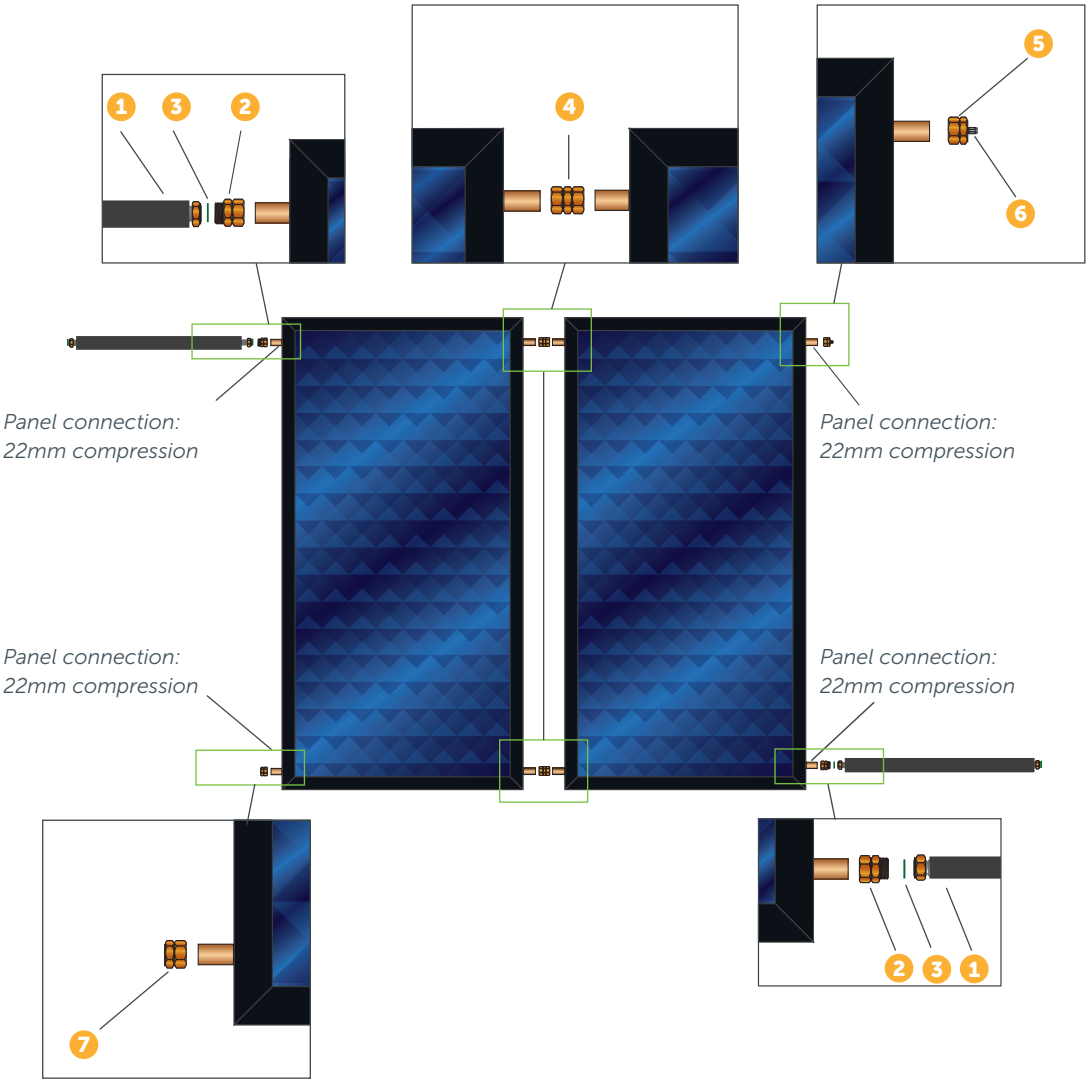


Connecting onto the panel

The EnergyPro panel has four 22mm compression connections

The array must be connected with the cold inlet on the bottom-right fitting, and the hot outlet at the diagonally opposite top-left fitting. The panel sensor 'S1' must be fitted in the pocket next to the hot outlet.

Each panel installation kit is supplied with the necessary fittings to blank off the two unused connections on the array, as well as the compression straight couplings for joining panels together.



1 DN16 stainless steel flexible hose, 1m long, with ¾" captive nuts and washers. (Not supplied for flat roof kits, where the flow and return pipework connects directly to the panel).

2 ¾" male BSP to 22mm compression fitting

3 Fibre washer

4 22mm straight compression coupling

5 22mm compression air vent connector

6 Air vent piece

7 22mm compression stop-end piece

If the hose is to be connected onto the ¾" captive nuts then the flat-faced male compression is used here, and the stop-end and air vent connects directly onto the panel's connections.

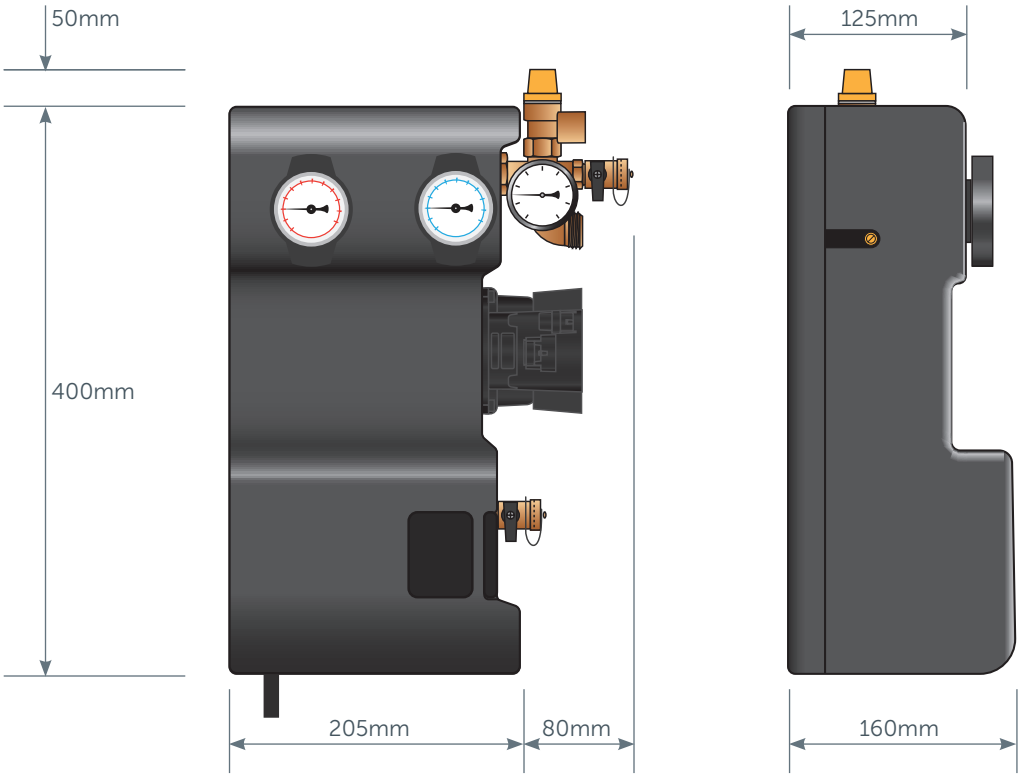
Connections should be sufficiently tightened, and pressure tested before the roof becomes inaccessible.

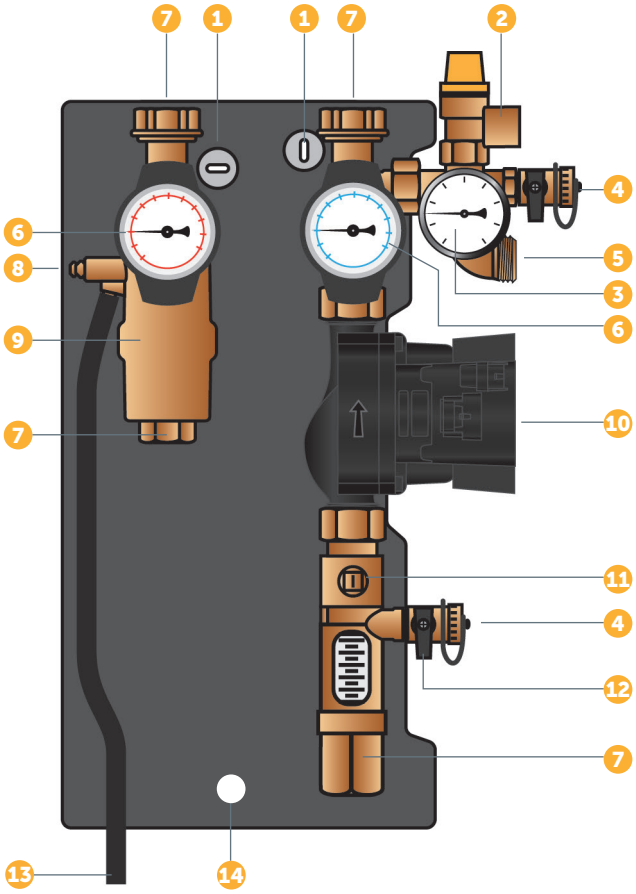
A high-temperature liquid PTFE sealant may be used in addition to the washers, if desired.

The solar pumping station

The pump station is supplied pre-assembled.

Dimensions





1. Mounting holes
2. Safety relief valve (3/4" female)
3. Pressure gauge
4. Fill/flush valve and connection
5. Expansion vessel connection (3/4" male)
6. Ball valve with gravity check and temperature gauge
7. Connection (3/4" female)
8. Air vent
9. De-aerator
10. Pump
11. Flow adjustment
12. Flow gauge
13. Air vent bleed tube
14. Optional extra fixing (not supplied, can be drilled and fixed here if requiored)

Installation

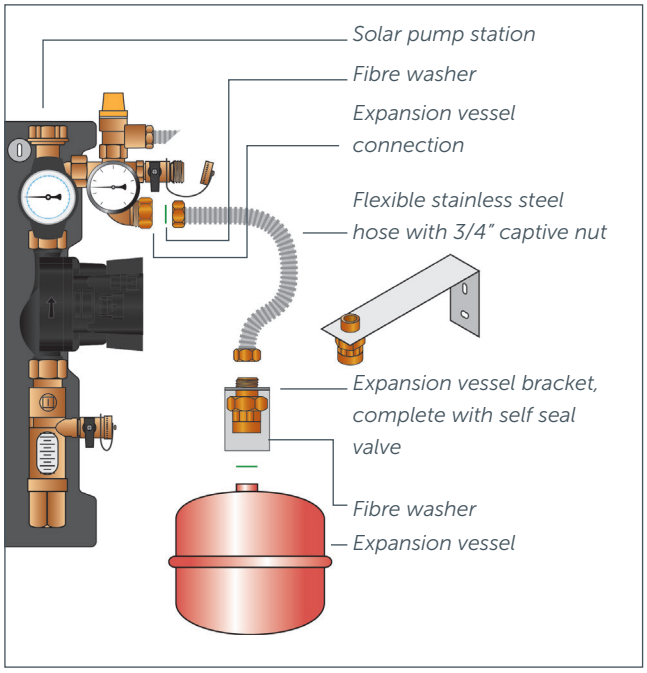
The pump station is designed to be wall-mounted.

1. When deciding on the position of the solar pump station enough room must be left to the right of the pump for the solar expansion vessel, and safety valve discharge vessel. There are dedicated fittings for connecting these.
2. Mark the position for the mounting screws (1) horizontally at 160mm centres.
3. Fix the back housing to the wall using the screws provided.
4. The pressure gauge comes pre-fitted. Should it be removed at any point to refit the gauge, screw it in fully and then unscrew it until the dial is the correct way up. It will self-seal.
5. All threaded connections are factory tested, however they must be checked for water-tightness during the system pressure test.

Solar expansion vessel

Fix the expansion vessel to the wall using the bracket provided. Take care when identifying the solar expansion vessel as it is rated for higher temperatures than standard heating types. The solar expansion vessel can be identified by the sticker on the vessel itself.

The solar expansion vessel should be mounted with the plumbing connection at the top. The connection is made using the 0.5m flexible hose provided. Make sure to use the fibre washers, as provided. This pipe must remain uninsulated, as the heat dissipated protects the vessel from extremely high temperatures.



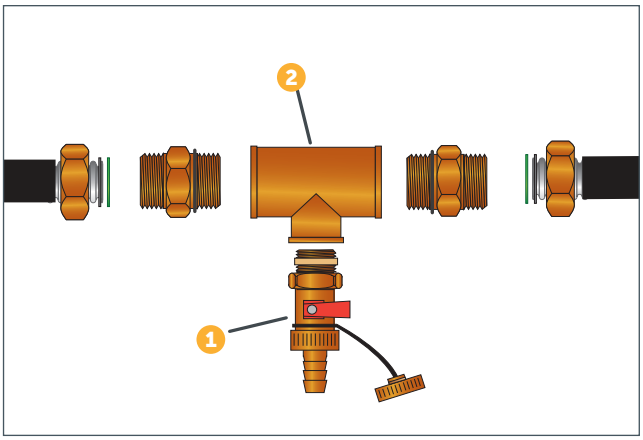
Solar safety valve discharge vessel (optional extra)

The safety valve discharge vessel should be fitted as close to the safety valve as possible. The pipework from the safety valve should have a continuous fall to the discharge vessel, and remain un-insulated to dissipate heat and protect the vessel from extremely high temperatures.

Solar drain-off

An unequal tee, and solar rated drain valve is supplied along with the solar pump station kit (SFCE-A). This must be fitted at the lowest point of the system in order for all the fluid to be drained if necessary.

Pipe fittings are supplied with the pre-insulated flexible stainless steel flow and return pipework, available as an optional extra from Nu-Heat. If the flow and return pipework is sourced elsewhere then suitable fittings must also be sourced.



Pre-insulated flexible stainless steel pipe

As part of the solar quote there will have been the option of being supplied stainless steel flexible pre-insulated pipe, complete with sensor cable. This will have been sized according to the length of run, and the required flow-rate, being available in 16 or 20mm nominal diameter (DN16 and DN20).

This comes complete with the required fittings, as well as fixing clips (for use at approximately 1.5m intervals).

Note: **The pipe-work must be earth bonded with a conductor of cross-section 6mm^2 or more.**

Making Connections with the Stainless Steel Flexible Pipe

Cutting the pipe

The stainless steel flexible pipe is supplied in standard lengths and can be cut with ordinary (copper) pipe cutters. The cut should be made in the trough of the corrugation (the 'minor diameter'). The pipe should be left free from burrs to avoid injury.

Connecting the stainless steel flexible pipe

In the assembly with the stainless steel pipe will be a connection kit.

1. Cut the pipe to length as described above
2. Place one of the pipe nuts over the pipe
3. Close one of the retaining clips (circlips) around the pipe in the first crease
4. The first corrugation must be compressed to provide a flat sealing surface. To achieve this assemble the fitting without the fibre washer and tighten as far as possible (this will avoid damage to the fibre washer).
5. Once the first corrugation has been flattened undo the fitting and fit the fibre washer before finally doing the fitting up tightly.

If a sealant is desired then high temperature liquid PTFE should be used (e.g. Rocol 28022 Pipeseal PTFE Liquid).

Alternatives to flexible stainless steel flow and return pipework

If the optional flexible stainless steel pipe has not been chosen then copper may be used with compression fittings – do not use solder joints. Compression olives must be brass, and a brass pipe insert must be used with compression fittings, as copper will anneal at the temperatures that may potentially occur.

Any threaded or compression joints should be sealed with a high temperature liquid PTFE sealant (such as Rocol 28022 Pipeseal PTFE Liquid).

The pipe runs must be insulated both to prevent heat-loss and risk of being burnt. Any material used for this must be capable of withstanding 150°C. High temperature nitrile rubber (e.g. Armaflex) is a proven material in this application (minumum 19mm thickness).

Copper pipework should be sized as indicated in the following table:

Pipe size (mm)	No. of panels						
Panel to cylinder distance (m)	2	3	4	5	6	8 (2x4)	10 (2x5)
10	15	15	22	22	22	22	28
15	15	15	22	22	22	28	28
20	15	22	22	22	22	28	28
30	15	22	22	22	28	28	35

Note: The pipe-work must be earth bonded using a conductor with a cross section of 6mm^2 or more.

Second fix wiring

For information about the second fix wiring please see the drawings supplied in the *Handover Pack*.

Filling & flushing the solar circuit

Before filling the solar circuit the cylinder should first be flushed (cleansed) and filled as per the instructions in the relevant cylinder manual.

In order to fill and flush the solar system a specialist flushing pump will be necessary, this can be purchased from Nu-Heat.

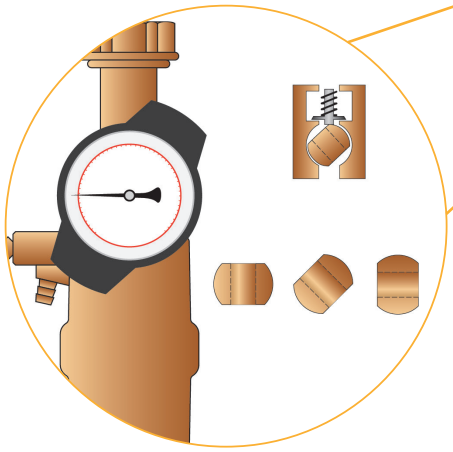
SAFETY: **Please note that if there has been any significant solar irradiation, then there is a scalding risk from the hot fluid. There is also the possibility that if the solar panel has been exposed for any amount of time that the fluid could flash to steam.**

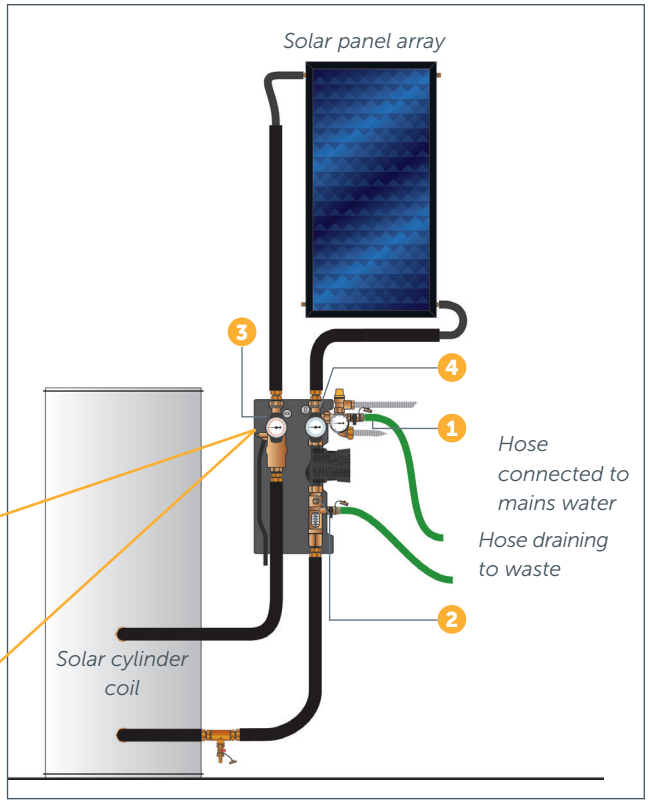
Filling should only ever be done when the system is cold, or when the panel has been suitably covered.

It is necessary to initially flush the system using water, which can also be used for pressure testing. This must then be drained down and the system filled with antifreeze, and purged of air. This is described below.

Flushing the Solar Circuit

1. First disconnect the expansion vessel from the system – this simply unscrews, and closes the self-seal valve.
2. Connect a hose from the mains to the filling valve (1), and another hose from the flushing valve (2) draining to waste as shown in the following diagram
3. Open the filling valve (1) and flushing valve (2)
4. Turn the return ball valve (3) by 45° in order to open the non-return valve. The flow ball valve (4) should be horizontal, i.e. in the closed position.





5. Turn on the mains water and allow it to flow through the system until it appears clear and free from debris at the drain.
6. Close the filling and flushing valves (1 & 2) and turn off the water.

Note: To avoid damage to components when freezing temperatures are expected, the system should be treated/filled with Glycol or drained completely.

Draining the Water

7 Remove the hose from the flushing valve (2) and connect it to the drain valve (5)

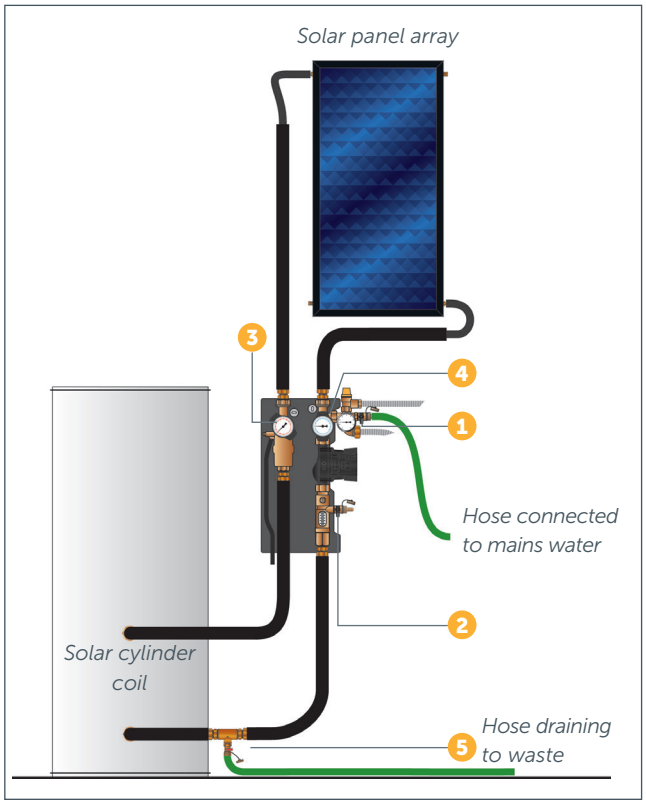
8 Put the outlet of both hoses to waste, as per the following diagram.

9 Set the flow ball valve (4) and the return ball valve (3) to 45° in order to open the non-return valves

10 Open the drain valve (5) and then the filling valve (1)

11 Allow the water to drain to waste. Be aware that there may be water left in solar coil in the cylinder, if both connections are at the same level.

12 Close the filling valve (1) and drain valve (4).



Flushing with a Cleansing Agent

Table 39, Section 9.0a of the *Domestic Heating Compliance Guide* states that the solar circuit should be cleaned with an appropriate cleaner.

To do this complete steps 14–17 below using cleansing agent (NOT antifreeze). Use a solar flushing pump to introduce the cleaning fluid (as per manufacturer's instructions).

Repeat steps 1–12 above *Flushing the Solar Circuit* and *Draining the Water* before filling the system with antifreeze as in the following section.

Filling with Solar Antifreeze, Pressure Testing the Solar Circuit and Purging

13 With the system drained, refit the solar expansion vessel onto the self-seal valve. First check that the solar expansion vessel has the correct air charge, as shown in the table below. This must be done before the system is filled with fluid.

Maximum height of system above expansion vessel	m	2.5	5	7.5	10	12.5	15
Expansion vessel charge pressure	bar	0.8	1.1	1.4	1.7	2	2.2
System fill pressure	bar	1.1	1.4	1.7	2	2.3	2.5

14 Set up the flushing pump with the antifreeze as in the diagram overleaf, with the hose removed from the drain valve (5) and replaced on the flushing valve (2).

15 Close the flow ball valve (2) by turning it clockwise. The return ball valve (3) should remain at 45°.

16 The inlet to the pump should be set to draw the antifreeze, and the outflow hose should return to the antifreeze reservoir.

17 Open the filling valve (1), then switch on the filling pump and flushing valve (2). Continue to run the pump until there are no air bubbles at the return to the antifreeze container.

Hints:

- Flush at a pressure of between 3-4 bar.
- To aid purging pulse the pump on and off.
- Closing the flushing valve (2) to allow pressure to build up, and then opening it again can help clear air pockets.

Filling with Solar Antifreeze, Pressure Testing the Solar Circuit and Purging – continued

18 To vent the pump close the return ball valve (3) and set the flow ball valve (4) to 45°. Make sure that the flow regulating valve (6) is open with the slot in line with the pipe. Flush the pump for about a minute.

19 Close the flow ball valve (4) and re-set the return ball valve (3) to 45°, and make sure that there is no further air in the system.

20 Once the air has been completely purged close the flushing valve (2) and allow the pressure to rise to 5 bar. 3.5-4

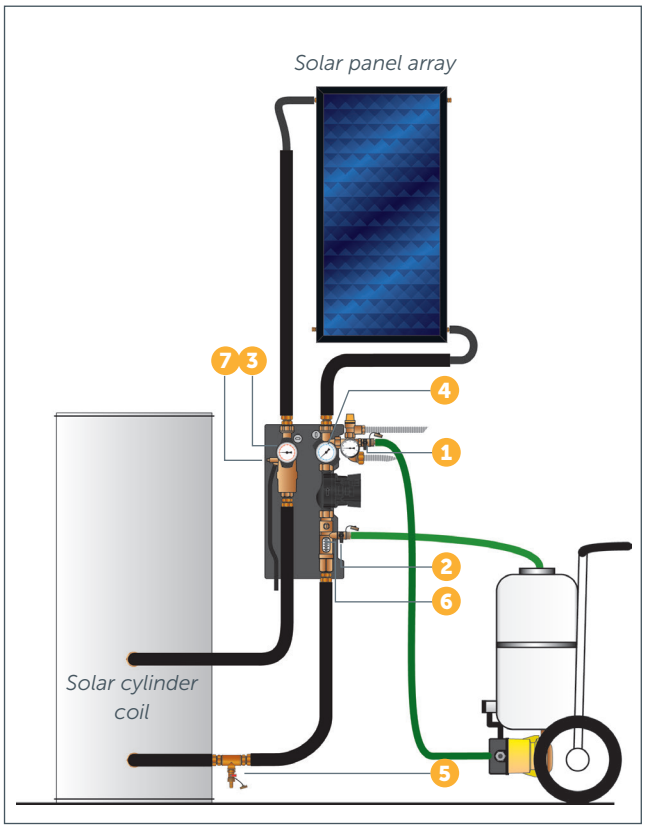
21 Close the filling valve (1), and shut off the pump.

22 Set the flow ball valve (4) to 45° to open the ball valve, and ensure that the return ball valve (3) is also set at 45°. Also make sure that the flow regulating valve (6) is open (the slot in line with the pipe).

23 Remove air bleed tube from recess and put into a small vessel. Open the air separator vent (7) to remove the air, then shut it. Replace the tube when completed.

24 The system should now be thoroughly checked for leaks at all the joints. The pump station is tested at manufacture, but should still have all joints inspected for signs of leakage. Leave the system overnight and repeat the inspection.

Note: **It is not possible to rely on the pressure gauge reading to indicate the presence of a leak as the expansion of the fluid may give erroneous indications.**



Setting the System Pressure

24 Once the pressure test is complete, open the flushing valve (2) to let the pressure down to the working pressure
(see table below), then close the flushing valve (2).

Maximum height of system above expansion vessel	m	2.5	5	7.5	10	12.5	15
Expansion vessel charge pressure	bar	0.8	1.1	1.4	1.7	2	2.2
System fill pressure	bar	1.1	1.4	1.7	2	2.3	2.5

25 The solar pump should be run to complete the air purging. To do this set both the flow and return ball valves (3 & 4) to open (vertical). Switch the power on to the solar pump station. The controller should come on, as indicated by a green LED.

26 To manually bring on the pump press the forward button until the display reads Time then hold it down. Further options will become available. Use the forward button to scroll through these until MAN1 is reached. Press the middle button, and the SET icon will flash.

27 Use the forward button to change it from Auto to ON and press the middle button again to confirm the selection. The pump should start running.

Pump set-up

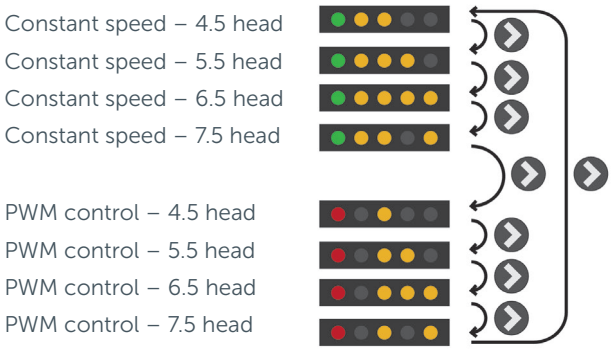
The Grundfos UPM3 SOLAR should be set up in **PWM control mode** (with the first indicator light red). When first switched on it will be in Constant speed mode with 4.5m head(first indicator light green). For flushing set it to the maximum 7.5m head in constant speed mode.

In normal running, the pump will display the pump performance. Press the button once to view the selected setting. If untouched for 2s it will revert back to performance view.

Adjusting the pump setting

To adjust the selected setting press the button for more than 2s – the indicator lights will flash.

Pressing the button will cycle through the following options:



If untouched for 10s it will revert back to displaying the pump performance.

28 After about half an hour the manual air vent on the de-aerator (7) should be checked again, and then several times within the first day of running. This will ensure any residual air is removed.

29 After having been left to run in this way for a several hours then the controller should be commissioned so that the solar system can start to draw heat from the panels.

Setting the Flow Rate

30 The flow rate must be adjusted for the solar circuit by varying the pump speed, and using the flow adjusting valve (6). The flow can be measured on the flow gauge on the pump station.

31 With the pump still in manual mode, and the flow adjustment valve (6) fully open, cycle the pump mode through to the lowest (4.5m) constant speed setting (see *Adjusting the pump setting*). If more flow is needed increase the pump head until the flow requirement is satisfied. The flow adjustment valve (6) can then be used to trim the setting if necessary.

There are two criteria for determining the flow rate:

- Based on the panel, the minimum flow rate should be to 1 litre/minute per panel , e.g. a three panel system requires 3 litres per minute.
- The flow speed in the pipes should be 0.3m/s to ensure correct air purging (as per the table below).

Nominal size	ID (mm)	Flow rate at 0.3m/s (l/min)
DN16	16	3.7
DN20	19.7	5.5
DN25	26.5	10

The flow rate should be set to whichever of these is the highest.

32 After setting the flow rate change the pump settings (see *Adjusting the pump setting*) to **PWM control** with the same head (4.5, 5.5, 6.5 or 7.5m head) you set on manual mode, so the controller can communicate with the pump via PWM cable.

33 Only at this stage should the cover be removed from the solar panels in order that they can receive solar irradiation.

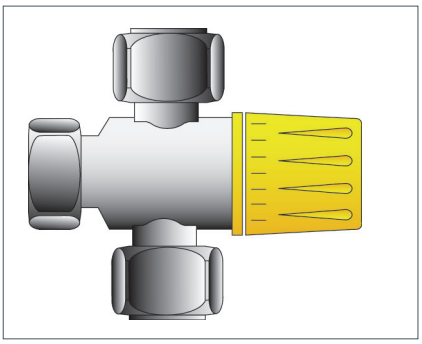
Note: A single panel system may require lower flow rates, therefore performance should be monitored. If poor solar gain is being achieved then the flow rate can be reduced by a small amount.

Solar domestic hot water tempering valve

All solar systems witha Nu-Heat cylinder are supplied with a domestic water tempering valve, as the solar input is capable of producing very high temperatures. The function of the tempering valve is to reduce the temperature to one that can be managed by a domestic thermostatic mixing valve (TMV).

The solar tempering valve is supplied pre-set to 38˚C (setting 3) to prevent scalding, but a higher temperature is recommended to prevent the growth of legionella bacteria – the water should reach the outlet at 50˚C within 1 minute of opening the tap.

Note: If there is a risk of scalding then hot water should also have a safety thermostatic mixing valve (TMV) at the outlet.



22mm domestic hot water blending valve

In order to set a different temperature, the following procedure should be followed:

- Remove the screw securing the adjustment knob to the valve.
- Remove both the knob and the locking ring.
- Replace the knob temporarily.
- Open a tap and adjust the set temperature of the valve as required (anti-clockwise to increase and clockwise to decrease). As a guide, the markings on the valve correspond to the following temperatures:

Position	Min.	1	2	3	4	5	Max.
Temperature (˚C)	30	36	42	47	53	59	65

Reference values: T_{hot} = 70°C; T_{cold} = 15°C, Hot and cold water inlet pressures = 3bar

- Remove the knob and refit the locking ring.
- Locate the tab on the inner face of the knob into the retainer in the locking collar and secure the knob with the screw.

MAINTENANCE OF THE DOMESTIC HOT WATER BLENDING VALVE

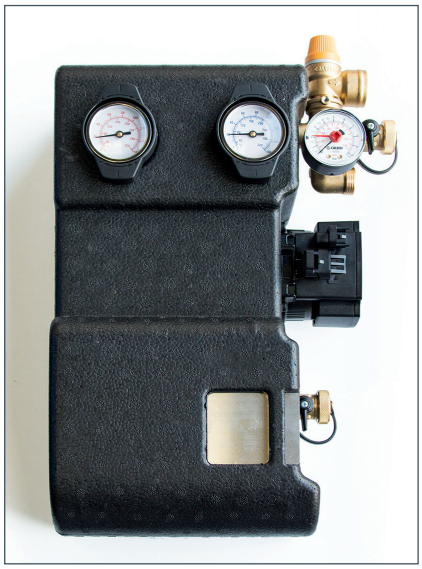
The valve should be checked and cleaned annually. If the cylinder's domestic hot water pipe is hot and the blending valve outlet pipe cold it is possible that there is a build-up of scale within the valve.

To strip down the valve and clean:

- Drain the domestic hot water system.
- Isolate the valve and remove the yellow knob and locking ring.
- Unscrew the large hexagonal cap and slide out the interior parts of the valve (note the orientation of the parts to aid reassembly).
- After cleaning and reassembling, the valve should be reset and tested.

See the manufacturer's instruction for full details.

Setting up electrical equipment



Setting up the Solar Controller – All Configurations

The solar system is supplied with the RESOL CS/4 controller; if required this can be moved to a more convenient location.

There are three buttons for altering the settings on the controller, as shown in the diagram to the left.

In running mode the backward and forward buttons can be used to scroll between the collector temperature COL, the cylinder temperature TST, cylinder top temperature TSTT, pump speed n%, the running hours h P, and Time. It is advisable to check the calibration of the temperature sensors by placing them in hot water, which should also be measured with an accurate digital thermometer.

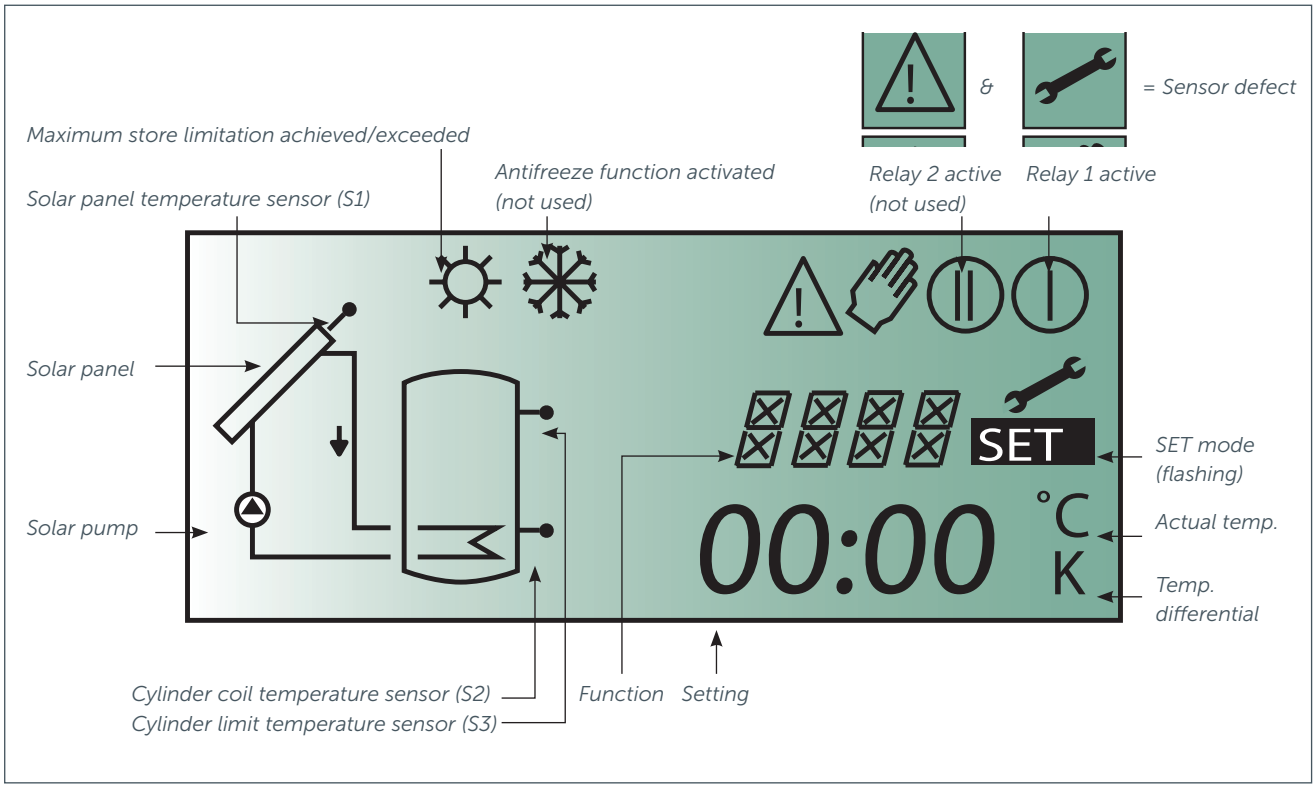
Sensor positions and connections should be double-checked to ensure correct operation.

To access the setup functions press and hold the Forward button. The table opposite lists all of the functions available. See the notes opposite should any functions need the settings to be altered.

First Start-up

On first start-up the controller will display an initial commissioning setup, the following display options will be shown and can be changed. On each option if the setting needs changing press OK and + or – to change and OK to confirm the change.

- SPR: DE > EN (once changed, the following will be in English)
- Unit: °C
- Time: xx:xx
- ARR: 1
- SM: 60 > 70
- PUM: PSOL
- nMN: 30%
- nMX: 100%
- nMN: 30%



Setting up the Solar Controller

Channel	Description	Factory setting
Arr	System	1
DT O	Switch-on temperature difference	6.0 K [12.0°Ra]
DT F	Switch-off temperature difference	4.0 K [8.0°Ra]
DT S	Nominal temperature difference	10.0 K [20.0°Ra]
RIS	Rise control R1	2 K [4°Ra]
nMN	Minimum pump speed	30 %
S MX	Maximum store temperature	70 °C
OSEM	Option store emergency shutdown	ON
EM	Emergency temperature collector	140 °C
	Emergency temperature collector if ODB is activated:	95°C
OCC	Option collector cooling	OFF
CMX	Maximum collector temperature	110 °C
OSYC	Option system cooling	OFF
DTCO	Cooling switch-on temperature difference	20.0 K [40.0°Ra]
DTCF	Cooling switch-off temperature difference	15.0 K [30.0°Ra]
OSTC	Option store cooling	OFF
OHOL	Option holiday cooling	OFF
THOL	Holiday cooling temperature	40 °C
OCN	Option minimum limitation	OFF
CMN	Minimum collector temperature	10 °C
OCF	Option antifreeze	OFF
CFR	Antifreeze temperature	4.0 °C
O TC	Option tube collector	OFF
TCST	OTC starting time	07:00
TCEN	OTC ending time	19:00
TCRU	OTC runtime	30 s
TCIN	OTC standstill interval	30 minutes
GFD	Grundfos Direct Sensor™	OFF
OHQM	Option heat quantity measurement	OFF
SEN	VFD allocation	2
FMAX	Maximum flow rate	6.0 l/min
MEDT	Antifreeze type	1
MED%	Antifreeze concentration (only if MEDT = propylene or ethylene)	45 %
ODB	Drainback option	OFF
tDTO	ODB switch-on condition – time period	60 seconds
tFLL	ODB filling time	5.0 minutes
tSTB	ODB stabilisation time	2.0 minutes
OBST	Option booster function	OFF
MAN1	Manual operation R1	Auto
MAN2	Manual operation R2	Auto
ADA1	HE pump control	OFF
LANG	Language	De
UNIT	Temperature unit	°C

Setting Up the Solar Controller

S MX – Maximum store temperature: The default maximum store temperature is 60°C. This may be increased to 70°C in order to get more solar gain from the system.

MAN1 – Relay 1 operating mode: Relay 1 controls the solar pump, and the operating mode would usually be 'Auto'. If the pump is needed to run for maintenance purposes then it can be switched to 'ON'.

OSEM – Option store emergency shutdown: When switched on this allows the sensor S3 to be labelled correctly as TSTT, and should the collector reach 140˚C the pump will shut off. **Sensor S3 is not required for operational use and should not be fitted to GSHP cylinders.**

Notes:

1. ***All current Nu-Heat systems are configured as Arrangement 1 (Arr.1)**

- To alter any of the function settings hold the Forward button to enter function mode.
- Scroll through the functions using the Forward and Backward buttons.
- Once the desired function is located press the Set button then use the Forward and Backward buttons to select the different options, then Set to confirm the selection.

2. **If Set isn't pressed then the previous selection will remain. The programmer will revert back to running mode if left for a few minutes.**
3. **Highlighted areas are not shown when option is OFF.**

Cylinder Thermostat and Timeclock

For information on setting up the cylinder thermostat and timeclock please see the cylinder or underfloor heating user guide.

Timing the Cylinder for Maximum Solar Gain

The cylinder timeclock should be set in accordance with water usage. If domestic water is not going to be drawn during the day and it is judged that the solar is able to heat the cylinder then the boiler can be timed to be off in order to get the most out of the solar gain. Obviously this will entail different setting for summer and winter.

If the domestic water capability of the cylinder is sufficient for the early evening then keeping the boiler timed off will allow further solar gain, with the boiler then being timed to heat up any deficit for the mornings water usage.

NOTE: **MIS3001 requires a durable label to be affixed at all time-control points (for solar and backup sources) to communicate the importance to the solar system performance of the backup timing.**

For more information please see the *Solar User Guide*.

Protection from Bacterial Growth, e.g. Legionella

It is the installer's responsibility to ensure that there is adequate provision in place to prevent bacterial growth, such as legionella. Please refer to the cylinder manual for further information, as this varies depending on system type in line with HSE, ACOP, L8 and MIS3001.

Appendix 1
Certificate of Conformity

Certificate No: MCS BBA 0128

Technology: MCS004 Solar Collectors

Products: Thermal Solar Collectors

FK7200 N4A Al FL; FK7200 N2A Al FL;FK8200 N2A Cu-Al
FK8230 N2A Cu-Al; K8250 N2A Cu-Al
FK8203 N4A Al-hs FL; FK8203 N2A Al-hs FL
FK8203 N4A Al-hs BF; FK8203 N2A Al-hs BF
FK8250 L4M; FK8250 N4M
FK8253 N4A Al-hs FL; FK8253 N2A Al-hs FL
FK8259N 2H ID; FK9250N
IDMK 1,25 AL f; IDMK 2,5 AL f; VRK10; VRK14

GREENoneTEC Solarindustrie GmbH
Industriepark St. Veit, Energieplatz 1
A-9300
St. Veit/Glan
AUSTRIA

The BBA (British Board of Agrément) has issued this Microgeneration Certification Scheme (MCS) Certificate to the company and products named above, in recognition of the products' compliance with the MCS Scheme Requirements for the technology named above.

On behalf of the British Board of Agrément

Claire Curtis-Thomas

Date of Third issue: 23 July 2018

Claire Curtis-Thomas
Chief Executive

The BBA is a UKAS accredited certification body — Number 113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

Readers are advised to check the validity and latest issue number of this MCS Certificate by either referring to the BBA website or contacting the BBA direct.

British Board of Agrément
Bucknalls Lane
Watford
Herts WD25 9BA
tel: 01923 665300
clientservices@bbacerts.co.uk
www.bbacerts.co.uk

Appendix 2
Glycol COSHH sheet (MSDS)

Solar thermal fluid
Manufacturer's safety data sheet (MSDS)

SOLARIS PGC SAFETY DATA SHEET

1. Product & company identification			
Product name	Solaris PGC (aka PG Antifreeze)		
Manufacturer/supplier	Hydra Technologies Ltd. (aka Hydratech) for Nu-Heat UK Ltd.		
Address	Unit 5, Europa Way, Swansea West Industrial Park, Fforestfach, Swansea, SA5 4AJ		
Telephone no.	01792 586800	Fax no.	01792 561606
Email	sales@coolflow.co.uk		

2. Composition/information on product components Hazerdous components for EC			
Components name	CAS no.	Concentration	R phases
Propane-1,2-diol	57-55-6	10-100%	Not classified

3. Hazard identification	
Main hazards	Not classified as a hazard or environmental hazard under current legislation

4. First aid measures	
Health effects - eyes	Wash eyes promptly and rinse for 15 minutes. Get medical attention.
Health effects - skin	Remove affected person from source of contamination. Wash skin with soap/mild detergent.
Health effects - ingestion	Get medical attention. Rinse mouth thoroughly. DO NOT induce vomiting.
First aid - inhalation	Remove person to fresh air at once. Perform artificial respiration if breathing has stopped. Keep the affected person warm and at rest. Get medical attention.

5. Fire fighting measures	
Extinguishing media	Alcohol resistant foam. Carbon Dioxide (CO_2). Dry chemicals, sand and dolomite, etc.
Special hazards	Acrid smoke/fumes. Carbonyl compounds. Acetic acid.
Protective equipment	Wear self contained breathing apparatus.

6. Accidental release measures	
Personal precautions	No special precautions necessary.
Environmental	Prevent the material from entering drains or water courses without pre-treatment.
Spillages	Clean with adsorbent material and dispose.

7. Handling & storage	
Handling	No special measures necessary.
Fire & explosion	Take precautionary measures against static discharge.
Storage	Containers should be tightly sealed and dry. Can be made from stainless steel. Do not use zinc.

8. Exposure control/personal protection	
Engineering control	Engineering methods to prevent or control exposure are preferred. Methods include process or personnel enclosure, mechanical ventilation (dilution and local exhaust), and control of process conditions.
Respiratory protection	Respiratory protection if there is a risk of exposure to high vapour concentrations.
Hand protection	PVC gloves
Eye protection	Chemical goggles or face shield
Body protection	Wear overall or apron

9. Physical & chemical properties	
Physical state	Liquid
Colour	According to specification
Odour	Almost odourless
pH at 500g/l, 20˚C	Range between 7.5 – 9.5
Density (g/cm^3)	1.03 – 1.06

10. Stability & reactivity	
Stability	Stable under normal conditions
Conditions to avoid	Naked flames and sparks
Materials to avoid	Powerful oxidising agents
Hazerdous decomposition products	None provided product is correctly processed

10. Stability & reactivity	
Stability	Stable under normal conditions
Conditions to avoid	Naked flames and sparks
Materials to avoid	Powerful oxidising agents
Hazerdous decomposition products	None provided product is correctly processed

11. Toxicology information	
Acute toxicity	LD 50/oral/rat:>20000 mg/kg
Irritancy – eyes	This material is irritating to mucous membrane/eyes
Irritancy – skin	This material is non-irritant (Draize test) to the skin

12. Ecological information	
Mobility	The product will dissolve rapidly in water
Ecotoxicity	The product is rated as: Algae EC50 (72h):>100mg/l Fish: LC50 (96h):.100mg/l, Oncorhynchus mykiss Bacteria: >1000 mg/l Daphnids (acute) EC50 (48h):>100mg/l

13. Disposal	
Product disposal	Dump according to local regulations use EWC-no:070104
Container disposal	Containers should be cleaned by appropriate methods and then re-used or disposed in same manner as contents.

14. Transportation – not classified as hazerdous under transport regulations	
IATA	Not Regulated
IMO	Not Regulated
ADR/RID – class	Not Regulated

15. Regulatory information	
Labelling information	According to EEC directives - not subject to labelling
R phases	n/a
S phases	n/a
EC annex 1 classification	n/a

16. Other information	
MSDS first issued	01 May 2001
MSDS data revised	29 Mar 2010

Footnote

The above information is believed to be accurate. The sole purpose of the datasheet is to provide guidance on the safehandling and use of the respective product. It does not form part of any product specification or contract. It is not practical for the information to cover every conceivable application of the product. It is the responsibility of the user to evaluate the information for their own particular purpose. In no event shall the company beheld liable for any injury, loss or damage resulting from its use.

Appendix 3

Solar system maintenance requirements

The following checks should be carried out at the specified time intervals. A record should be kept that all checked items were found to be satisfactory. If possible, the installer should be engaged for maintenance work.

Note: **Collector checks will more than likely require access to the roof. This should not be attempted without completing a suitable risk assessment.**

Annually:

Collector

- Collector glazing is undamaged.
- Collector glazing is reasonably clean.
- There is no visible evidence of leakage on the roof
- Where visible, absorber coating is sound.
- The roof fixings are firm and the roof covering satisfactory by visual inspection.

Solar circuit

- The solar system pressure is correct according to the pressure gauge (see 'Setting the system pressure' in this manual for details)
- There is no visible evidence of leakage
- Safety valve manually checked
- Antifreeze concentration checked. Should protect to -19°C.
- De-aerator checked for air build-up
- Electrical controls and temperature sensors are operating correctly
- Flow rate remains at level stated on commissioning certificate
- The circulating pump is operating without due noise.
- Pipework insulation is firmly in place.
- There are no condensation or damp spots, particularly around the pipework and fixings in the roof space.
- All safety and information labels are in place.
- Solar blending valve is operational; strip and clean as required.

Every 5 Years:

- The system should be emptied, flushed and refilled with fresh antifreeze.

Appendix 4

Solar decommissioning schedule

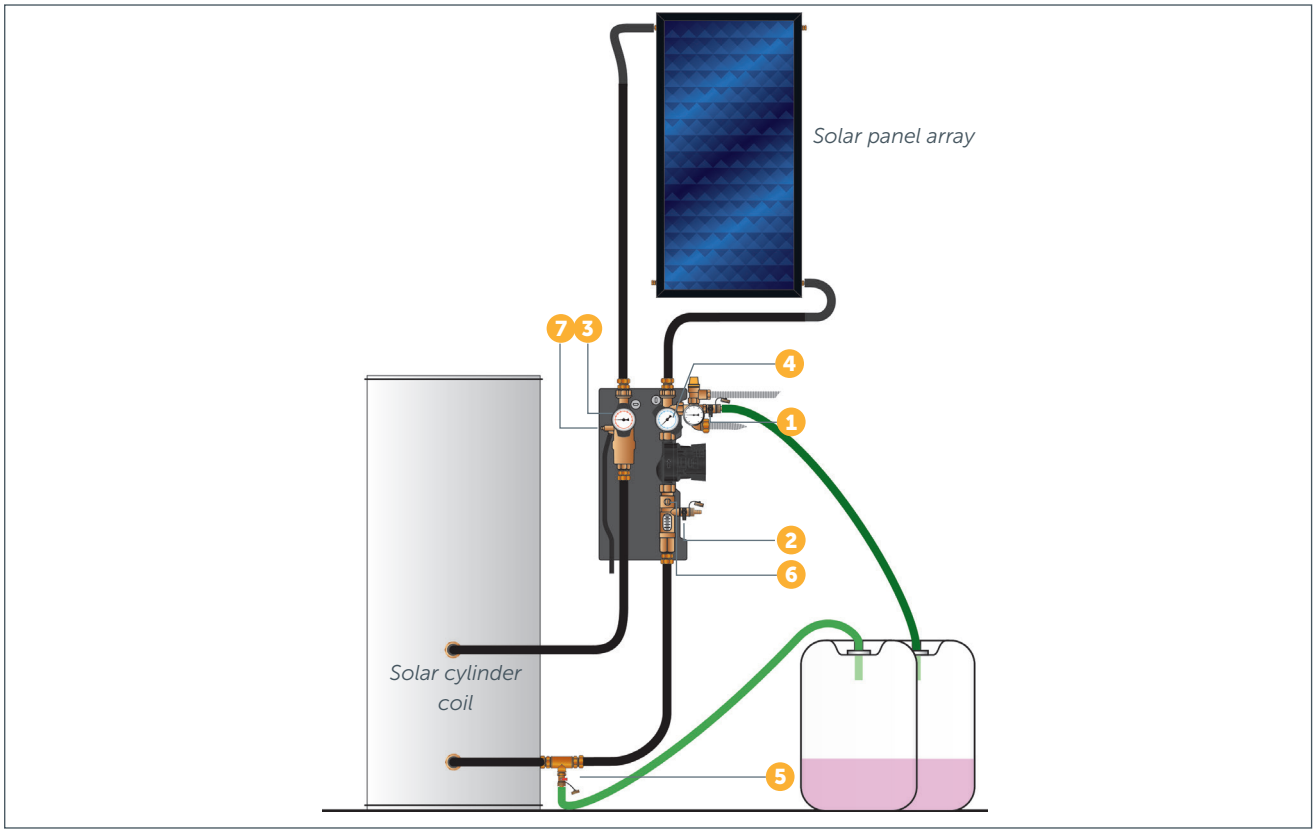
Should it be necessary to decommission for maintenance or in the case of a fault the system the panel will need to be covered to prevent further solar irradiation, the power supply switched off. The expansion volume of the system should be sufficient for the system to be left with fluid in it.

An engineer should be called as soon as possible to enable the system to be brought back into normal operation.

The panel covering must be robust enough to stay in place until it is possible to re-commission the system.

Should it be necessary for any reason to drain the solar circuit this is done as follows:

1. Connect hoses to the filling valve (1), and drain valve (2)
2. Put the outlet of both hoses to suitable collection vessels*, as per the following diagram.



3. Set the flow ball valve (4) and the return ball valve (3) to 45° in order to open the check valves.
4. Open the drain valve (5) and then the filling valve (1)
5. Allow the solar fluid to drain to suitable collection vessels*. Be aware that there may be fluid left in the solar coil in the cylinder if the connections are at the same height.
6. Close the filling valve (1) and drain valve (5).
7. The panel covering must be robust enough to stay in place until it is possible to re-commission the system.

* It may be possible to reuse the solar fluid, however even if this is not the case it is unlikely that the local Water Authority would permit the disposal of solar fluid into the mains drainage system. See COSHH data sheet.

Appendix 5

Specification

Model – EnergyPro Solar FK8203		
Dimensions & Weights	Orientation	Portrait
	Height/Width/Depth (mm)	1730 x 1170 x 85
	Overall collector area (m^2)	2.02
	Aperture area (m^2)	1.84
	Absorber area (m^2)	1.84
	Weight empty (kg)	31
	Capacity solar fluid (l)	1.56
Performance	Solar glass transmission (%)	90
	Solar radiation absorption (%)	95
	Solar radiation emission (%)	5
	Zero loss collector efficiency ($\eta 0$)	0.814 (i.e. 81.4%)
	Efficiency coefficient a1 (W/m^2K)	4.061
	Efficiency coefficient a2 (W/m^2K)	0.013
	Max operating pressure (bar)	10
	Stagnation temperature ($^{\circ}C$)	200
	Certification	EN12975, Solar Keymark
	MCS Certification No.	BBA 0128
Materials & Construction	Absorber plate	Aluminium with selective coating
	Absorber tube	Copper
	Absorber tube joints	Laser welded
	Frame	Aluminium frame
	Frame/glazing	Anodised aluminium (black)
	Glazing	Toughened safety glass
	Insulation	40mm mineral wool
	Solar fluid	Water/propylene glycol
	Flow/return connections	3/4" (22mm) compression joint

Nu-Heat
UNDERFLOOR & RENEWABLES

Online www.nu-heat.co.uk
Follow us @nuheatuk
See our videos /nuheatuk
Freephone 0800 731 1976 or 01404 540650

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