EarthSaveProducts
Renewable Energy Solutions

Earth Save Products

SOLIS

Air Source Heat Pump Installation and User Manual

APPROVED PRODUCT
MCS
kiwa

Dated 17/09/19 V1.2

ESP-HC-DHW 11DC
ESP-HC-DHW 17DC

Dated 17/09/19 V1.2

ESP-HC-DHW 11DC
ESP-HC-DHW 17DC

WARNING

READ THIS BEFORE INSTALLING THE UNIT.

The installation of all un-vented water heating systems above 15 litres MUST comply with local area Building Regulations. It is a legal requirement that the local Building Control Officer be notified of any proposed installation.

UK regulations require an appropriately sized expansion vessel (internal or external) to be incorporated, safety devices to prevent the stored water exceeding 100°C, and pipe work to convey discharged hot water safely away from the safety devices.

Furthermore, the installation must be carried out by an engineer who has successfully completed a recognised course in the installation of un-vented heating systems such as CITB. Failure to fit the unit correctly and in accordance with regulations may affect its safety, efficiency and WILL invalidate any guarantee.

THE UNIT MUST BE INSTALLED, COMMISSIONED AND MAINTAINED BY A COMPETENT INSTALLER IN ACCORDANCE WITH BUILDING REGULATION G3 (ENGLAND AND WALES), TECHNICAL STANDARD P3 (SCOTLAND) OR BUILDING REGULATION P5 (NORTHERN IRELAND) AND THE WATER FITTING REGULATIONS (ENGLAND AND WALES) OR WATER BYELAWS (SCOTLAND). FOLLOWING INSTALLATION AND COMMISSIONING, THE OPERATION OF THE UNIT SHOULD BE EXPLAINED TO THE USER AND THESE INSTRUCTIONS LEFT WITH THEM FOR FUTURE REFERENCE.

Models: SOLIS 11 / 17
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Installation and Maintenance

Solis Air Source Heat Pumps *must* be installed and maintained in accordance with both current regulations and these instructions and by qualified and experienced technicians. Failure to do so WILL invalidate the warranty. Although the Solis units can be modified to provide cooling, the MCS accreditation applies to the Solis in Heating mode only

This manual includes important information about the installation and maintenance of the ESP Solis Air Source Heat Pump (ASHP) units. Please read this manual carefully before installing or carrying out maintenance works on the unit. Please note that, failure to observe the provisions in this manual will invalidate any warranty on the unit and may lead to loss and/or damage to people and/or property for which ESP will not be liable. All ESP ASHPs are covered by the warranty contained in the ESP *Terms and conditions of Business* a copy of which will have been provided to you prior to your purchase.

Safety Advice

It is important to take the following precautions when planning your installation, installing and operating Solis ASHPs: *Failure to observe these points could lead to loss or damage to property and/or injury/death of installers/operators and will invalidate the warranty*.

Switch the unit off at the rotary isolation switch before cleaning or maintaining the unit.

All installation and maintenance works must be carried out by a properly qualified technician.

None of the safety or control devices should be modified without the express permission of Earth Save Products Limited.

Do not pull, detach, twist or otherwise damage the electrical cables coming from the unit

Do not introduce any objects through the grill and into the fan or any other part of the unit.

Important Notice for Antifreeze Protection

1. There must be enough Earth Save Products glycol in the system to avoid damage during cold weather. Sufficient Glycol must be used to protect the system to -20°C.
2. The power supply must always be connected even when you don't use the heat pump. Our heat pumps have an automatic antifreeze function that will only operate if power is maintained to the unit.
3. If the unit is to be left for long periods without use, the unit should be *completely* drained of fluid.
4. ESP Glycol is food grade and non-toxic.

1 GENERAL

The unit is an air source heat pump for space heating and domestic hot water heater for both domestic and commercial applications. Solis heat pumps use ambient (outdoor) air as a heat source to generate heat for your property.

2 SYSTEM DESCRIPTION

The unit is a monobloc (single unit) air to water heat pump, specially designed for the colder climate and for ease of a 'no fuss' installation.

The unit can provide both space heating and domestic hot water heating (via an external tank – controlled by the Solis control system). Although the unit is also capable of cooling in the summer, the parameter that allows this must be unlocked prior to delivery. The heat pump is controlled via an intelligent wired control panel.

The units have a rated output of 11KW (ESP-HC-DHW 11DC) or 17kW (ESP-HC-DHW 17DC) depending on the model. The material and components have been chosen and designed to provide a long service life and to withstand harsh outdoor conditions.

Each unit has different installation options:

1) Space heating only.

2) Space heating + DHW (Domestic hot water)

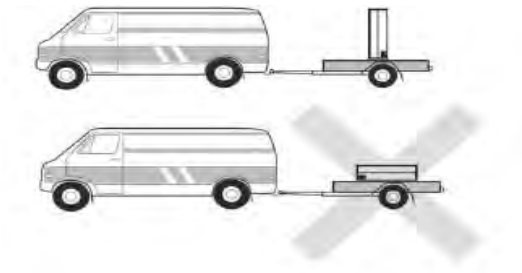
Additionally, both units can be modified by Earth Save Products Limited before delivery to provide a cooling circuit.

3 INSTALLATION

3.1 General points for installation engineer

3.1-1 Transport and storage

The unit should be transported and stored vertically. *Care must be exercised so that the heat pump is not scratched during transport and installation. And damage to the unit during transport must be reported to Earth Save Products Limited immediately upon delivery. Any claim for damage after the delivery documents have been signed will not be entertained.*



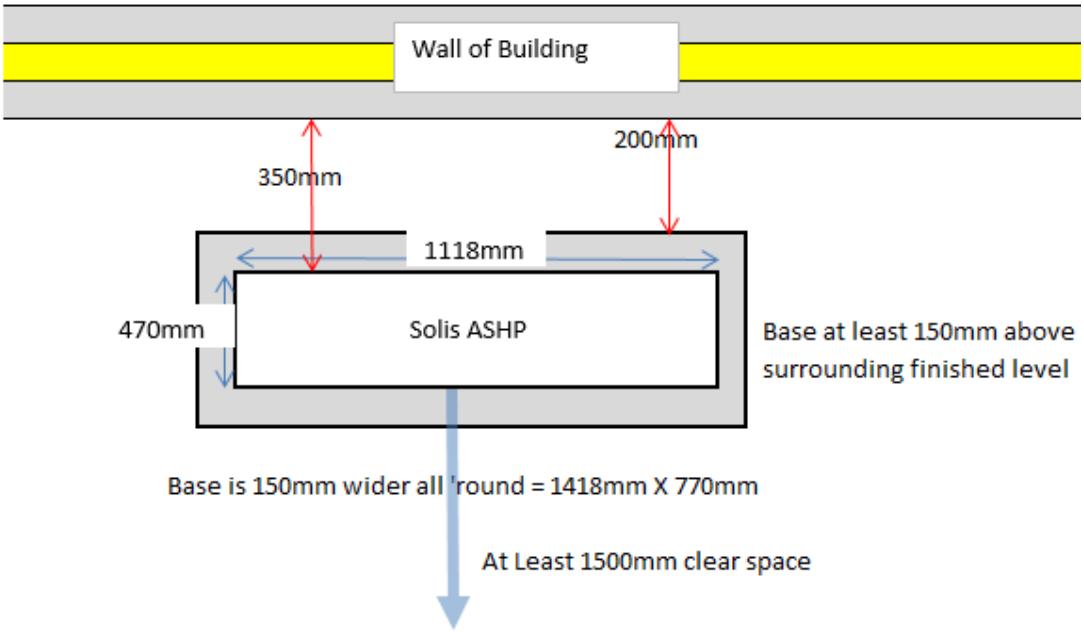
3.1-2 Commissioning the installation

The ASHP installation should be inspected before it is commissioned by a suitably qualified person and must be recorded on the commissioning document then signed by both the installer and the owner. Further, the installation of an ASHP is a notifiable occurrence under current building regulations. If the heat pump is replaced, the installation must be re-commissioned.

3.1-3 Sitting the heat pump

The unit is placed (securely fixed through rubber ant-vibration feet) outdoors on a firm base, preferably a concrete foundation. It should not be positioned in a position where the low running noise is going to cause a nuisance, for example, next to a bedroom.

The base on which the unit is secured must be both large and strong enough to take the weight of the unit comfortably and must not subside (see below). The base should also be at least 150mm above the surrounding ground level and should be checked periodically to ensure that there is no subsidence of the base or the immediate surrounds. In areas prone to flooding, care should be taken to ensure that the unit is elevated to avoid flood damage. The base should be positioned to ensure that the operation of the unit does not inconvenience any neighbours; this can be achieved by carrying out the calculations required by MCS 020.



The installation site must be well ventilated but not windy.

Large amounts of condensate as well as water from defrosting can be produced. There must be sufficient drainage at the installation site to ensure the water cannot run onto paths or the like to avoid ice forming during winter – a drain or a suitable soakaway must be provided. The distance between the unit and the exterior wall must be at least 350 mm (see above). The free space above the must be at least one meter to avoid recirculation of cold (exhaust) air. Where multiple units are sited together, there must be sufficient space left between them for access but certainly no less than 400mm.

3.1-4 Controller

The unit is equipped with an electronic controller that handles all functions necessary to manage

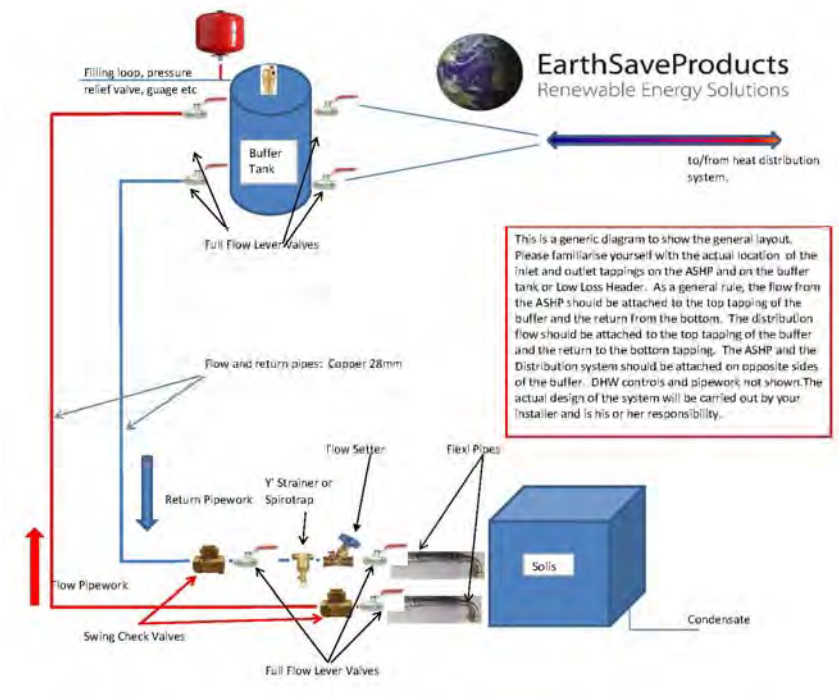
heat pump operations. Parameters such as defrost trigger points, pressure and temperature maximum and minimum, pressure switch behaviour, electrical protection and connection of the compressor can all be changed. However, changing parameters can be dangerous in the extreme or simply reduce system efficiency and PARAMETERS SHOULD NOT BE CHANGED WITHOUT CONSULTING EARTH SAVE PRODUCTS LIMITED. The one exception is the temperature set point maximum and minimum settings.

The controller can also be used to interrogate the number of starts and the operating time.
The controller is normally set during installation and, under normal operating conditions, the home owner does not need change any setting whatsoever because the installer will set the unit to run at maximum efficiency.

3.2 Installation design

ESP Solis units can be installed in several different ways to provide Space Heating (SH), Domestic Hot Water (DHW – via an external storage vessel) or both. If requested, they can be modified to provide cooling.

Safety equipment must be installed in accordance with current regulations for all installation options. The final design of each installation is the responsibility of the installer. The following shows a generic design:



3.3 Pipe Connection

An expansion vessel must be installed if the heating system is unvented. The size of the vessel(s) must be determined by the installer on site and take into account the entire volume of water/glycol mix being heated including the volumes contained in the Solis unit (s), the buffer tank, the distribution system, emitters and any other system connected to the unit. For this

reason, they are not included as part of the optional ASHP or buffer fittings pack. Expansion vessels can, however, be provided by ESP as an additional optional extra.

If, as advised, you are using a buffer tank in the system, you will need to fit a suitably sized water pump on the water distribution side of the system. This water pump will need to be wired to receive an appropriate signal from the heating system. Because the pump must be sized according to the requirements of the distribution system, this item is not provided by ESP as part of any installation pack but can be provided as an optional extra. There is a water pump within the Solis unit to provide circulation from the ASHP to the buffer tank or Low Loss Header. This is controlled directly from the ASHP (even in standby mode) and is one of the reasons that the ASHP should have power to it at all times.

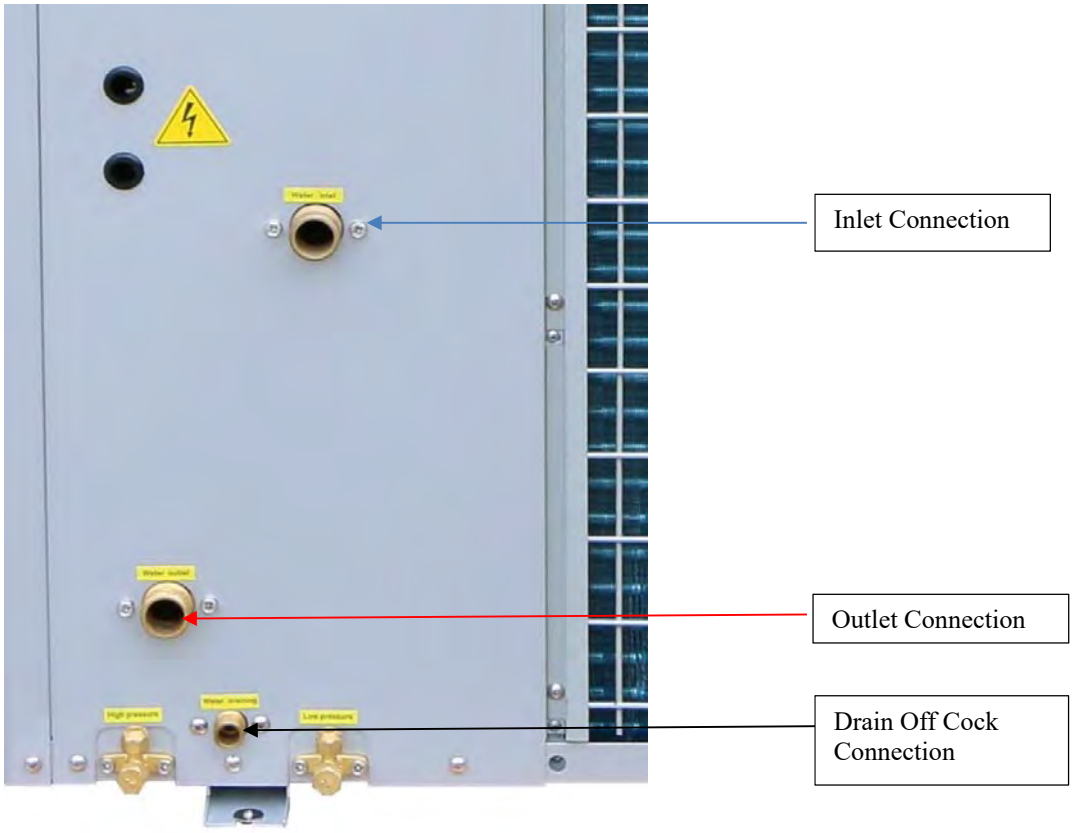
28mm copper pipe must be used between the ASHP and the buffer tank or Low Loss Header. The system must be sized so that the total water volume in the heat pump pipe system and buffer tank must be at least 10 litres per KW of output. It is highly recommended that a suitably sized buffer tank be installed between the unit and the heating distribution system. Please consult your installer or ESP when considering this system design point – the right sized buffer tank can make a significant difference to the economy, life span and efficiency of the unit and the heating effectiveness.

The final connection to the heat pump flow and return must be made with suitable flexible pipes to prevent vibration in to the system pipework. Please ensure that two wrenches are employed to take up the torque created in tightening the fittings to avoid damage to both the fittings and the heat pump. The flexi pipes are each attached to the ASHP via a 90° female/female fitting so that the flexi pipes are angled downwards.

These flexible hoses are available from ESP as part of an optional ASHP Installation Pack or individually.

The pipe work of the whole system must be flushed and pressure tested before the heat pump is connected, to ensure that any contaminants are removed and to avoid damage to the ASHP. Shut-off valves and drain valves must be fitted so that unit can be emptied in the event of prolonged power failures.

The heating inlet and outlet hoses must be to the correct tappings as marked on the rear left side of the unit:



A drain off cock must be connected to the correct tapping on the ASHP as above.

All outdoor pipes must be thermally insulated with external grade waterproof insulation at least a 30 mm thick wall. The insulation must also be vapor resistant. All indoor pipes must be lagged with insulation with a wall thickness of at least 19mm.

Important: Even though the unit has anti-freeze protection, if the circulation pump fails or there is a problem with the power supply, there is still a risk of damage due to freezing. The system *must* be protected from freezing by using a glycol solution in the water circuits.

The glycol/water should be added into the system from the water loop or via the top of the buffer tank. The Glycol must be suitable for the whole system which is why ESP can supply the ideal glycol for the Solis as an optional extra. The following table details the volume of the glycol/water solution mix:

% Glycol	10	20	30	40	50
Ambient Temp	-3	-8	-14	-22	-33
Heating Capacity Fluctuation	.991	.982	.972	.961	.946
Power Input Fluctuation	.996	.992	.986	.976	.966
Water Flow Fluctuation	1.013	1.040	1.074	1.121	1.178
Water Drop Fluctuation	1.070	1.129	1.181	1.263	1.308

Note: if the glycol/water mix is too concentrated, the water flow and water pump will be affected and the efficiency of the unit will be decreased. The above table is for reference only and you should use a glycol/water solution that is suited to local conditions. Using an incompatible Glycol may invalidate your warranty.

You must fit a filter or Y-strainer in-line on the return pipe between the buffer tank (or Low Loss Header) and the ASHP. This is normally fitted in an external location (outside the property) and *must* have a full flow lever valve either side of the strainer to minimise glycol loss during maintenance. Due to the mix of metals in the Solis it is both advisable and preferable to install a Spirotrap ® (or similar) rather than the minimum standard Y strainer. Failure to fit a good quality strainer in the return flow to the unit will invalidate the warranty on the unit. This filter *must* be cleaned as part of the annual maintenance cycle.

ESP Strongly recommend the use of a flow setter in the return pipework from the buffer to the Solis ASHP. This will allow the system flow rate to be optimised for the individual project to increase efficiency.

Automatic bleed valves (air vents) must be fitted at all high points in the system. The Solis will shut down if air is in the system because the water flow switch will recognize air in the system as no water flow and a system alarm/protection code will appear on the unit controller (code EF or P6).

A suitable strainer, flexible hoses, flow setter, lever valves and swing-check valves can be supplied as part of the optional fittings pack.

3.4 Electrical Connection

There are three electrical connections to be made to the Solis ASHP.

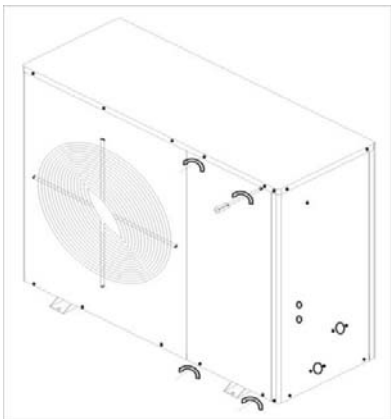
Electrical installation must be carried out by a qualified electrician and in accordance with current regulations.

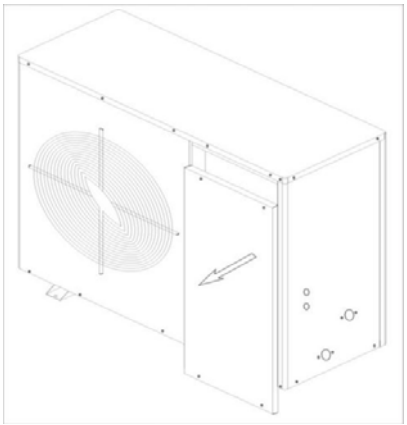
Under no circumstances should power be connected to the unit if the controller is disconnected.

Failure to do so may be hazardous, may lead to prosecution and will invalidate any warranty.

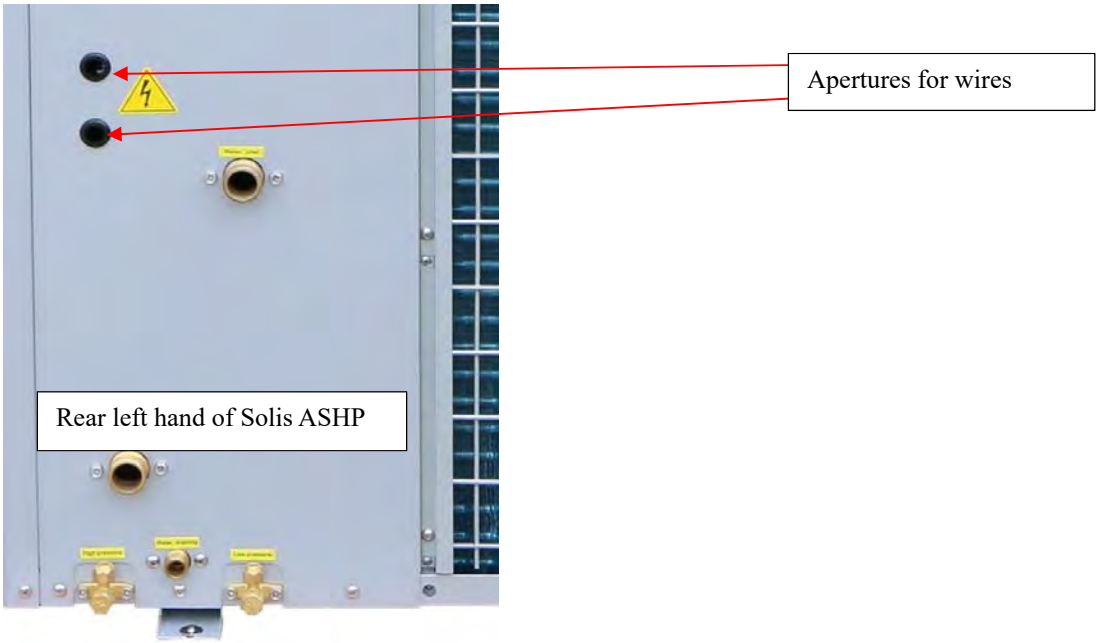
3.4-1 Installation Drawings

Undo the 4 retaining screws and retain for re fitting, remove the access panel to the right side of the unit and place the panel in a safe place where it cannot be damaged and is protected from being scratched.





All three wires should be fed through the two glands at the rear of the unit, taking care not to damage the gromets so that the waterproof seal is not damaged:



The 240V connection, controller and Zero volt 'call' signal from the circulation control system (normally a wiring centre) should be connected as follows:

Solis 17kW:

Solis 11kW:

3.4-2 Electrical Connections for all Solis Units.

Zero Volt 'Call'

The unit is shipped with a link wire in the zero-volt connector block. This should be removed and a 2 core wire should be run from the circulation system controller (normally a wiring centre), through the wiring gland at the rear of the unit and connected to this connection block.

Controller

The controller should be disconnected at the plug shown above, the cable routed from the desired position, though the wiring gland and re-connected to the plug. The cable is 3 core and can be run a maximum of 100m.

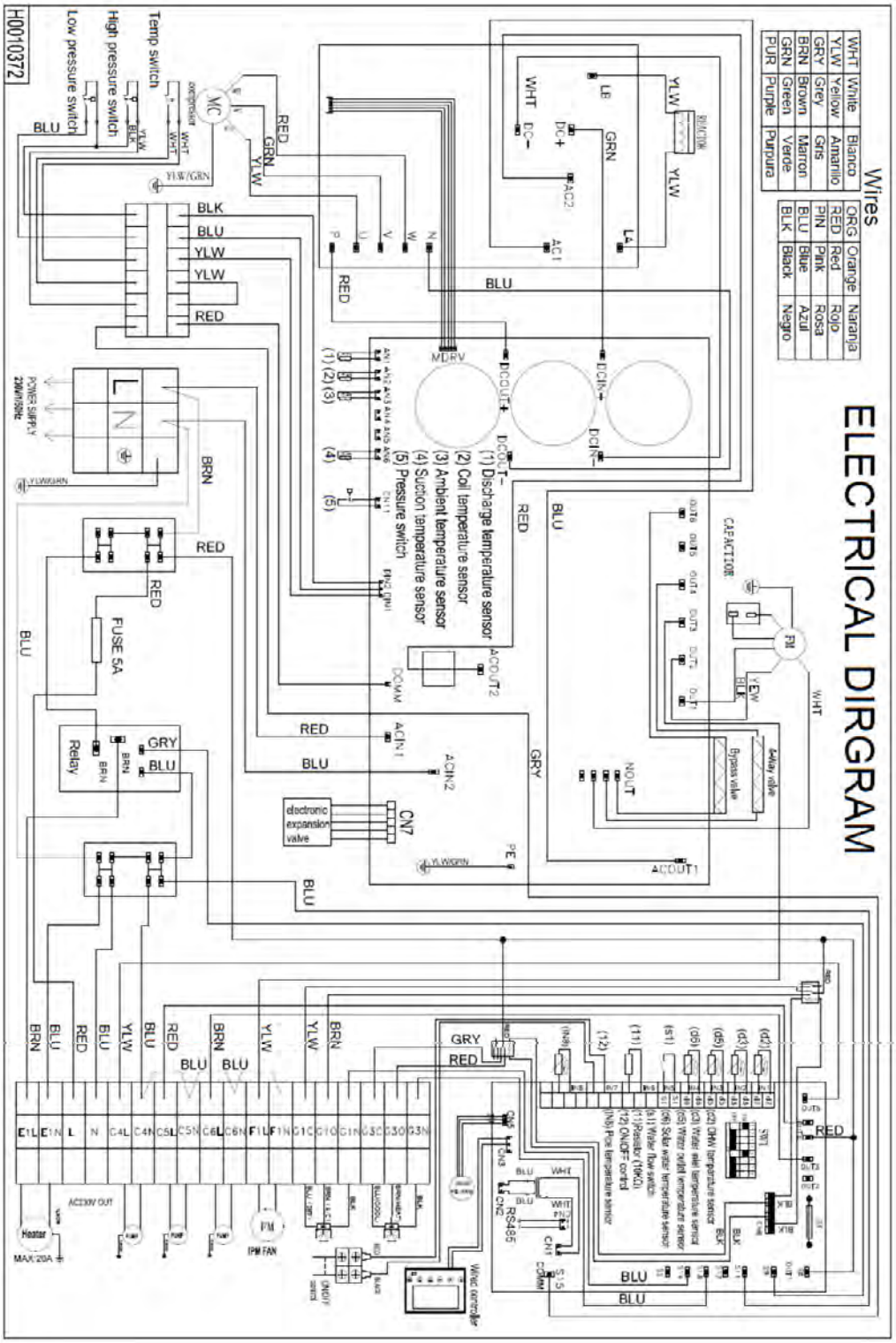
Power should never be applied to the unit if the controller is disconnected

240V Mains Connection

The Solis unit must be connected to its own Type C MCB (32Amp for the 17kW and 20Amp for the 11kW) on the consumer unit via a rotary isolation switch installed in accordance with current regulations. The cable from the rotary isolation switch should be routed through the electrical gland on the rear of the unit and connected to the main voltage connection block shown above.

Typical rotary Isoation Switch

Wiring Diagram SOLIS 11



For options to control a 3-way valve for DHW production. See DHW Appendix.

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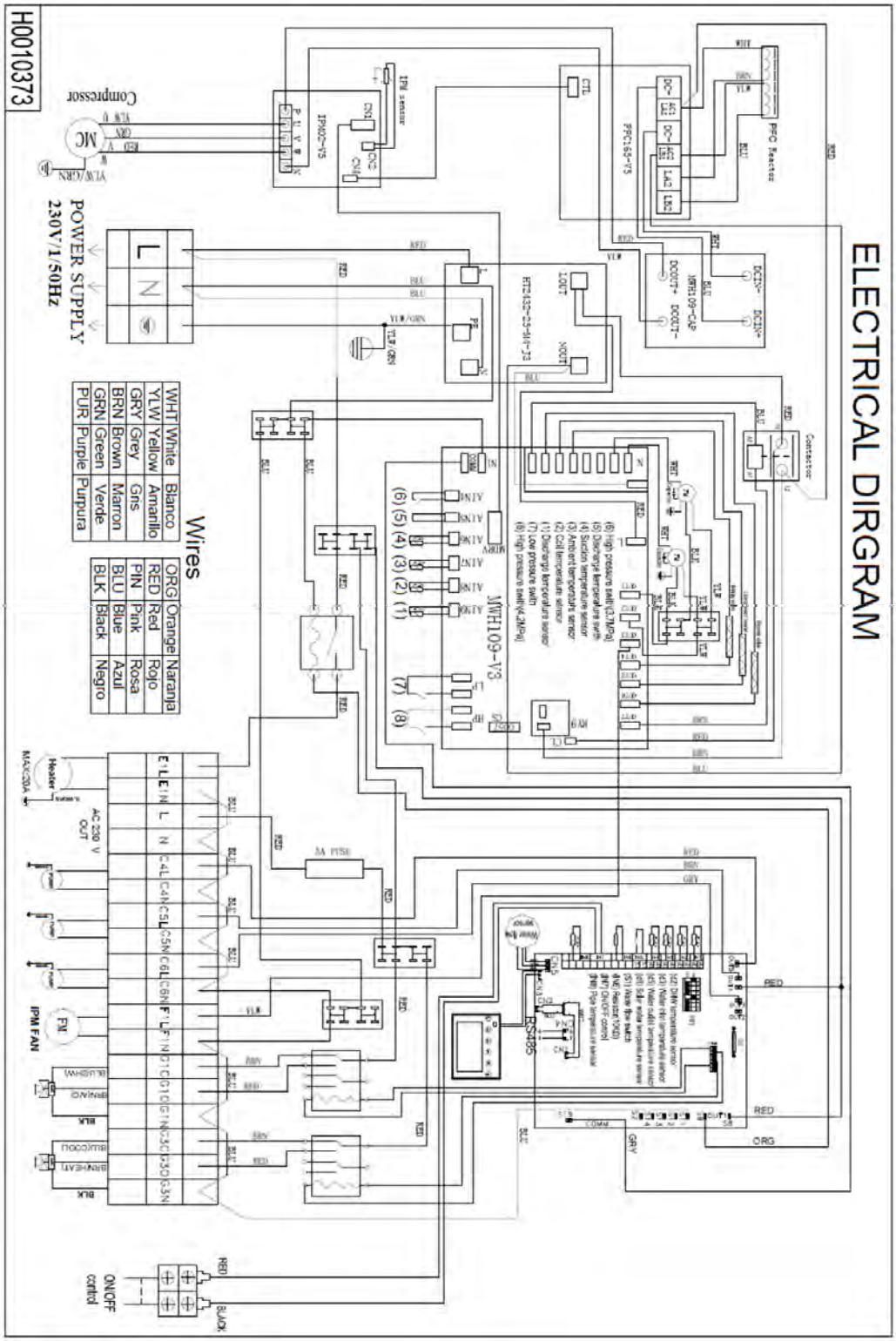
ESP-HC-DHW 11DC
ESP-HC-DHW 17DC

Wiring Diagram SOLIS 17



For options to control a 3-way valve for DHW production. See DHW Appendix.

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3.5 Commissioning

3.5-1 Compressor Delay

To safeguard the Solis 17kW compressor, the compressor heater will run for a defined period of time before the compressor starts for the first time. If the ambient temperature is below 10°C but above 5°C, it will run for 3 mins, if it is between 5°C and 0°C, it will run for 5 mins and if the ambient temperature is below 0°C, it will run for 10 minutes. This delay does not apply to the Solis 11kW model.

Filling and Venting

The entire system should be filled, flushed, refilled and pressure tested before connection to the Solis unit. Only when all debris has been removed, any leaks corrected and the system thoroughly purged of air should the Solis be connected to the rest of the system, the system topped up and any air purged..

Pre Start-up Inspection

Mechanical Inspection:

a. Check the cabinet and internal pipes for signs of damage during transportation.
b. Check that the Fan can rotate freely.

Electric System Inspection:

a. Check the power supply (voltage/frequency) matches the rating label and specification.
b. Check all electrical connections for loose or damaged wires.

Pipe Inspection

a. Check that flow directions on all valves and other directional fittings is correct.
b. Check that all pipes have been properly insulated.

3.5.3 Start up and Commissioning

After the system has been inspected and any faults corrected, the unit can be set-to-work:

Switch on the isolator to turn on the power to the heat pump.
The circulation pumps will start immediately.
After 30 seconds, the fan motor will start.
After another 10 seconds, compressor starts (see above for delay for compressor heater to run).
Air may be released as the water/glycol mix is heated and further bleeding may be necessary. If bubbling sounds can be heard from the heat pump, the circulation pump or emitter system, the entire system will need to be bled again and the system topped up as necessary to achieve the required pressure.
Check the inlet/outlet temperature differential when flow temperature has been achieved and adjust the flow setter as appropriate.
Adjust the parameters according to maximise efficiency and in accordance with the design.
The ambient temperature parameter value (parameter P09) can be set to a value between -20°C and 30°C. The factory setting is 0°C. On commissioning, this should be set to the design ambient temperature for the locale.

4 THE CONTROLLER

4.1 How it works

Start-up / Shut-down Sequence

When there is a ‘call’ for heat from the Solis, the water circulation pump starts followed by the fan (30 seconds later) then, after a further 10 seconds, the compressor. (see above for set-to-work delay).

When the heat pump switches off, the compressor stops first, followed by the fan 5 seconds later then the water circulation pump shuts down 30 seconds after the compressor.

When the compressor shuts down, it has a minimum interval of 3 minutes before it will start again. During a defrost cycle, the compressor stop/start interval is based on the defrost parameters During defrost, the water circulation pump runs continuously.

Compressor Operation

Once started, the minimum run time for the compressor is 15 mins.

4.2 Operating Mode Principle

1) Space Heating Mode

The temperature can be set to a value between 10°C and 55°C, the factory setting is 45°C. This should be set to the design flow temperature calculated by your heating designer.

2) Domestic Hot Water Mode

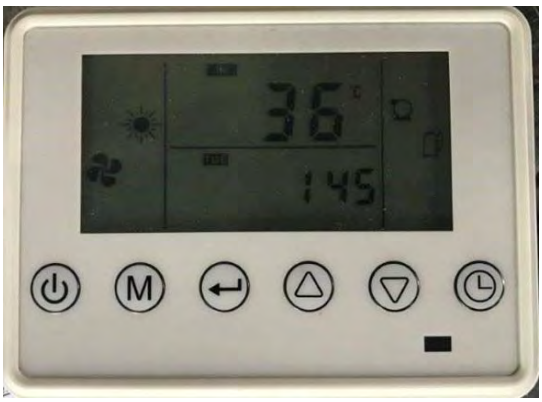
The DHW temperature can be set to any value between 10°C and 50°C. If a storage temperature of greater than 60°C is desired, Earth Save Products Limited can advise on how to control this through the unit using an auxiliary electrical heater controlled by the Solis. The default factory setting is 50°C. Please note that the Solis unit will need to be altered before dispatch to enable DHW production and requires an external storage vessel. A full explanation can be found in the Solis Domestic Hot Water Appendix available from Earth Save Products Ltd.

3) Defrost Cycle

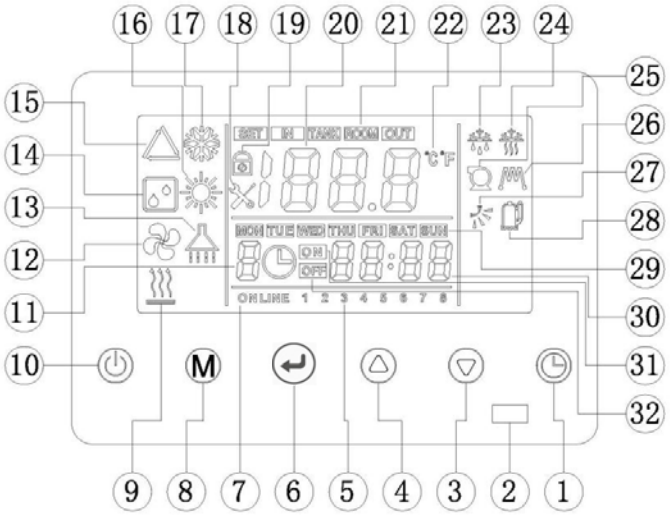
Solis heat pumps are fitted with an intelligent defrost cycle controlled automatically by the microprocessors. A number of parameters are taken into account before defrost begins and ends. The parameters set by the factory should not be changed without consulting your design Engineer or Earth Save Products Limited. The defrost time will vary depending upon the working conditions of the Solis unit. The length of, and interval between, defrosts cycles will vary.

4.3 Wired controller

4.3.1 Controller



6 Keys are used to navigate the controller:



4.3.2 Key to buttons (above)

(1) Clock: Used to change the clock and timer
(3) Down key: used to reduce a parameter value or navigate down the menu
(4) Up key：used to increase a parameter value or navigate up the menu
(6) Confirm key: used to confirm a parameter value or setting
(8) Mode key: Used to change mode
(10) On/Off key: Used to Turn the heat pump on or off

4.3.3 Icon definition

Item	Icon meaning	Item	Icon meaning	Item	Icon meaning
5	Not Used	7	Not Used	9	Not used
11	Timer period	12	GH water pump or fan motor	13	DHW
14	Sterilization	15	Auto mode	16	Room heating
17	Cooling	18	Service icon	19	Lock icon/Off by Remote

20	Temp	21	Indicating temp location	22	Temp unit
23	Defrost icon	24	Anti-freeze	25	Water pump
26	E-heater	27	Not Used	28	Compressor icon
29	Week display	30	Time display	31	Timer on icon
32	Timer off icon				

4.4 Controller Operation

4.4.1 Changing the mode:

In Standby or On mode, press M, then press M again to cycle through the 7 modes:

AC AUTO (15), COOLING (17), HEATING (16), DOMESTIC HOT WATER(13), AC AUTO (15) & HOT WATER (13) TOGETHER, COOLING (17) & DOMESTIC HOT WATER TOGETHER(13), HEATING (16) AND DOMESTIC HOT WATER TOGETHER (13), COOLING AUTO (14).

Notes:

In heating plus DHW mode, DHW will be prioritized to comply with building regulations. See Appendix.

In DHW mode, the unit will not supply heating. See Appendix.

The Pasteurization cycle is automatic independent of any mode selected.

Cooling Mode is only available if the Solis Unit is modified before delivery.

4.4.2 To Modify a parameter:

The only parameter that should be changed is the set point temperature for space heating or DHW production (if enabled). Changing any other parameter can decrease the unit's efficiency and, in extremis, prove dangerous. When contemplating changing parameters, the operator should consult the heating engineer who installed the unit.

Modifying the parameters

When in running mode, the unit will use the factory set default values or the last changes made to parameters.

To change the temperature set point:

In On or Standby modes, press the M and keys together until the control beeps. The current operation mode will flash and by pressing the M key, you select the required parameter by cycling through the modes in the following order: cooling, heating, DHW. When the required mode is flashing, press the , and the value flash. Use the ▲ or ▼ to select the required value then press key to confirm change and press to exit. If the key is not pressed within 15 seconds, the new value will not be saved and the unit will revert back to the previously saved value.

The default settings are in the table below. Please note that the cooling function is not available unless enabled by Earth Save Products prior to delivery. For further details of the DHW function, see the relevant appendix.

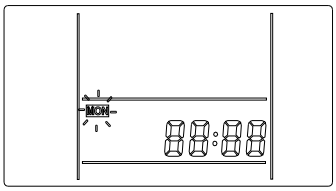
Item	Meaning	Setting range	Default	Change setting date
1	AC cooling	10°C~25°C	12°C	M+ ◷→M→▲or▼→ ✣→ ⏻
2	AC heating	**(AU)**10°C~55°C	45°C	
3	Hot water	**(AU)**10°C~60°C	50°C	
4	Antibacterial	60°C~70°C	65°C	

Antibacterial (Pasteurization) setting. These settings are governed by regulation. Changing them could mean that your installation does not comply with Building and other Regulations.

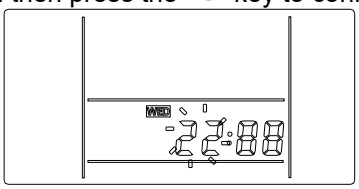
In On or standby mode press the M and ◷ keys together until the control beeps. Press the M again and the triangular icon appears at position 15 (see above). Use the ▲ or ▼ keys to set the sterilization temperature then press the ↵ key to confirm the new setting. The number of days will flash and show the original or default value 7 (that means 7 days). Use the ▲ or ▼ keys to increase or decrease the number of days between Pasteurization cycles; the minimum is 7 days and the parameter can be set to a maximum of 99 days. Once the desired value has been selected, press the ↵ key to confirm. Next, the "ON" character appears, the "hour" appears and flashes, showing the current setting or the default value (default value 01 means that it will start at 1:00 am). Use the ▲ or ▼ keys to modify the parameter (0-23) ,and, press the ↵ key to confirm. The new start time is now set. The "ON" character will disappear and the "OFF" character appears, "minute" value flashes and shows the current or default value (default value is 10 meaning 10 minutes). Use the ▲ or ▼ to change the Pasteurization cycle period (minimum is 10, the maximum is 99 minutes), and press the ↵ key to confirm the change and exit the settings screen. If the ↵ key is not pressed within 15 seconds to confirm the new setting, the unit will exit the change screen and revert to previously stored values.

4.4.3 To Set the Clock:

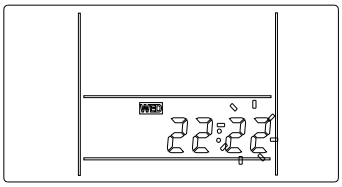
Press the ◷ key until the control beeps and the day icon will flash:



Use the ▲ ▼ keys to set the day and then press the ◷ key to confirm. The hour digit will then flash:



Use the ▲ ▼ to set the hour then ◷ to confirm. The minute digit will then flash:



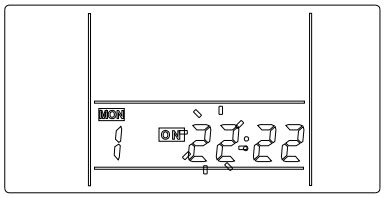
Use the ▲ ▼ keys to set the minutes then press to confirm and exit.

4.4.4 Setting the Timers

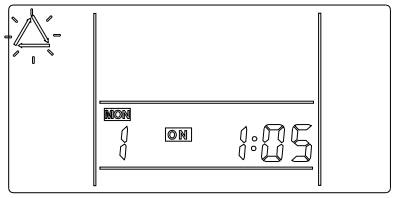
The most economic way to run an ASHP is to let it run 24hrs a day. It is strongly recommended that timers are not used.

If it is decided to set the timers, up to 3 per day can be set (3 on and 3 off to correspond to 3 periods; set points 1,3 and 5 are 'ON' and points 2,4 and 6 are 'OFF'). The timer icon (position 11 above) will only display if at least one timer is set.

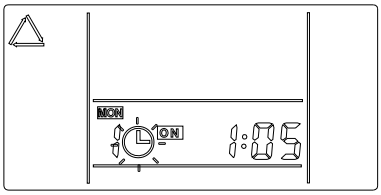
To set the timers: Press the key until the control beeps to enter the setting mode. The day icon MON flashes. Use the ▲ ▼ keys to select the required day and press the key to confirm. Timer number 1 icon will then flash. Use the ▲ ▼ keys to select the required timer (1-6), then press to confirm. The hour icon will flash:



Press the ▲ ▼ keys to set the required start hour for that timer and press to confirm. The, minute icon will then flash. Use the▲ ▼ to set the required start minute for that timer and press the key to confirm. The Δ icon at position 15 above will flash:

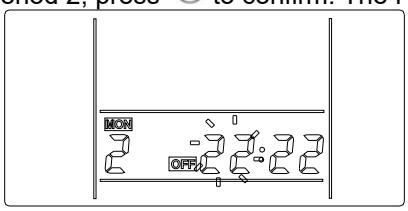


Use the ▲ ▼ keys to select mode (on or off), then press the key to confirm. The 'timer on' icon will then flash:

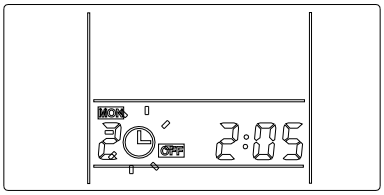


Press the up key and the timer icon will stop flashing if the setting is valid. Press the key to confirm then press the down key. If the timer icon disappears, the setting is not valid.

Repeat the instructions above to set period 2 (the first ‘off’ time) as follows.
Enter timer setting, select week, and period 2, press ↵ to confirm. The Hour icon will flash:



As before, use the ▲ ▼ keys to set the hour and the ↵ key to confirm. The minute value will then flash and the ▲ ▼ keys can be used to set the required value, pressing the ↵ key to confirm. If the setting value is valid, the timer icon will flash.



As before, press the up key, and the timer icon will disappear if the setting is valid. Press the ↵ key to confirm. Press the down key and if the timer icon disappears, the setting is not valid

Repeat the process for timers 3 (ON), 4(OFF), 5(ON) and 6 (OFF) as required, remembering to set ‘pairs’ of off and on.

Press the On button to confirm and exit.

To clear the timers, press the up and ⏲ until the controller beeps.

4.4.5 Night mode

For most installation, Night Mode is not recommended.

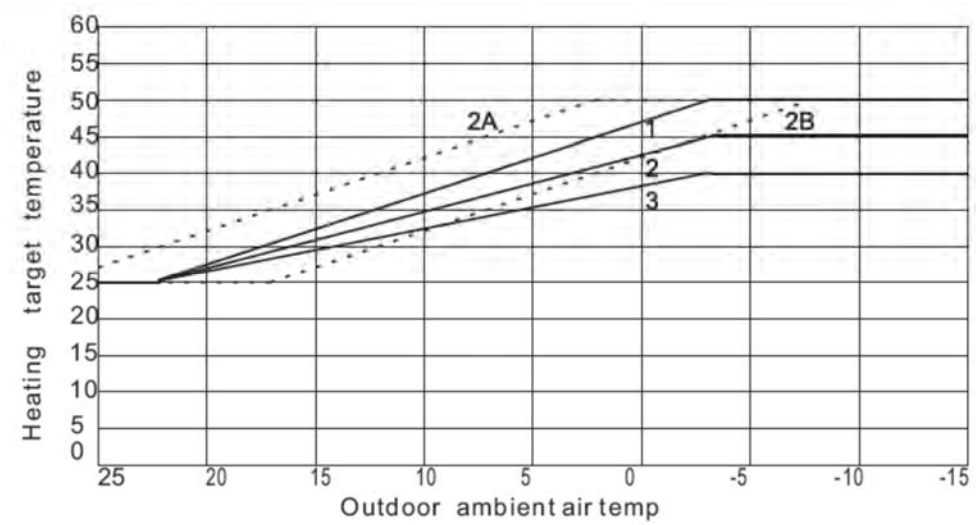
If night mode is set (parameter 47=1. 0=off), the Solis units engage a ‘set back’ period:

Space heating flow temperature will decrease by 2°C.
DHW heating (if applicable) will increase by 3°C.
If Cooling has been enabled, set temperature for cooling will increase by 2°C.
The fan speed will be set to low.

4.4.6 Auto mode

If this mode is selected *and* cooling has been enabled by the factory, the Solis will run in heating mode below an Ambient temperature of 15°C and in cooling mode in temperatures above 25°C. In Auto mode, in Ambient temperatures between 15 and 25°C, it will run in the latest mode selected i.e. cool if it was previously in cooling mode or heat if it was previously in heating mode.

4.4.7 Weather compensation curve



The weather compensation curve is set by parameter 46 with permissible values from 30 to 50. The default value is 45. This means that the Solis will automatically adjust the flow temperature as the ambient temperature drops, to a maximum flow temperature of 45°C. See graphs above.

Likewise, if cooling has been enabled by the factory, the flow temperature will automatically decrease as the temperature increases as defined in parameter 45. Increasing the value moves the curve up, decreasing the value moves the curve down the temperature scale. Permissible values are -15 to15. The default value is 0.

4.5 System Protection and Error Codes

In the unlikely event of a fault, the controller will show an error code consisting of a letter (E,F or P) and a number. The controller will also show a code is encounters circumstances such that it needs to shut down for safety reasons. The most common codes are:

Code	Meaning	LED2	Remark
E1	Compressor overheat or discharge high temp protection	Red flashing	Decided by outdoor unit
E2	Outdoor air temp sensor error	Flashes 3 times	Outdoor air temp sensor open circuit or short circuit
E3	Pipe or return air temp sensor error	Flashes 6 times	(1)temp sensor open circuit or short circuit (2) suck sensor open or short circuit
E4	AC return water temp sensor error	Red flashing	Stops compressor when running AC
E5	AC leaving water temp sensor error	Red flashing	Stops compressor when running AC
E6	DHW temp sensor error	Red flashing	Stops compressor when running AC
E7	Solar water temp sensor error	As normal	Won't stop compressor
E8	fan coil high temp protection	Red flashing	Water source anti freeze protection
E9	System anti freeze twice	Red flashing	Stops compressor
EA	DHW anti freeze twice	Red flashing	Stops compressor
EB	Indoor refrigerant pipe sensor error	No flashing	Temp sensor open circuit or short circuit
EC	Water source inlet water sensor error	No flashing	Temp sensor open circuit or short circuit
ED	Water source leaving temp sensor	No flashing	Temp sensor open circuit or short circuit
EE	Water source anti freeze	No flashing	1.Water source heat exchange not efficient or water

	protection		source temp too low 2.Water source water flow volu not enough
EF	Water source water flow not enough	No flashing	Water source water flow volume not enough
EG	Indoor ambient sensor error	No flashing	Temp sensor open circuit or short circuit
F1	voltage protection	Flashes once	Voltage is too high or too low, heat pump will recover when voltage is normal (165~265VAC)
F2	power module PFC error	Red flashing	IPM module error or wire connection wrong
F3	Compressor abnormal stop	Red flashing	Compressor stops abnormally
F4	Outdoor module radiator sensor error	Flash 5 times	Temp sensor open circuit or short circuit
F5	Outdoor current sensor error	Flash 8 times	Current sensor fault or no test wire cross it
F6	IPM error or Module control board error	Red flashing	Communication or IPM module fault
F7	Compressor fail to start up	Red flashing	Compressor cannot start properly
F8	Outdoor over current	Red flashing	Compressor current is too high
F9	Discharge sensor error	Flash 7 times	Temp sensor open circuit or short circuit
FA	Outdoor module overheat, over current	Flashes 5 times	IPM module temp too high or compressor current to high
FB /E8	Outdoor coil over heat	Flashes 15 times	Outdoor heat exchange not good
P1	High pressure protection	Flashes 2 times	1.Refrigerant volume too high 2. throttling part error, 3. High pressure switch error
P2	Low pressure protection	Flashes 9 times	1.Refrigerant volume too low 2. throttling part error, 3. low pressure switch error
P3	Compressor discharge air over heat protection	Flashes 10 times	1.Refrigerant too low, 2. throttling part error
P4	Over current protection	Flashes 11 times	1.Refrigerant volume too High 2. throttling part error Current sensor error
P5	Indoor unit water flow error	No flash	1.Water flow volume too low 2. Water flow switch err
P6	Outdoor water flow error (For GH)	Flashes 17 times	1.Water source side water flow volume too small 2. Water source side Water flow switch error
P7	Miss phase	Red flashing	Power supply error
P8	Wrong phase	Red flashing	Power supply error
P9	Communication error	Red flashing	Communication wire or PCB error

Note: not all errors are applicable to Solis Units

4.6 System Parameter Table THESE SHOULD NOT BE CHANGED WITHOUT CONSULTING THE INSTALLING ENGINEER

Code	Name	Range	Default	Remark
P00	Auto restart (after power supply, unit come back to the previous working mode before power cut off)	0:off, 1:on	1	
P01	DHW hot water temp difference	2~15°C， minus difference	2°C	
P02	AC temp difference	2~15°C，minus difference	2°C	
P03	Coil copper pipe temp to active defrost	-20~5°C	0°C	
P04	Water source side anti-freeze temp (for Geo heat pump)	-20~5°C	2°C	
P06	Coil copper pipe temp to stop defrost	10~35°C	*30*°C	
P07	Defrost time (defrost action lasting max time, will stop defrost if longer than this value)	15~99 minutes	*15*	
P08	Defrost interval time (time between 2 defrosts, less than this value, it will not defrost)	15~99 minutes	35	
P09	Ambient temp to activate hot water e-heater	-20~20°C	0°C	
P10	Ambient temp to activate AC e-heater	-20~20°C	0°C	
P11	DHW frequency limitation percentage on max frequency. (If heat pump max is 90HZ, P11=9, DHW runs @ 81hz)	2~10(equal to the highest frequency 20~100%)	10	
P12	Compressor discharge air protection temp (higher than the setting, it will protect)	100~127°C	*115*°C	
P13	Defrost interval control (if P08=35minutes, P13=2, interval between defrost will be 35*2=70Minutes)	0:no defrost:1~4, defrost interval time multiple rate	1	

P14	Functional parameter (to control seasonal valve and solar valve, UK may not use it)	0:G3 is seasonal switching valve, 1:G3is solar valve	0	
P15	Set Temperature (target temperature) Cooling	If applicable will be set by Installer		
P16	Set Temperature (target temperature) Heating	Will be set by Installer		
P17	Set Temperature (target temperature) for Hot Water	Will be set by Installer if Enabled		
P18	Set Temperature (target temperature) for Pasteurization	Do not change		
P19	Running with fixed frequency (for factory testing only)	10~100 HZ	50HZ	
P20	Running frequency setting (for factory only)	0:manual frequency, 1:auto running frequency	1	
P21	EEV manually initial open degree (heating) /2	50~240 (Only valid when P23=3)	175	
P22	EEV manually initial open degree (cooling)/2	50~240(Only valid when P23=3)	175	
P23	EEV control mode	0:no, 1:checking, 2:manual, 3:auto for factory only	0	
P24	EEV Temp differential to stop the valve (heating)	-5~10°C for factory only	0°C	
P25	EEV temp differential to stop the valve (cooling)	-5~10°C for factory only	0°C	
P26	Water pump working mode	0(no stop), 1(stop when reach temp), 2(running 1 minute every 15minutes)	1	
P27	Second heat source validation	0(no), 1(yes)	0	
P28	Starting air temp for second heat source	-30~15°C (On when lower than this)	-15°C	
P29	Room target setting temp	10-28°C	21°C	(**H**)
P30	Buffer tank highest temp	35-55°C	45°C	(**G**)
P31	Buffer tank lowest temp	15-30°C	25°C	(**L**)
P32	Water temp adjust range	1-5°C	2°C	(**F**)
P33	Water temp adjust interval	20-255min	120min	(**I**)
P34	Longest counting period	6-48H	24H	(**J**)
P35	Target water temp modification value	-2° C -5°C	2°C	(**E**)
P36	Ambient temp correction factor X100	10-200	75	(**C**)
P37	Starting ambient temp for calculation	-7-15°C	7°C	(**B**)
P38	Temp differential to reduce frequency	4-15°C	7°C	(**T**)
P39	Target of low frequency(when reach the setting of P38, it will reduce to the P39/100 of the highest	15-90	15	(**U**)
P40	Monitoring interval (to adjust frequency)	1-15min	2min	(**V**)
P41	Temp interval (increase or decrease base on this setting. Every P40 minutes when reach P41 C/2, will change frequency)	1-4°C	1°C	(**W**)
P42	Increase frequency adjustmentX100	2-50(%)	15	(**S**)
P43	Decrease frequency adjustment X100	2-50 (%)	15	(**Y**)
P44	Target temp tolerance	1-3°C	2°C	(**Z**)
P45	AC AU curve offset value (our weather compensation curve AU)	-15~15°C	0°C	
P46	AC AU curve max temp value (our AU)	30~50°C	45°C	
P47	Night mode validation (night mode: DHW increase 3C, AC temp reduce 2C)	0(off), 1(on)	0	
P48	Night mode starting point	0-23(time)	22	
P49	Night mode ending point	0-23(time)	6	

Press the M and▲keys together until the control beeps and change the parameters.

THESE SHOULD NOT BE CHANGED WITHOUT CONSULTING THE INSTALLING ENGINEER

Please Note:

Parameters P21 to P25 are different for different models and can only be set during the production (see below). Not all parameters are applicable to Solis units.

Correct Parameter values

The following are default values for certain parameters that should not be changed.

Code	Meaning	Range	**11KW Correct value**	**17KW Correct value**
P21	EEV manual open degree (heating) /2	50~240	**200**	**180**
P22	EEV manual open degree (cooling)/2	50~240	**180**	**150**
P23	EEV control method	0-No; 1-check;2-manual;3-auto	**3**	**3**
P24	EEV Temp differential to stop the valve (heating)	-5~10°C	**1**°C	**2**°C
P25	EEV temp differential to stop the valve (cooling)	-5~10°C	**1**°C	**4**°C
P26	water pump working method	0 (no stop); 1 reach temp stop; 2 stop for 15 mins on 1 min	**0**	**0**

To force an anti-bacterial cycle, press the M key and hold it until the control beeps. The controller will beep and initiate the cycle. Please note that this only works if DHW production has been selected as part of the installation.

To reset all parameters, press and hold the ↵ key on the controller until the unit beeps. The controller will beep and initiate a, parameter reset. The unit will need to be powered off and on again to complete the process. **WARNING BEWARE PUSSHING AND HOLDING THIS KEY BY MISTAKE**

Parameter P14 is used in conjunction with solar thermal panels. When the parameter is set to 1 and the unit is in heating mode, the controller compares the solar water tank temp and Solis flow return temperature. When solar water tank temperature is 5° C above the return flow temperature to the Solis unit, the solar 3-way valve control is activated. When the temperature difference is less than 2° C (Solar input to return flow temperature), the 3-way valve controller is off. When P14=0, the G3 connection for the 3-way valve is inoperative.

4.7 Checking Parameters

Press the M +▼ keys and hold until the control beeps to check any of the following parameters:

Whilst Checking Parameters, particular care should be taken to ensure that they are not changed.

No	Name	Range / meaning	Remark
00	Out pipe temp	-30~97° C	
01	Compressor discharge temp	-30~128° C	
02	Ambient temp	-30~97° C	**Calculation parameter D**
03	AC leaving water temp	-30~97° C	
04	Hot water pipe temp	-30~97° C	
05	Solar pipe temp	-30~97° C	
06	DIP switch input state	0(cooling only), 1(heating only)	

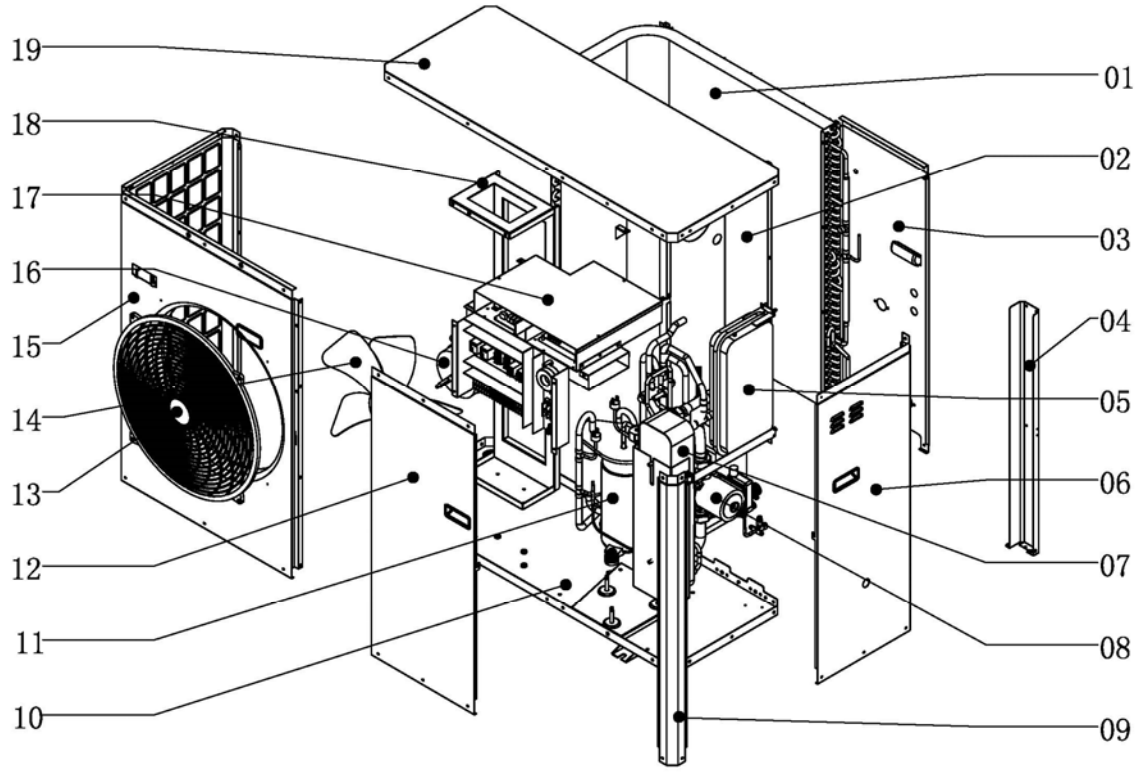
07	DIP switch input state	0(air source), 1(water source)	
08	DIP switch input state	0(DHW invalid), 1(DHW valid)	
09	DIP switch input state	0(G1 valid), 1(G1invalid)	
10	High pressure switch state	1(On), 0(Off)	
11	Over current protection switch	1(On), 0(Off) not valid	
12	Low pressure switch state	1(On), 0(Off)	
13	Inner water flow switch (for AH, GH)	1(On), 0(Off)	
14	External water flow switch (for GH)	1(On), 0(Off)	
15	Second high pressure switch state	1(On), 0(Off)	
19	Compressor running Hz	Inverter: Show actual frequency	
20	Outdoor fan motor	1:running, 0:stop	
21	Bent axle heater	1(On), 0(Off)	
22	Four way valve	1(On), 0(Off)	
23	Bypass valve	1(On), 0(Off)	
24	1 electrical valve	1(On), 0(Off)	
25	2 electrical valve	1(On), 0(Off)	
26	3 electrical valve	1(On), 0(Off)	
27	1 electrical heater 1	1(On), 0(Off)	
28	2 electrical heater 2	1(On), 0(Off)	
29	C4 water pump	1(On), 0(Off)	
30	C5 water pump	1(On), 0(Off)	
31	C6 water pump	1(On), 0(Off)	
32	Accumulation days since last antibacterial	0-99	
33	Cooling setting temp	Real setting temp	
34	Heating setting temp	Real setting temp	
35	Hot water setting temp	Real setting temp	
36	Anti-bacterial setting temp	Real setting temp	
37	Outdoor modular temp	-30~97° C	
38	Outdoor back temp	-30~97° C	
39	Inner pipe temp	-30~97° C	
40	Expansion valve open degree		
41	Water source side inlet water temp	-30~97° C	
42	Water side leaving temp	-30~97° C	
43	Solar water tank temp	-30~97° C	
44	**Inner pipe temp**	**Entrance of the plate heat exchanger**	
45	**Room temp display**		
46	**Home optimization target temp**		**Calculation parameter A**

Whilst Checking Parameters, particular care should be taken to ensure that they are not changed.

5 TECHNICAL SPECIFICATION

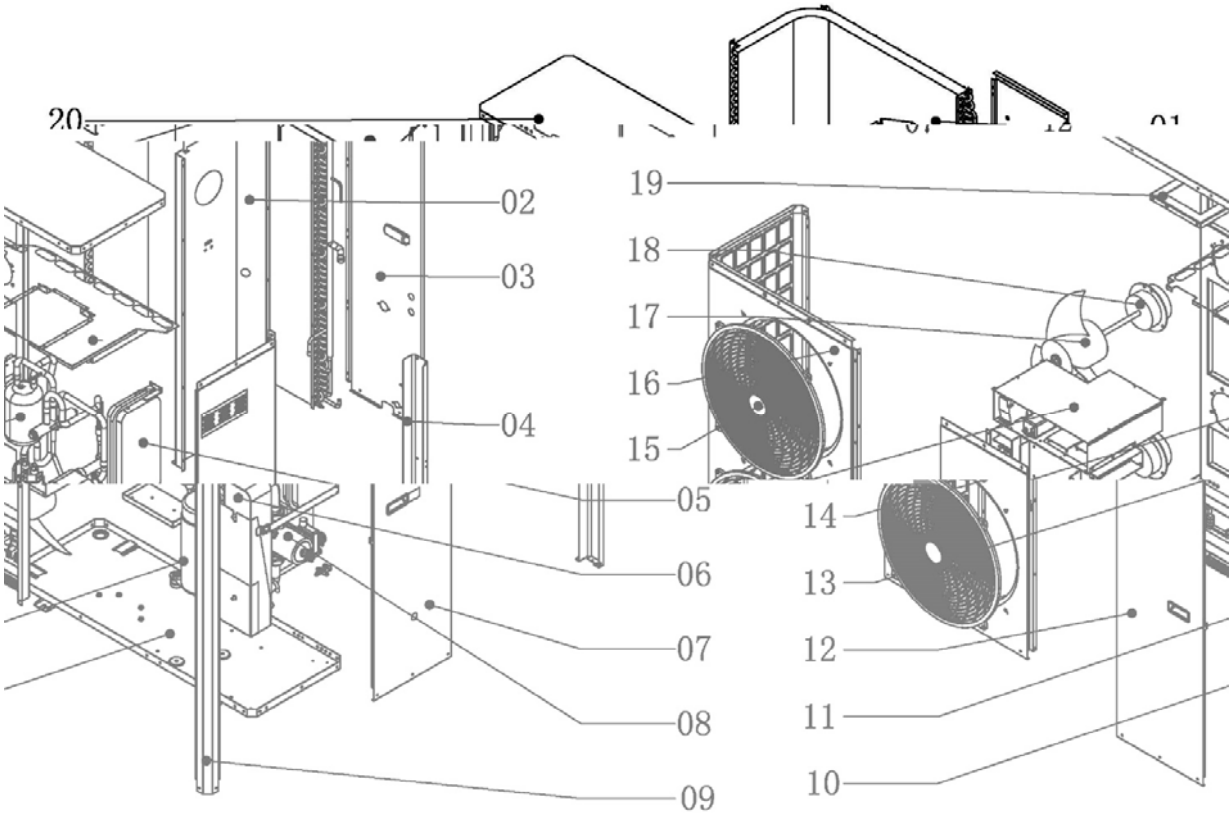
5.1 exploded diagrams

SOLIS 11



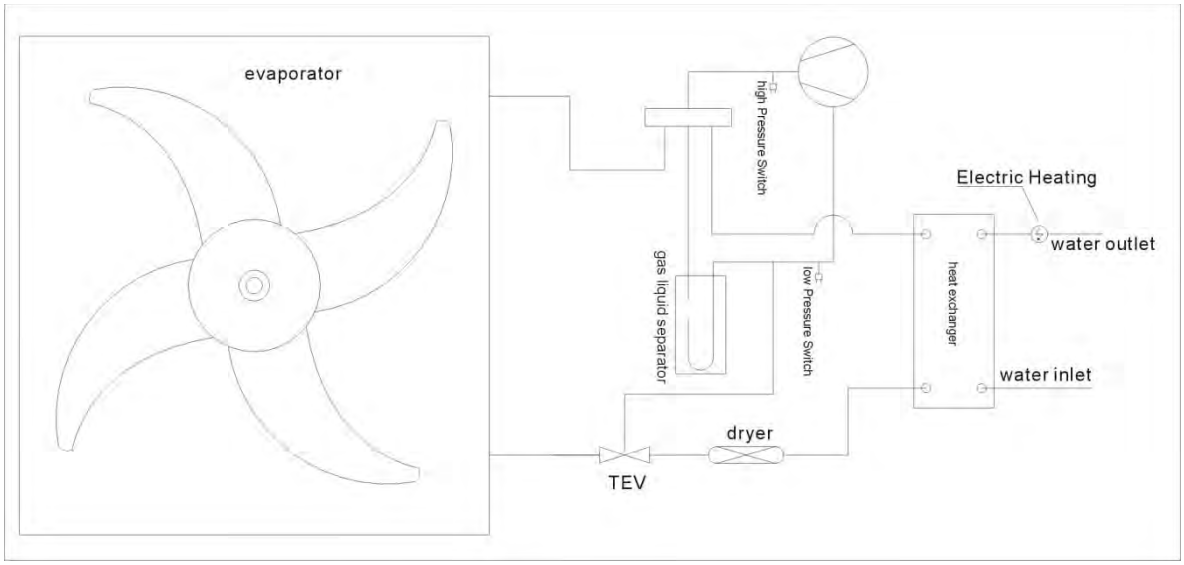
1	Evaporator	11	Compressor
2	Mid-support plate	12	Service plate
3	Back side panel	13	Fan grille
4	Back side support	14	Fan blade
5	Expansion vessel	15	Front panel
6	Right side panel	16	Fan motor
7	Plate type heat exchanger	17	Electrical box
8	Water pump	18	Fan support
9	Support plate	19	Top cover
10	Base plate		

SOLIS 17



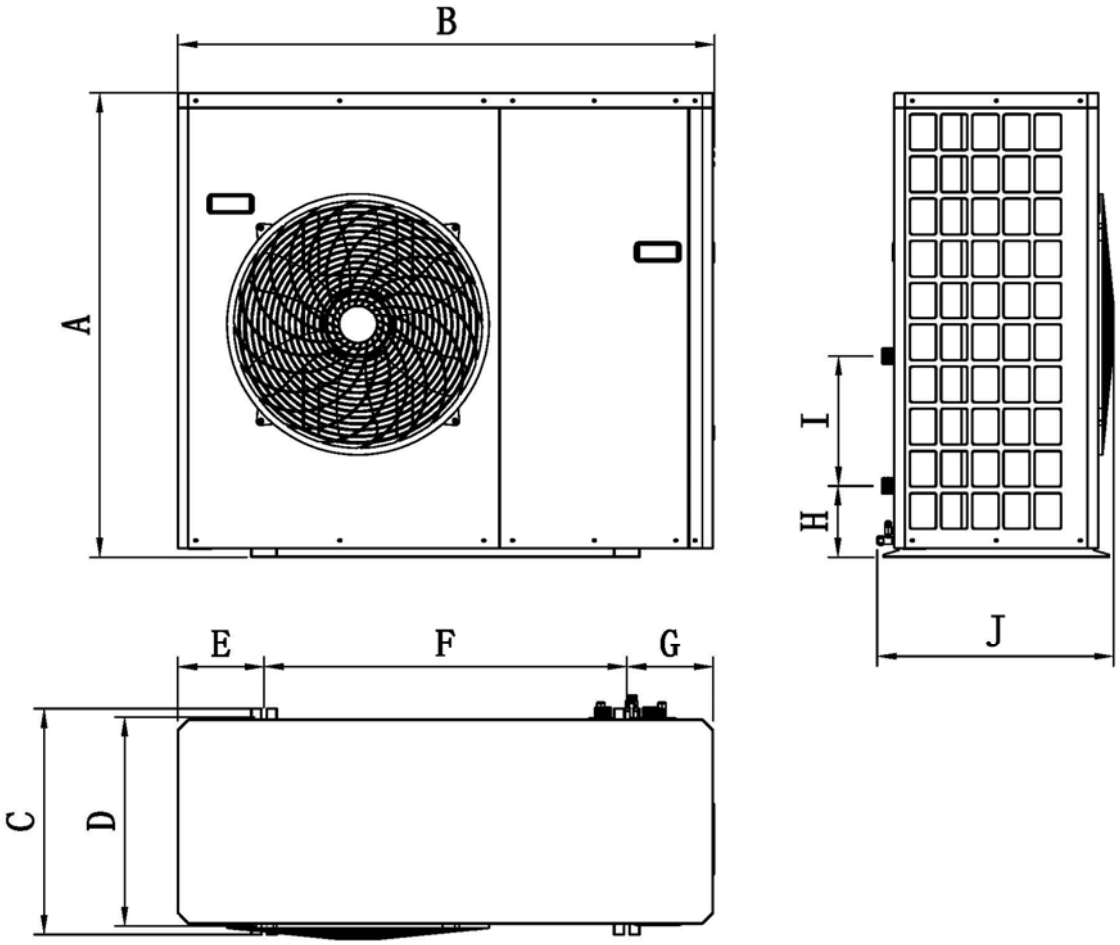
1	**Evaporator**	**11**	**Compressor**
2	**Mid-support plate**	**12**	**Service plate**
3	**Back side panel**	**13**	**Gas-liquid seperator**
4	**Back side support**	**14**	**Electrical box**
5	**Expansion vessel**	**15**	**Fan grille**
6	**Plate type heat exchanger**	**16**	**Front panel**
7	**Right side panel**	**17**	**Fan blade**
8	**Water pump**	**18**	**Fan motor**
9	**Support plate**	**19**	**Fan support**
10	**Base plate**	**20**	**Top cover**

5.2 System Schematic



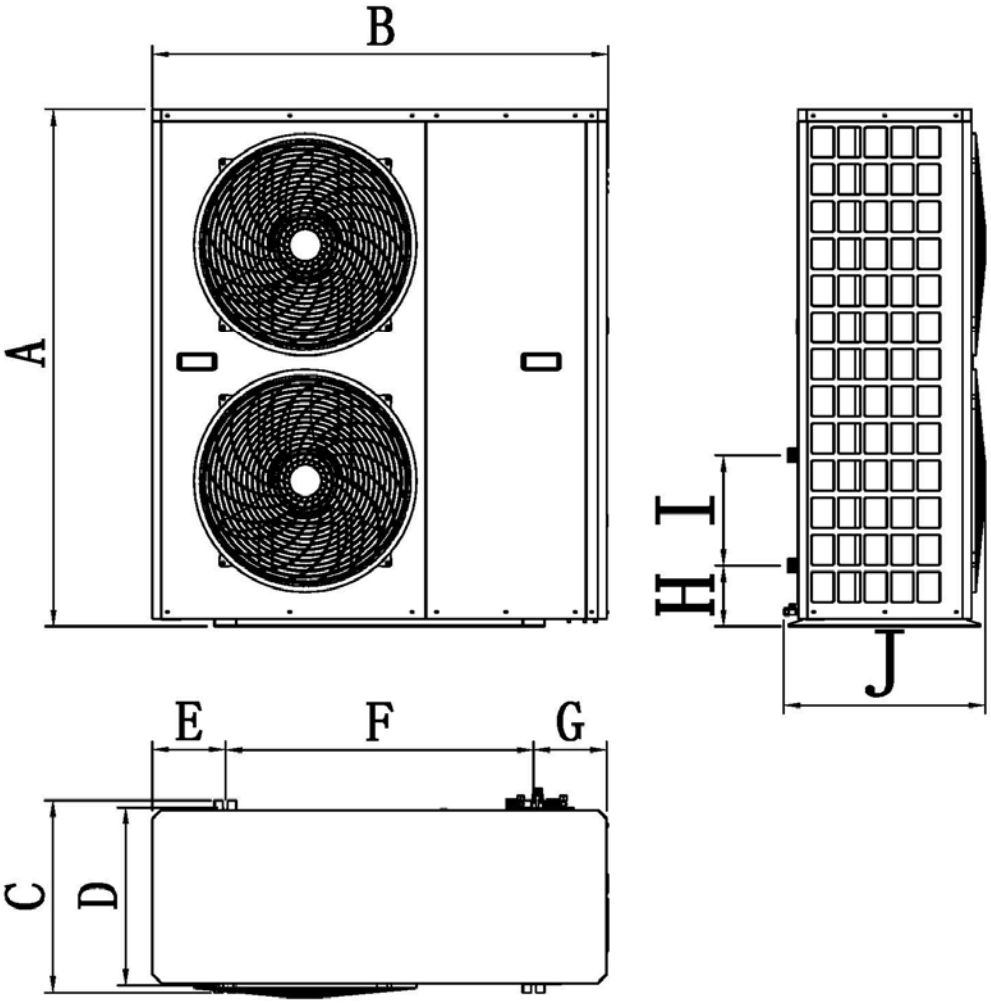
5.3 Dimensions(mm)

SOLIS 11



A	970	F	756
B	1118	G	180
C	470	H	149
D	435	I	270
E	180	J	494

SOLIS 17



A	1270	F	756
B	1118	G	180
C	470	H	149
D	435	I	270
E	180	J	494

5.4 Specifications

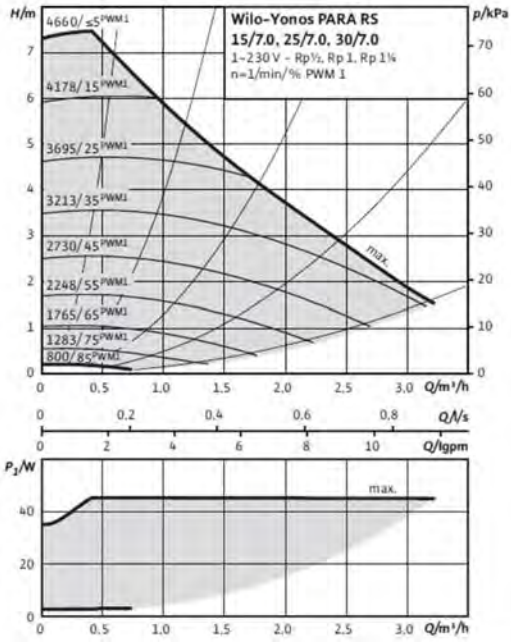
Model:		SOLIS 11	SOLIS 17
Heating Capacity Range	kW	4-13	8-18
Rated Heating Capacity	kW	11.60	16.70
Rated Heating Input	kW	2.52	3.56
Rated Heating Current	A	11.2	15.5
COP	W/W	4.60	4.69
Rated Cooling Capacity	kW	11.40	16.50
Rated cooling Input	kW	3.05	4.45
Rated cooling Current	A	13.4	19.1
EER	W/W	3.7	3.7
Start Current	A	0.9	1.5
Rated voltage /Frequency	V/Hz	230/50	230/50
High pressure value cut-off pressure	MPa	4.20	
Low pressure valve cut-off pressure	MPa	0.03	
Brand/Type of Compressor	/	CRSS/Rotary	Mitsubishi/Scroll
Compressor Model	/	C-7RVN153H0W	LNB42FSCMC
Brand of EEV		Saglnomiya	
Brand of 4-way valve		Saglnomiya	
Compressor oil type	/	FV50S	
Compressor oil amount	ML	520	1400
Refrigerant	/	R410A	
Refrigerant	Kg	3.30	3.90
Air flow	m3/h	4000	6600
Fan output	W	60	100
Brand of Water pump		WILO	
Water pump Model		RS-25/7.5	RS-25/7.5
Defrost	/	Auto defrost with 4 way valve	
Waterproof grade	/	IPX4	
Noise	dB(A)	49	52
Max water outlet temperature	°C	60	
Diameter of water connection	/	DN 25	
Rating water flow	m^3/Hour	2.15	2.90

Internal pressure drop at rating water flow	KPa	16.0	20.0
Min/Max heating water pressure	bar	0.5/3.0	0.5/3.0
Fluid Volume	l	2	3
Fuse (except power supply of compressor, aux heater)	A	5	
Lowest Operational point, outdoor air/flow line (heating mode)		-15°C/58°C	-15°C/58°C
Highest Operational point, outdoor air/flow line (heating mode)		43°C/60°C	43°C/60°C
Lowest Operational point, outdoor air/flow line (cooling mode)		10 C/5°C	10 C/5°C
Highest Operational point, outdoor air/flow line (cooling mode)		43°C/5°C	43°C/5°C
Colour		White	White
Net Dimensions (L/W/H)	mm	1118/470/970	1118/470/1270
Net Volume of Unit	m^3	.472	.617
Net Weight	KG	125	150
Rated test conditions: Heating: Ambient Temp. (DB/WB): 7°C/6°C, Water Temp. (In/Out): 30°C/35°C Cooling: Ambient Temp. (DB/WB): 35°C/24°C, Water Temp. (In/Out): 12°C/7°C *Although the Solis units can be modified to provide cooling, the MCS accreditation applies to the Solis in Heating mode only*			

6. Water pump water flow curves

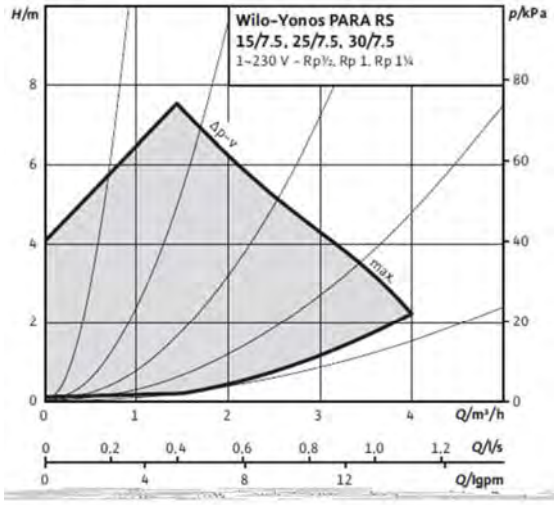
RS-15/7.0

External control via PWM 1

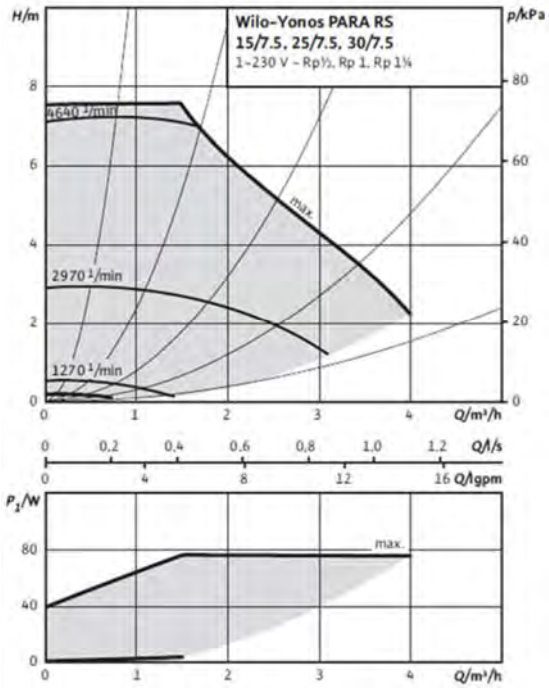


RS-25/7.5

Δp-v (variable)



Constant speed I, II, III



7 Maintenance

7.1 Maintenance and Cleaning Guidance

It is good practice to inspect your heat pump regularly. Maintenance must be carried out at least annually to ensure the longevity of your heat pump and to meet warranty conditions. There are no user-maintainable items inside the cover of the Solis unit. Should you notice unusual sounds or odours emanating from your Solis unit, you should turn the unit to standby, isolate it at the rotary isolation then call your installer for advice. Please see the document "Maintenance Requirements" issued by Earth Save Products Limited.

1. Clean the filter in the return pipework between the buffer and the Solis every 6 months to ensure that the system is clean and to avoid blockage to the system.
2. The Solis should be kept clean and free of debris (leaves etc) and clear of obstructions to the front and rear. Good ventilation and regular cleaning (3-6 months) of the evaporator will help maintain maximum efficiency.
3. Ensure the unit has power throughout the year whether the unit is used or not.
4. Check the power supply to the unit and all electrical cable for damage, security and condition. Should you discover any signs of damage, the unit should be closed down, isolated and the rotary isolation switch a qualified electrician consulted.
5. Check the water pipes, condensate drain, safety valves and other safety devices for correct functionality and leaks.
6. Check that the various components of the unit are working properly. Inspect the refrigerant pipes, joints and components for oil leaks that could indicate refrigerant leaks.
7. Chemically flush the plate heat exchanger after every 3 years.
8. Check refrigerant pressure if necessary.
9. Check ΔT (water in/out differential) to ensure that it is between 3 to 7.
10. Check electrical components for signs of impending failure (swelling, discolouration etc)

8 How to Get the Most Out Of Your Heat Pump

It is important to understand that your heat pump(s) is/are used very differently from conventional heating systems such as gas boilers. Listed below are a few pointers:

- Since heat pumps produce water at a lower temperature (than carbon based boilers), it is important to remember that your property will heat up more gradually.
- The lower temperature the heat pump produces, the more efficient your Solis will be.
- The higher the ambient temperature (outside temperature), the more efficient your Solis will be.
- The heat pump has a simple job, and that is to maintain the buffer tank at the set temperature.
- It is strongly recommended that your Solis is allowed to run 24 hours a day during the Heating Season. By maintaining your property at a steady temperature, the Solis will be more efficient. This will enable your central heating controller to call for heat at any time.

All installations are unique and must be designed to suit the property, aspect, occupant requirements and Building Regulations during the design phase BEFORE installation. Often it is too late to change the designed usage drastically after commissioning. Whilst 24hr operation is high recommended for the Heating Season, the use of energy monitors may help the operator to 'fine tune' the system to achieve greater efficiency and match occupant lifestyle.

9.0 GUARANTEE

Should any factory fitted Temperature and/or Pressure Relief Valve(s) or other safety devices be tampered with or removed or any recommended Temperature or Pressure Relief Valves/safety devices not be fitted, your warranty/guarantee will be invalidated. Neither the Distributor nor Manufacturer shall be responsible for any damage resulting from the tampering, howsoever caused, save where such exclusion is unlawful.

9.1 GUARANTEE TERMS

ESP warrants/guarantees the electrical parts, thermal controls and valves for a period of one year from the date of purchase, with the exception of normal wear and tear including any damage caused as a result of lime scale deposits.

The compressor in the heat pump is warranted/guaranteed for 2 years from the date of purchase. Remaining parts of the heat pump are warranted/ guaranteed for 2 year from the date of purchase. An extra year of guarantee for parts can be purchased from ESP but only at the time of purchasing your Solis.

Evidence of purchase and date of supply must be submitted with any warranty/guarantee claim.

This warranty/guarantee is not valid for installations outside the United Kingdom or the Republic of Ireland. For other areas, see separate warranty terms.

Any warranty/guarantee is for replacement parts only.

The purchaser of the unit acknowledges that he/she has seen ESP's conditions of supply and has understood them.

All of our units are RoHS approved units. (SUBJECT TO CONFIRMATION)

This guarantee does not affect your statutory rights.

10 ENVIRONMENTAL INFORMATION

This product is made from many recyclable materials, therefore at the end of its useful life, it should be disposed of at a Local Authority Recycling Centre in order to realise the full environmental benefits.

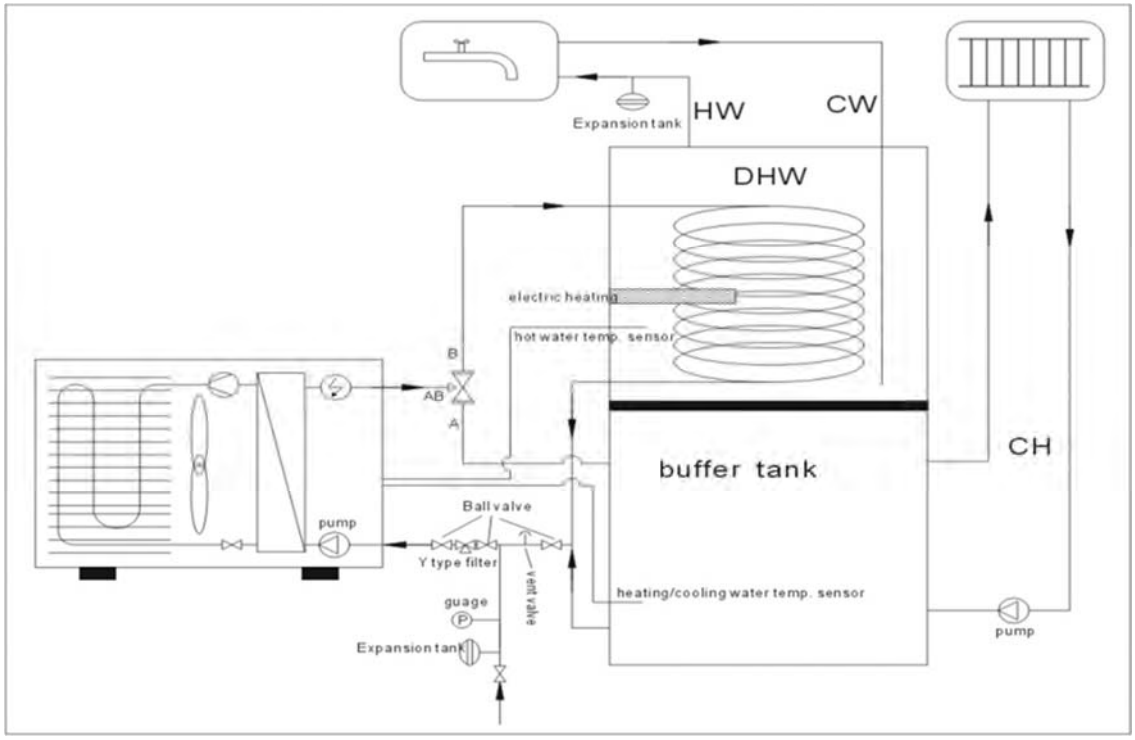
ESP Solis units contain fluorinated gasses

Refrigerant: R 410a

System Charge Weight:
Solis 11kW 3.3kg
Solis 17kW 3.9kg
R410a GWP value: 2088
System CO_2 equivalent charge weight:
Solis 11kW 6.89 Metric Tonnes
Solis 17kW: 8.143

11 Space Heating and DHW operation.

If included as part of the system design, Solis units are capable of providing sufficient power for space heating and DHW production. When designed to work in this mode (P27 set to 1), the Solis controls the 3 way valve via an auxiliary control G3. Further details are available in the DHW appendix.



12 Option Fittings Pack Available from Earth Save Products:

Solis ASHP:

2 X 28mm Stainless Steel Flexi Hoses (elbow) with washers
2 X 28mm Swing-Check Valves
3 X 28mm Full Bore lever valves
1 X 28mm Flow Setter
6 X 28mm Male iron/copper compression Fittings
2 X 28, Female iron/copper compression fittings

Solis Buffer:

4 X 28mm Full Bore lever valves
2 X Male iron/copper 28mm
2 X Male Iron/Copper to suit circulation pipework
Bushes for above
AAV
Pre-configured filling loop
Pressure Relief valve with gauge

13 Technical Support

Should your installer need guidance or technical support during installation, he or she should contact Earth Save Products Limited on 01865 598158 for technical advice. If you have any questions about your Solis unit you should, in the first instance, consult your installer.

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Website: www.esavep.com