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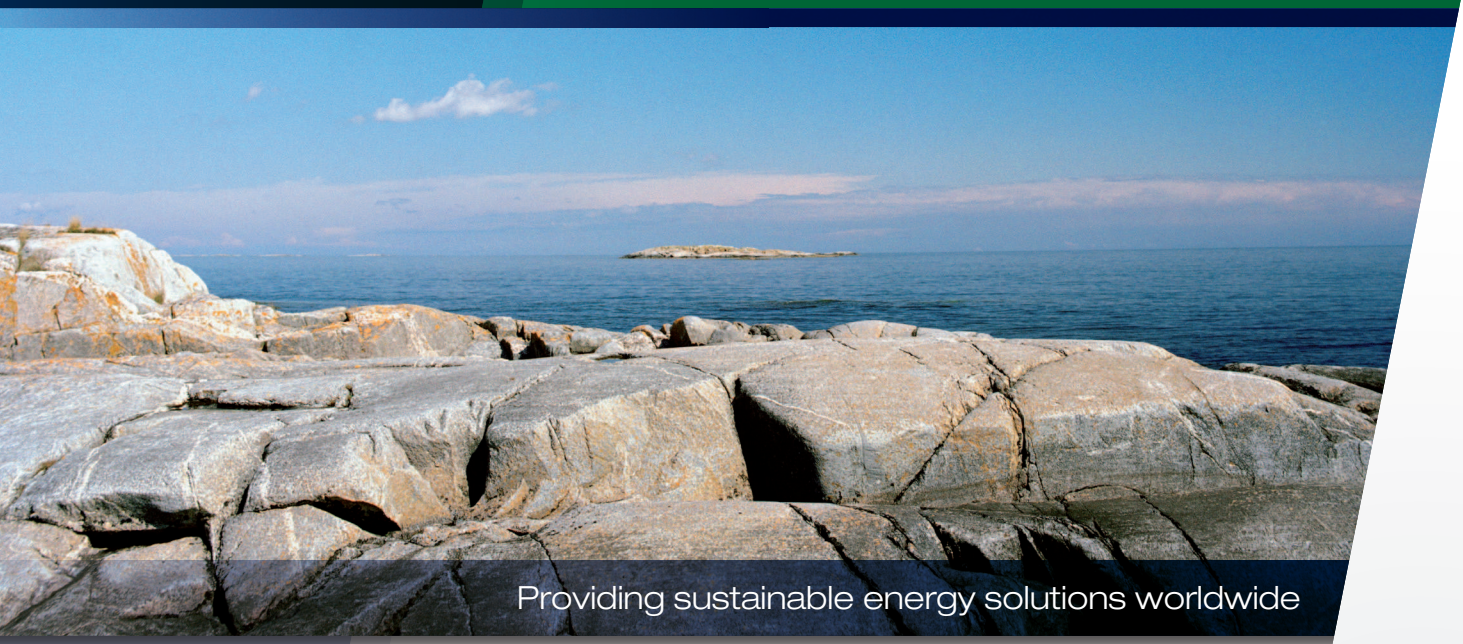


Installation- and Maintenance Manual

CTC EcoSol

Enertech Group

Installation- and Maintenance Manual

CTC EcoSol

162 105 12-1 2013-11-18

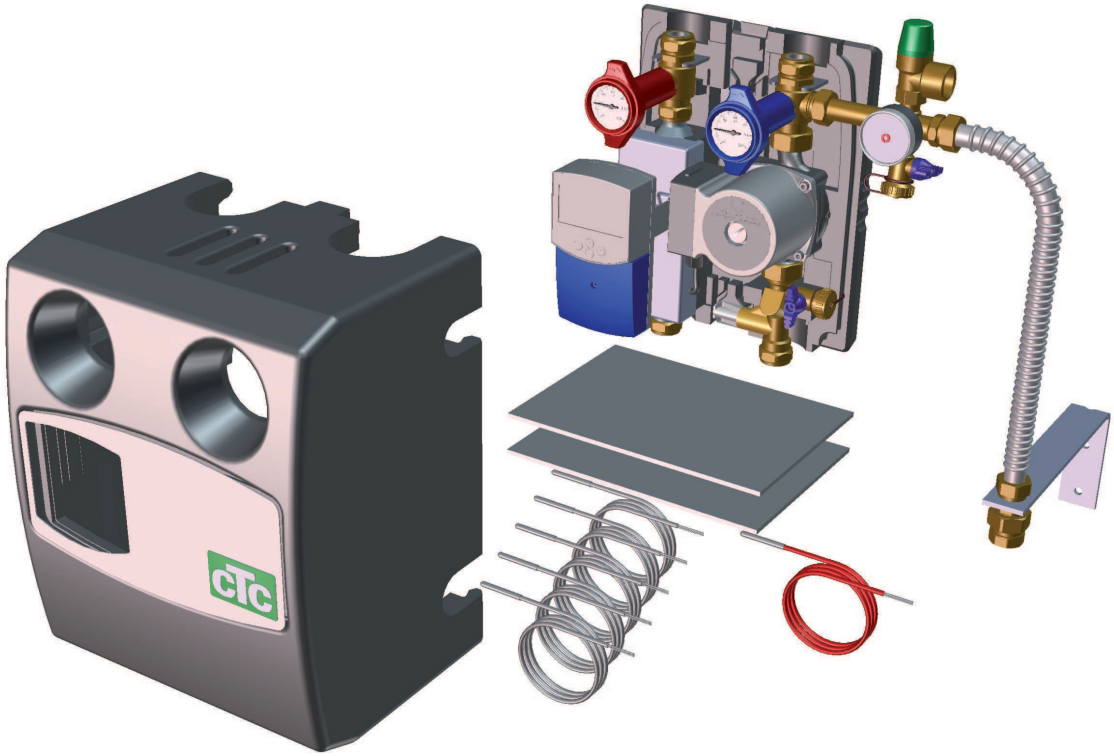


Table of Contents

As a reminder

Fill in the information below: it will be useful to have handy if anything should happen.

Product:	Serial number:

Pipe Installation Engineer:	Name:
Date:	Phone no.:

Electrical installation:	Name:
Date:	Phone no.:

Congratulations

You have just purchased a CTC EcoSol, which we hope you will be completely satisfied with. In the following pages you can read about how to operate your installation. One chapter is dedicated to you the property owner, and the other is for your installation engineer. Keep this Installation and Operating Instructions Handbook. If it is looked after properly, you will enjoy your CTC EcoSol for many years, and it is in this handbook you will find the information you need.

CTC EcoSol

CTC EcoSol contains all the important component parts you will need for a complete solar heating installation: a digital central controller for solar heating automation, circulation pump, expansion tank, safety valve, thermometer, manometer and a flow meter. Everything is packed ready-to-go, to get you set up and running quickly. You can choose between CTC's flat plate solar collectors or vacuum solar collectors.

Important!

Check the following points at delivery and during installation:

- When installing the solar collector, follow the solar collector manual carefully.
- Remove the packing, and before installation check that the product has not beendamaged during transport. Report any transport damage to the forwarding agent.
- Pipe temperatures to and from the solar collector can be very high. Therefore these pipes must be carefully insulated, and the insulation must be able to withstand temperatures above 150 °C.

Safety Regulations

The following safety regulations must be observed when handling, installing and operating the installation:

- Bear in mind that current must always be switched off before work on the central controller is begun. All electrical work must be performed by a qualified electrician.
- The central controller is sensitive to water and is not damp-proof. Ensure therefore that the equipment is installed free from damp.
- If you get collector fluid in your eyes, flush your eyes immediately with copious amounts of running water. If swallowed, rinse mouth and drink plenty of water.
- Never jeopardize safety by removing fastened covers, hoods and such.
- Never jeopardize safety by disabling safety equipment.

1. Technical data

Technical data	
Temperature range	0 - 50 °C
Protection class	IP40
Fuse	4 A 250 V AC
Supply	230 V AC
Circulation pump	15-60
P1 Charge pump P1 & P2	Triac 0,8 A 230 V AC
P2 Charge pump P4	Triac 0,8 A 230 V AC
P3 Charge pump P3 & Valve V1	Relay 2 A 230 V AC

2. Solar water heating

CTC EcoSol is a solar heating installation adapted for connection to products from CTC's heat pump range. The installation supplies solar heat for both space heating and hot tap water. The system is also built in such a way that it can, in favourable conditions, store solar energy underground. This energy can later be put to profitable use by the heat pump in the form of higher efficiency (COP).

In favourable circumstances, the solar collector can deliver 350–450 kWh/m² per year.
Solar heat output from the solar collector does not just depend on the solar collector's construction, working temperature and the weather; orientation and inclination are also decisive factors. If a comparison is made with the solar heat output from a collector facing south and which is installed at a 45° inclination, correction factors

The table shows the importance of the solar collector's orientation and inclination. Optimal location is facing south with a 45° inclination (the table applies to northerly latitudes and presumes a comparison of the solar energy gains for a full year).

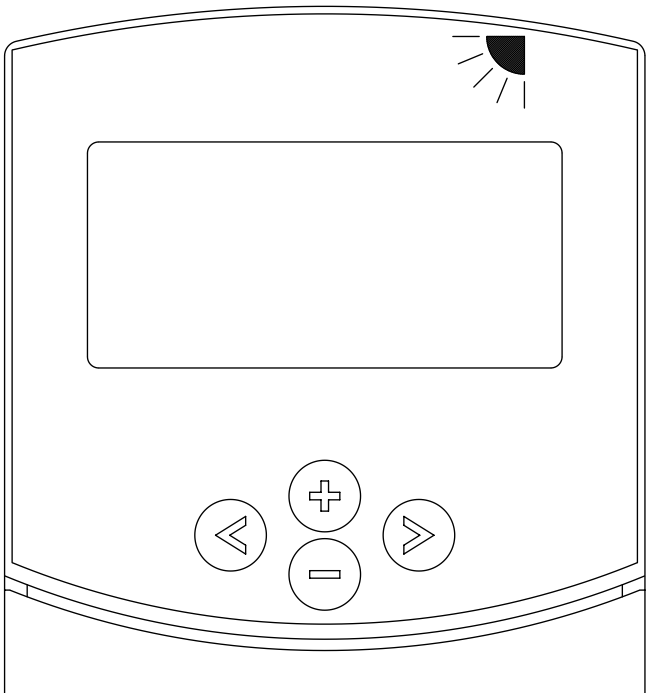
Direction / Inclination	S	SW / SE	W / E
15°	84 %	79 %	66 %
30°	96 %	86 %	72 %
45°	100 %	91 %	75 %
60°	99 %	90 %	75 %
90°	90 %	84 %	68 %

3. Control system

All settings are entered on the clear and easy control panel, where you can also access information concerning operation and temperatures. The information is shown in the display window. With just a few buttons you can easily access all information by choosing from a number of different menus.

How to use the buttons

You can access operation information or enter your own setting values simply by selecting from the various menus. Press any button to access the menu. Button functions are described below.



+ "Back" or "Confirm" button

Use this button to step back, or confirm a value or a choice.

> "Select" button

This button selects the menu you wish to access, and also what you would like to change.

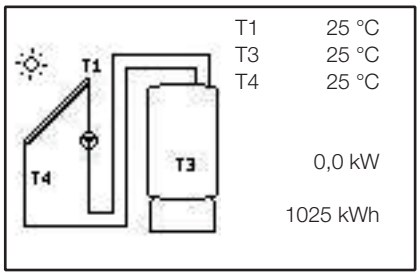
+ "Up" button

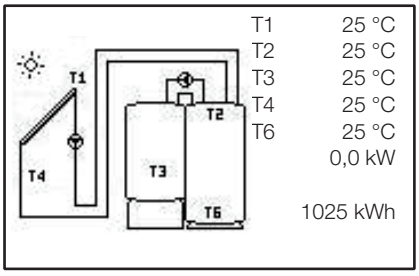
This button allows you to move up in the menu, or increase a value.

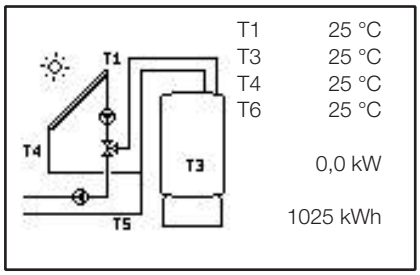
+ "Down" button

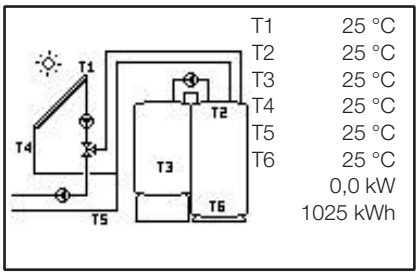
This button allows you to move down in the menu, or decrease a value.

4. Overview menus










```
►► Information

►Temperatures
Operation h
Operation
Settings
Service
```

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►► Information

Temperatures
►Operation h
Operation
Settings
Service
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►► Information

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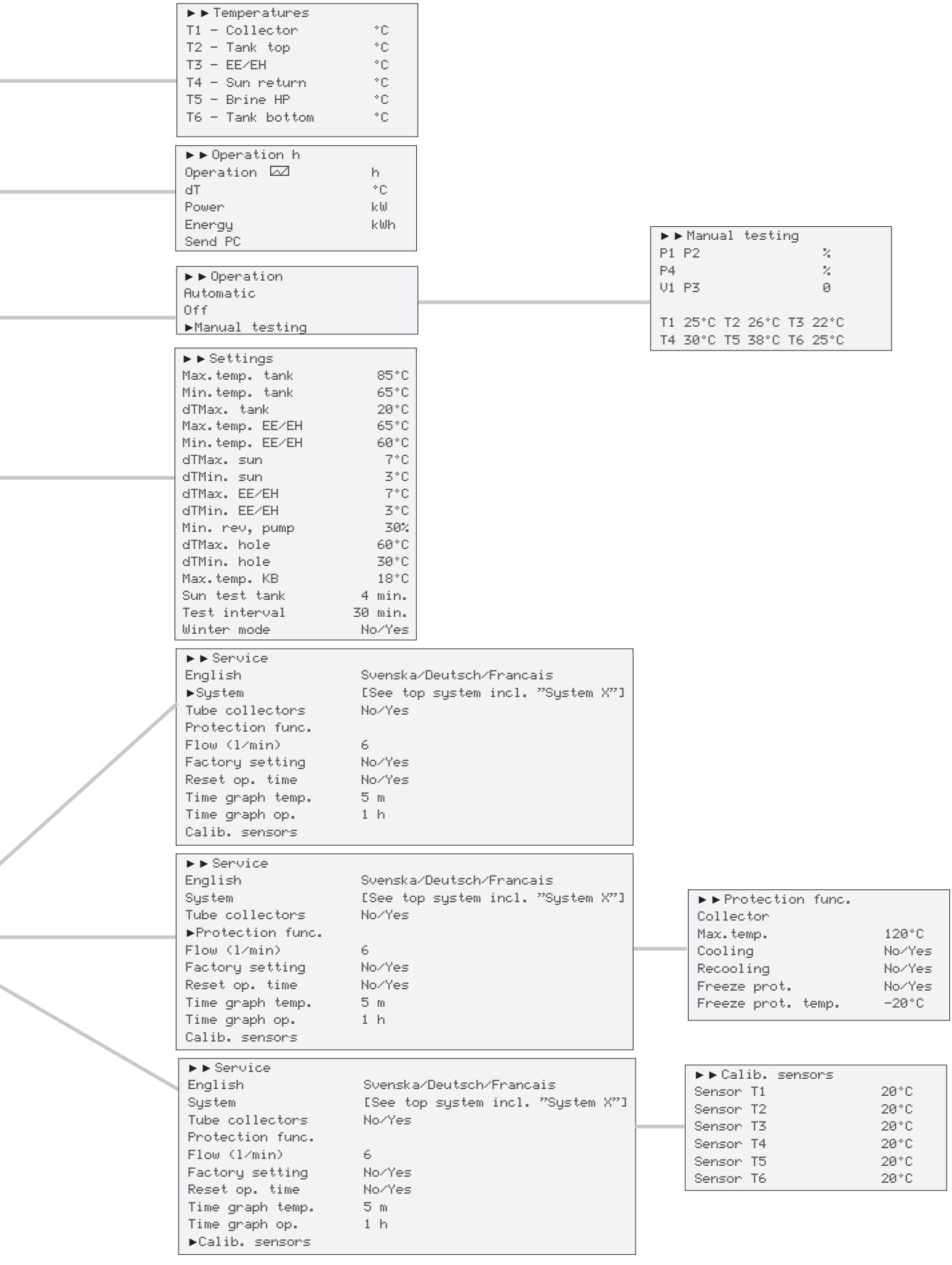

►►Temperatures
T1 - Collector °C
T2 - Tank top °C
T3 - EE/EH °C
T4 - Sun return °C
T5 - Brine HP °C
T6 - Tank bottom °C
►►Operation h
Operation h
dT °C
Power kW
Energy kWh
Send PC
►►Operation
Automatic
Off
►Manual testing
►►Manual testing
P1 P2 %
P4 %
V1 P3 0
T1 25°C T2 26°C T3 22°C
T4 30°C T5 38°C T6 25°C
►►Settings
Max.temp. tank 85°C
Min.temp. tank 65°C
dTMax. tank 20°C
Max.temp. EE/EH 65°C
Min.temp. EE/EH 60°C
dTMax. sun 7°C
dTMin. sun 3°C
dTMax. EE/EH 7°C
dTMin. EE/EH 3°C
Min. rev, pump 30%
dTMax. hole 60°C
dTMin. hole 30°C
Max.temp. KB 18°C
Sun test tank 4 min.
Test interval 30 min.
Winter mode No/Yes
►►Service
English Svenska/Deutsch/Francais
►System [See top system incl. "System X"]
Tube collectors No/Yes
Protection func.
Flow (l/min) 6
Factory setting No/Yes
Reset op. time No/Yes
Time graph temp. 5 m
Time graph op. 1 h
Calib. sensors
►►Service
English Svenska/Deutsch/Francais
System [See top system incl. "System X"]
Tube collectors No/Yes
►Protection func.
Flow (l/min) 6
Factory setting No/Yes
Reset op. time No/Yes
Time graph temp. 5 m
Time graph op. 1 h
Calib. sensors
►►Protection func.
Collector
Max.temp. 120°C
Cooling No/Yes
Recooling No/Yes
Freeze prot. No/Yes
Freeze prot. temp. -20°C
►►Service
English Svenska/Deutsch/Francais
System [See top system incl. "System X"]
Tube collectors No/Yes
Protection func.
Flow (l/min) 6
Factory setting No/Yes
Reset op. time No/Yes
Time graph temp. 5 m
Time graph op. 1 h
►Calib. sensors
►►Calib. sensors
Sensor T1 20°C
Sensor T2 20°C
Sensor T3 20°C
Sensor T4 20°C
Sensor T5 20°C
Sensor T6 20°C

5. Detailed description, menus

5.1 Factory settings

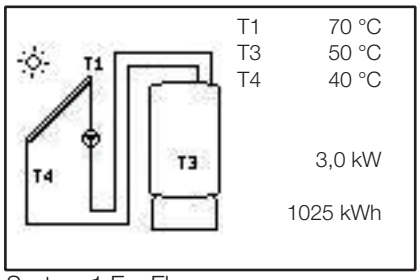
The product is delivered with pre-programmed values for variable parameters. These values are set for a standard installation. In order to optimize and adapt control for your specific installation, several parameters will need to be adjusted. Note that not all of the parameters described below are active in all systems (1–4). The choice of system dictates which parameters are necessary. The following values are delivery settings:

! Settings should be carried out in consultation with the installation engineer.

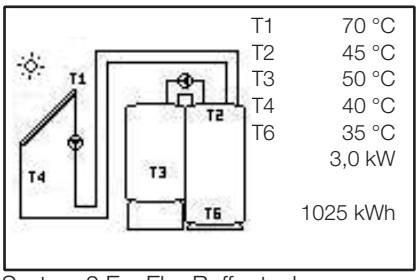
Parameter	Factory setting
Max. temp. tank	85 °C
Min. temp. tank	65 °C
dTMax. tank	20 °C
Max. temp. EE/EH	65 °C
Min. temp. EE/EH	60 °C
dTMax. sun	7 °C
dTMin. sun	3 °C
dTMax. EE/EH	7 °C
dTMin. EE/EH	3 °C
Min. rev, pump	30 %
dTMax. hole	60 °C
dTMin. hole	30 °C
Max. temp. KB	18 °C
Suntest tank	4 min
Test interval	30 min
Winter mode	No
Tube collectors	No
Flow	2 (l/min)
Max. temp, solar collector	120 °C
Cooling	Yes
Recooling	No
Freeze prot.	No
Freeze prot. temp.	-25 °C

5.2 Main menu/normal display menu

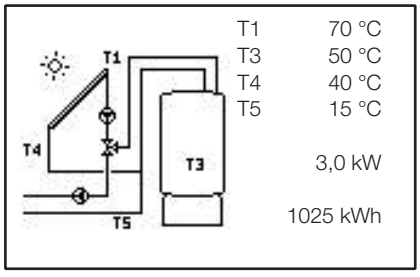
The display window always shows current operational information such as temperatures, whether pumps are running or not, and any fault indications. Depending on the system selected, one of the images 1–4 below will be shown.



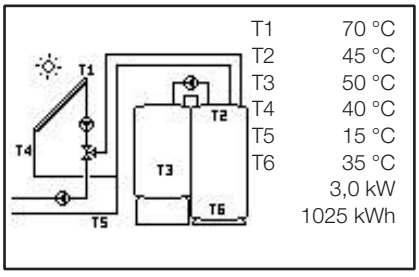
System 1 EcoEl



System 2 EcoEl + Buffer tank



System 3 EcoHeat

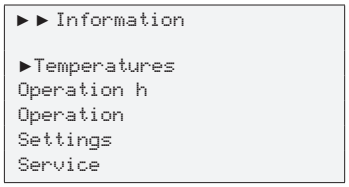


System 4 EcoHeat + Buffer tank

The selected system is shown graphically in the window. Essential information regarding operational conditions can be read off from the display. In addition to the graphic information, the solar collector's current output is shown along with the amount of collected energy.

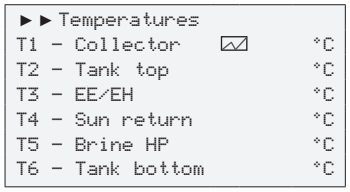
Description of information:

Sun:	A sun icon in the display indicates when charging starts.
Pump:	When a pump is running it is indicated by a rotating symbol for the pump in question.
Valve:	As an indication of a valve's setting, its symbol is filled in the direction of flow.
Temperatures:	T1, T2, … T6 show where current temperatures are measured.
T1	Shows the current temperature in the solar collector.
T2	Shows the current temperature in the upper section of the extra tank (systems 2, 4).
T3	Shows the current temperature in EcoEl/EcoHeat.
T4	Shows the current temperature of return flow to the solar collector.
T5	Shows the current temperature of the heat pump's brine fluid (systems 3, 4).
T6	Shows the current temperature in the lower section of the extra tank (system 2, 4).



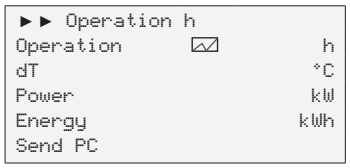
5.3 Basic menu

This menu is the main system menu. All other menus are selected from here by pressing any key. If a graph symbol is shown on the menu line, you may continue in this menu to see how values have changed over time. The cursor can be moved along the time axis with the + and – keys. If no key is pressed within 10 minutes, the screen will revert to the normal display.



5.4 Temperatures

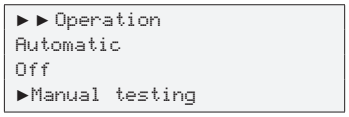
T1 – Collector	Temperature in the solar collector.
T2 – Tank top	Temperature in the extra tank's upper section.
T3 – EE/EH:	Temperature in EcoEl/EcoHeat.
T4 – Sun return	Temperature of return flow to the solar collector.
T5 – Brine HP	Temperature of the heat pump's brine fluid.
T6 - Tank bottom	Temperature in the extra tank's lower section.



5.5 Operatation h

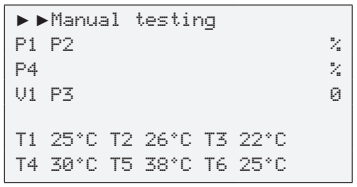
In the menu "Operation h", among other things the number of operating hours and accumulated energy may be analyzed. An historical overview can be obtained by accessing the respective parameters.

Operation	Shows the number of hours the system has been running.
dT	Differential temperature between the collector supply and return.
Power	Shows recorded output at a given time.
Energy	Recorded accumulated energy amount.
Send PC	Future possibility to send data to PC (not active).



5.6 Operation

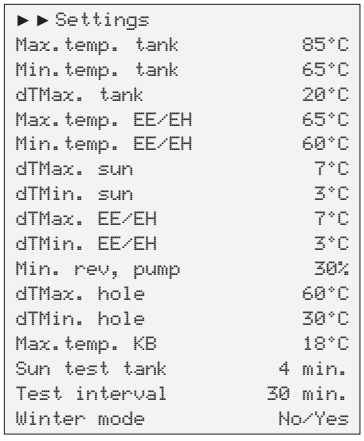
In the "Operation" menu it is possible to choose either fully-automatic control, or manual control (advisable during troubleshooting). When automatic control is de-activated, the automatic logging function continues to work.



5.7 Manual testing

Can be used for troubleshooting to check if pump/valve connections are correct.

P1	Pump which controls the solar collector/system flow.
P2	Pump which provides charging from the system unit.
P3	Pump which circulates coolant for underground charging (systems 3, 4).
P4	Pump which controls charging between tank and EH/EE (systems 2, 4).
V1	Valve which switches between tank and underground charging (systems 3, 4).



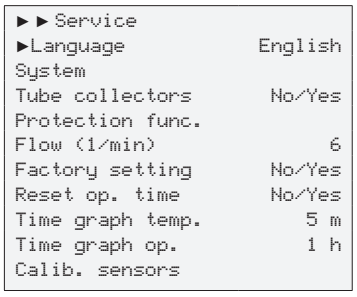
5.8 Settings

Any adjustments necessary to optimize the system for maximum energy gains are made in the “Settings” menu.

These settings should be established in consultation with the installation engineer.

Max.temp, tank	Setting for highest permissible temperature in extra tank. When the set temperature is reached, tank charging stops. Factory value: 85 °C (settings:10 – 95 °C).
Min.temp, tank	Setting for lowest permissible temperature in extra tank. When the temperature in the tank falls below a set value, tank charging is prioritized (solar test tank activated immediately). Factory value: 65 °C (settings: 10 – 95 °C).
dTmax. tank	Setting for maximum permissible temperature differential between the tanks upper and lower sections. This function ensures the entire tank volume is utilized when charging. If the condition is transgressed, tank charging will begin even if the max. temperature in the tank has been reached (the temperature can however never exceed 95 °C). Factory value: 20 °C, (settings: 0 – 40 °C).
Max.temp, EE/EH	Setting for highest permissible temperature in EcoEl/EcoHeat. When the set temperature is reached, charging between the extra tank and EcoEl/EcoHeat is stopped, even if the differential gives a start signal. Factory value: 65 °C (settings: 10 – 95 °C).
Min.temp, EE/EH	Setting for lowest permissible temperature in EcoEl/EcoHeat. When the set temperature is reached, changing between the extra tank and EcoEl/EcoHeat is started if the temperature differential is reached. Factory value: 60 °C (settings: 10-95°C).

ddTMax. sun	Setting start condition for solar charging. Specifies the temperature differential at which (solar collector – or EE/EH) charging starts. Factory value: 7 °C (settings: 3 – 30 °C).
dTMin. sun	Setting stop condition for solar charging. Specifies the temperature differential at which (solar collector – or EE/EH) charging stops. Factory value: 3 °C (settings: 2 – 20 °C).
dTMax.	EE/EH Setting start condition for charging EE/EH from tank. Specifies the temperature differential at which (tank – EE/EH) charging starts. Factory value: 7 °C (settings: 3 – 30 °C).
dtMin.	EE/EH Setting stop condition for charging EE/EH from tank. Specifies the temperature differential at which (tank – EE/EH) charging stops. Factory value: 3 °C (settings: 2 – 20 °C).
Min. rev. pump	Setting lowest permissible revolutions for circulation pumps P1, P2 and P4. Factory value: 30% (settings: 30 – 100%).
dTmax. hole	Setting start condition for solar charging to underground. Specifies the temperature differential at which (solar collector – underground) charging starts. Factory value: 60 °C (settings 3 – 120 °C).
dTmin. hole	Setting stop condition for solar charging to underground. Specifies the temperature differential at which (solar collector – underground) charging stops. Factory value: 30 °C (settings 1 – 118 °C).
Max.temp. KB	Setting highest permissible coolant temperature. When the value is reached solar charging to the bore hole is stopped. Factory value: 18 °C (settings: 1 – 30 °C). Note: Should not be adjusted without consulting installation engineer.
Suntest tank	During underground charging, flow is switched to tank charging once every 30 minutes to check if tank charging is possible. Tests are carried out at set intervals. If sufficient temperature has been reached, tank charging continues, otherwise the system switches back to underground charging. Factory value: 4 min (settings 1 – 20 min).
Test interval	Specifies the intervals at which the solar test function operates. Factory value: 30 min. (settings: 30 – 180 min).
Winter mode	De-activates the solar test tank. Charging only takes place to the bore hole. Factory value: No (settings No/Yes).



5.9 Service

In the Service menu, comprehensive settings are established which e.g. adapt control to suit the actual system configuration.

Language Setting desired language.	Swedish, German, English and French available.
System Setting system type.	Controls the look of the normal display menu. Four different systems are available. See chapter System Configuration.

Tube collectors	Setting the type of solar collector. In the case of vacuum tube collectors, circulation is started every 30 minutes to check if the temperature is sufficient. This setting is used if vacuum solar collectors are installed, or if a temperature sensor is not situated at the hottest point in the solar collector. Factory value: No (settings: No/Yes).
Protection func.	There are a number of functions which protect the system against extremes of temperature.
Max.temp.	Protects the solar panels against high temperatures by allowing circulation in the panels despite the maximum temperature having been reached in the tank. For safety reasons, the temperature in the extra buffer tank is never permitted to exceed 95 °C (90 °C if only EcoHeat/EcoEl are used). Factory value: 120 °C (settings: 110–150°C).
Cooling	Permits circulation to EcoHeat/EcoEl/extra tank to prevent too high a temperature in the solar collector. Applies when highest permissible temperature is reached. Factory value: Yes (settings: No/Yes). Note: The temperatures in the tanks are under no circumstances permitted to exceed 95 °C (90 °C in EcoHeat/EcoEl).
Recooling	This alternative can be activated when the cooling function is activated. The function involves the system striving to reduce the temperature in the tank to the setpoint, for which reason the solar collectors are used as cooling elements during a brief period. Factory value: No (settings: No/Yes).
Freeze prot.	When there is a risk of ice blockages in the solar collector, circulation may be started to reduce the risk of freeze damage. Factory value: No (settings No/Yes).
Freeze prot. temp.	Specifies the temperature (T1) at which freeze protection is activated (indicated when freeze protection active). Factory value: –25 °C (settings: –30 – 7 °C).
Flow	Specifies flow through the solar collector (read-off on system flow meter). Flow must be read off when pump P1 is running at 100%. Factory value: 2 l/min. (settings: 1–25 l/min.). Note: Flow provides the basis for calculations regarding output and accumulated energy – incorrect flows will cause false values for these parameters.
Factory settings	Returns all settings to factory values. Factory value: No (settings: No/Yes).
Reset op. time	Restarts operating hour meter.
Time graph temp.	Time interval for graphs based on operating hours. Factory value: 5 min (settings 1–60 min.).
Time graph op.	Time interval for graphs based on operating hours. Factory value: 1 h (settings: 1–48 h).
Calib. sensors	Troubleshooting function for sensors. (Place the sensor in a water/ice mixture and read off; all sensors should read 0°C.). The function is also used in those cases where sensors show incorrect values; adjustments of ±3 ˚C may then be made.

6. Operation and maintenance

When the solar heating installation is installed, the engineer must ensure that the installation is in perfect condition. Allow the engineer to walk you through the installation, so that you know how it operates and should be looked after. A correctly-assembled and commissioned solar heating installation will in principal require no maintenance. However, it is advisable to check over your installation at regular intervals to make sure it is working as it should. It is worthwhile running through the check items below a couple of times per year:

- Operating pressure, solar side
  The pressure check is carried out when the collector is not exposed to insolation. The pressure is read off at the manometer located near the expansion tank. When the collector is not exposed to insolation, the pressure should be around 2.5 bar in a standard system. See table on page 52 for correct primary pressures.
- Flow control
  Behind the system unit insulation there is a flow sensor. System flow should be the same as when the installation was started up. If not, there may be air in the system and venting may be necessary.
  Note: If the reading is taken on a hot summer's day there is a risk of system overheating and the flow meter indicating the wrong value. This is normal and does not mean there is a fault in the installation. Preferably, take readings during moderate insolation.
- Temperature differential, solar side
  The fluid temperature differential between entering and leaving the solar collector should be at least 10 °C on a day with good insolation. A lower differential may indicate that flow in the circuit is too high. If necessary, adjust pump speed with the circulation pump regulator. For fine settings, use the adjustment valve next to the flow meter.
  Note: Do not forget to adjust the central controller setting value at the same time.
- Check heat transfer fluid
  The heat transfer fluid must be checked every two years with regard to its antifreeze and pH value. Check antifreeze using antifreeze tester and replace or refill if necessary! Target value is ca. - 25° C and - 30° C depending on climatic conditions. Check pH value with a pH indicator rod (target value approx. pH 7.5). If the limit pH value is less than pH 7, replace the heat transfer fluid.

General maintenance:

- Solar collectors do not normally require maintenance, but heavy grime and/or moss or algea should be cleaned away with a sponge and water. (Tip: Automotive shampoo with wax will provide a protective effect).
- If the solar collector is exposed to abnormal weather conditions the following should be checked and any faults remedied:
  - Check roof integrity at attachment points, together with cable and pipe penetrations.
  - Check for damages and leakage .

6.1 System data

Fill in the flow, temperature och pressure in this table regulary, then it is easier to notice changes over time in the system.

Date	Flow (l/min)	Temperature (°C)	Pressure (bar)

7. Troubleshooting/ appropriate actions

The automatic solar heating central controller monitors all active sensors. When a fault is detected by the device, it will be displayed on screen in the form of a flashing, cleartext alarm. The significance of the various types of alarms is described below.

Alarm Sensor Tx	When Alarm and Sensor T1–T6 (dependent on system type) flash, a sensor fault is indicated. If there is a fault on a solar sensor or a tank sensor, charging will be stopped. • Action: Check wiring connection or sensor, replace faulty sensor.
Alarm Sensor sun return/flow 0.0 kW	When Alarm and Sensor/Solar return flow/0.0kW is flashing, where otherwise kW shows in the Main menu, this indicates a fault on the sensor used as the solar return sensor (for energy measurement only). • Action: Check wiring connection and sensor, replace faulty sensor.
Alarm Flow	When Alarm and Flow is flashing, this indicates a flow blockage and charging is stopped. Cause: Charge pump or charge pump connection fault. Temperature sensor fault or system boiled. • Action: Run the pumps in manual test; see page 15. Check wiring connection and sensor, replace faulty sensor. If the system has boiled, wait until the temperature has dropped and restart the system.

Miscellaneous troubleshooting/ appropriate actions

- Unusual noise from pump is commonly the result of air in the system.
  Action: Vent the system
- Flow meter fault may result from system boiling or faulty meter.
  Action: Check temperature and flow meter.
- Air in system.
  Action: Bleed the system
- Solar circuit does not maintain pressure. Note that solar circuit pressure can vary a lot but ought not drop below the expansion tank's primary pressure; see chapter Dimensioning. Carry out checks on a cloudy evening/night when the tank and the solar circuit are cold. The pressure in the system can only be checked when the entire fluid volume has the same temperature over a longer period. If the system requires topping up or has too low a pressure a couple of times during the season, this is probably because there is a leak in the system.
  Action: Check the entire system for leaks. A small leak will not cause large fluid losses, but it will be difficult to maintain system pressure
- Condensation on the solar collector for a brief period is not a cause for concern, it will disappear when the collector warms up. If there is a lot of condensation and/or for a long period, damp has entered the collector. This is probably the result of a leak in the collector, not in the fluid system.
  Action: Find the leak and seal it.

8. Installation

This chapter is for the person responsible for ensuring that the installation function as the property owner wishes. Take time to walk the property owner through the various functions, wheels, knobs and settings and answer any questions he or she may have. Both you and the user benefit from him or her having a clear understanding of how the installation works and should be looked after. Bear in mind the following:

- Please read all instructions thoroughly before installing or placing the solar collectors.
- Remove the packing, and before installation check that the product has not been damaged during transport. Report any transport damage to the forwarding agent.
- Temperatures in the pipes to and from the solar collectors can be very high. Therefore, these pipes must be carefully insulated and the insulation must withstand temperatures above 150 °C.

8.1 Example roof penetration

When a solar collector is roof mounted, there are problems concerning roof penetration by the pipes. The risk of water leakage at the penetration is ever-present if it is not carried out in a correct manner. In those cases where a collector is recessed into the roof, piping can run beneath the tiles with reduced risk of water damage. Penetrations through roof paneling must be sealed thoroughly with silicon. In cases where the collector is placed above the tiling there are a couple of methods for pipe penetration.

1. Well-stocked builders' merchants have specially-adapted plastic roofing tiles with ready-made penetrations in rubber. Ensure that the penetration is perfectly sealed. Bear in mind that pipes from the collector can get hot (150 °C); the rubber at the penetration must be able to withstand these temperatures.
2. An alternative is to make the penetration in the wall beneath the collector. In this case the piping is run along the top of the tiles and in through the wall under the eaves. This method is preferable from a leak-proofing point of view; refer to figure 1.
3. A third alternative is to have a sheet metal worker make a penetration box through which pipes can be led and then run through the roofing panels and on down to the main unit; refer to figure 2.

Figure 1

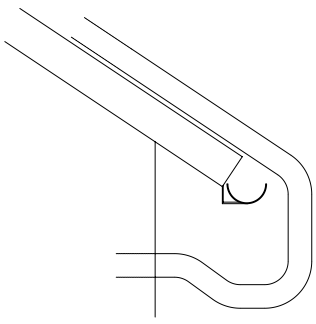
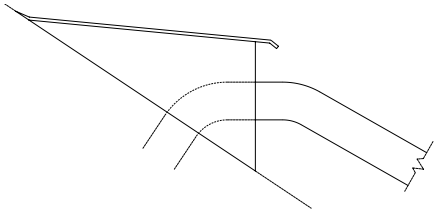


Figure 2

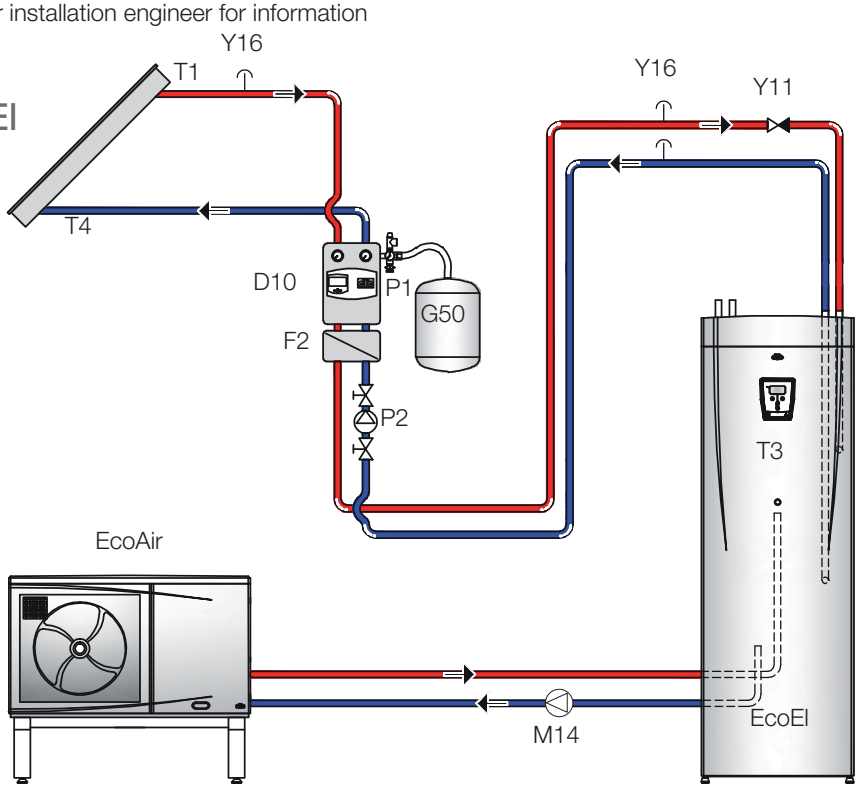


9. System configuration

The following describes the various systems which CTC EcoSol is adapted for. Systems 1–4 are general solutions and many variations exist. If you are unsure about your system, contact your installation engineer for information and recommendations.

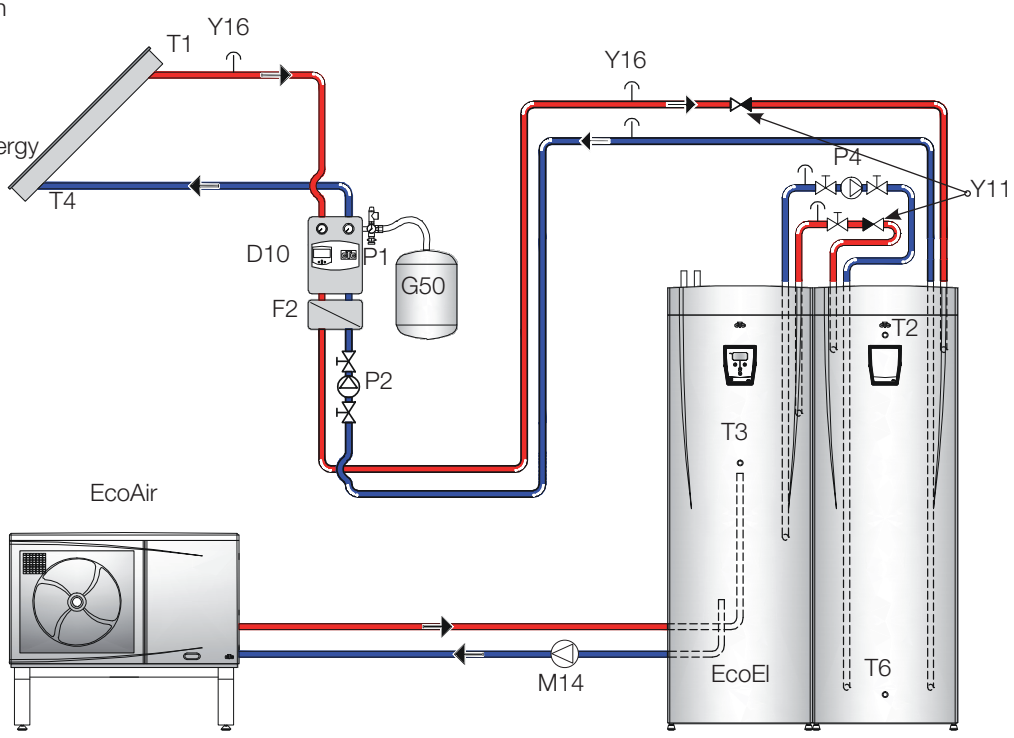
9.1 System 1 EcoEl

System configuration for systems where EcoSol is combined with CTC EcoEl (for the best savings, the system can be combined with CTC EcoAir).



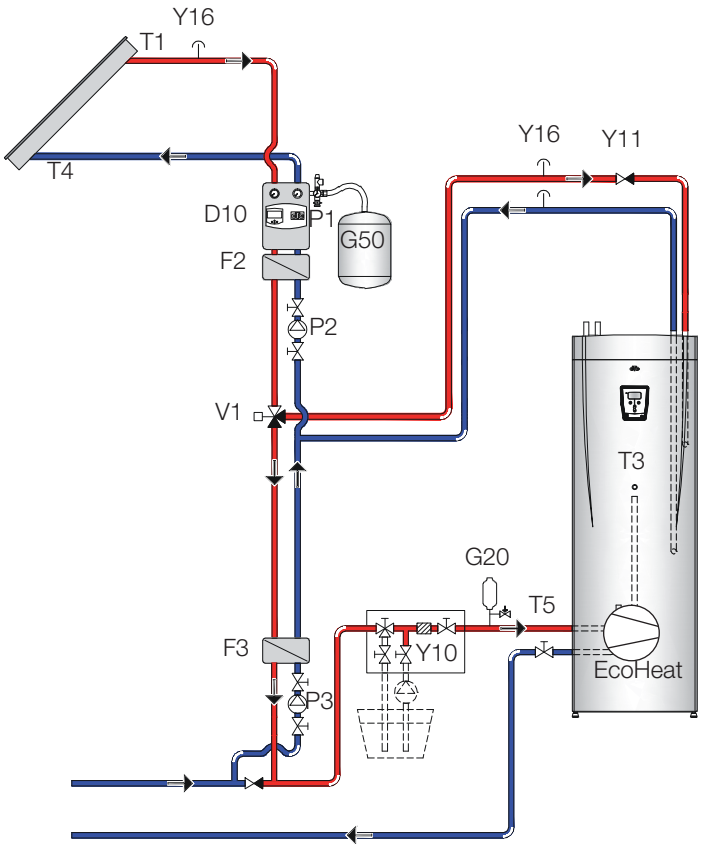
9.2 System 2 EcoEl + Buffer tank

System configuration for systems where EcoSol is combined with CTC EcoEl and an extra buffer tank – a system which makes larger solar collector areas possible and thereby larger energy gains from the solar collector system (for best savings the system can be combined with CTC EcoAir).



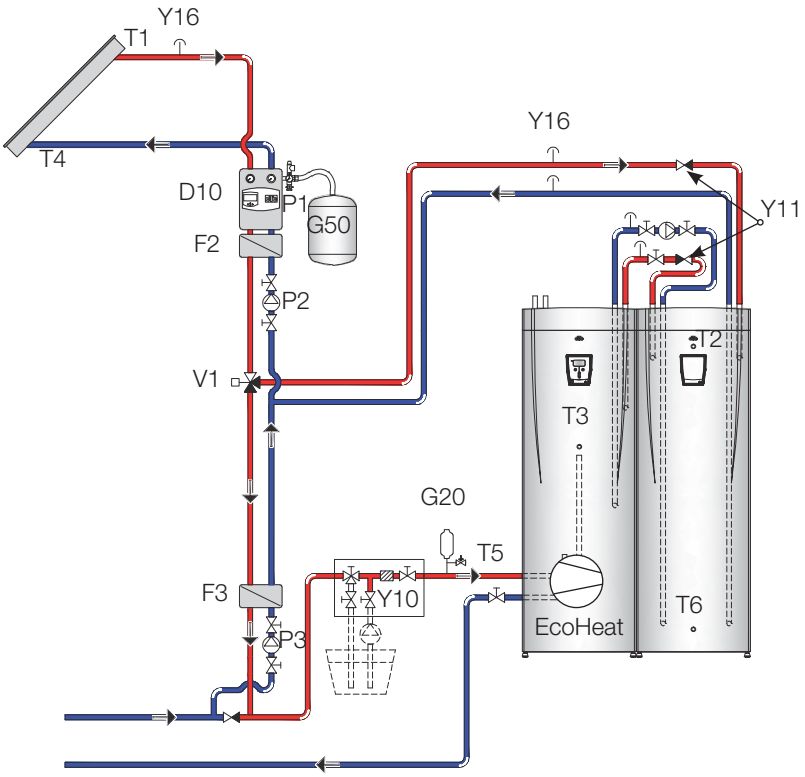
9.3 System 3 EcoHeat

System configuration for systems where EcoSol is combined with CTC EcoHeat (or EcoEl + EcoPart). The system makes larger solar collector areas possible as energy can be stored underground for the benefit of the heat pump in the form of a higher COP.



9.4 System 4 EcoHeat + Buffer tank

System configuration for systems where EcoSol is combined with CTC EcoHeat (or EcoEl + EcoPart) and an extra buffer tank. The system makes larger solar collector areas possible as the system has a larger water volume, and also because energy can be stored underground for the benefit of the heat pump in the form of a higher COP.



Symbol	Designation	Comment
D10	Central controller	Controller for EcoSol system 1 – 4
F2	Heat exchanger solar	
F3	Heat exchanger solar/brine	
G20	Expansion vessel brine	
G50	Expansion vessel solar	
M14	Charging pump HP	
P1	Pump solar	From solar collectors to heat exchanger
P2	Pump solar	From heat exchanger to EcoHeat/EcoEl
P3	Pump solar	From heat exchanger to brine
P4	Pump solar	From EcoTank to EcoHeat/EcoEl
T1	Solar sensor	Mounted in the collector
T2	Upper tank sensor	Only for system 2 and 4
T3	Sensor EcoHeat/EcoEl	Mounted in present sensor pocket
T4	Solar return sensor	Mounted on the copper tube
T5	Brine sensor	Mounted on the pipe from the ground source
T6	Lower tank sensor	Only for system 2 and 4
V1	3-way valve	
Y10	Filling equipment for brine	
Y11	One way valve	
Y16	Air venting valve	

10. Fluid system

The installation must be carried out in accordance with existing engineering standards and building regulations. On the solar side, the product must be connected to the expansion tank included, and the water side to an open or closed system. Adjust all installation settings according to the description in the chapter “First start”

Recommended installation sequence (fluid system):

1. Begin by thinking through how the system’s various components will be best located. Bear in mind that the expansion tank and adjacent equipment can get very hot; it is therefore advisable to site them out of reach to small children. Depending on space, various arrangements may be more, or less, advantageous. The most important thing however, is that flows move in the directions shown in the schematics on the first page. Generally speaking, bleed valves should be located at places suitable for facilitating start up and maintenance.
2. Attach the system module to the wall with suitable screws.
3. Install the safety fittings, the expansion tank and its included connection pipe.
4. Continue to configure the system with heat exchangers, circulation pumps and valves (the extent will depend on the type of system). Sometimes it can be advantageous to assemble this separately, for subsequent attachment to the main unit.
5. Ensure that the product (EcoHeat/EcoEl/EcoTank) you are connecting to is shut off, then carry out the connection. The procedure will vary, depending on which EcoHeat/EcoEl version the solar circuit is to be connected to. EcoTank is equipped with connections according to point (A) below.

   A. If the product is fitted with two connection plugs at the front of the tank, these should be used for best results. Connection is made by removing the plugs and replacing them with two right-angle compression fittings, which should point upwards. In the top panel there are prepared holes for 22 mm copper pipes (for a more detailed description of pipe connection, refer to the respective product manual).
   Note: Bear in mind that the direction of flow must be such that water is drawn from the bottom section of the tank and is returned to the upper.

   B. Earlier EcoHeat/EcoEl models are not prepared for tank connection. Connection must therefore be carried out by inserting T-joints in the tank primary and return pipes. These run from the tank’s right and left sides respectively. Note: Bear in mind that the flow direction must be such that water is drawn in through the return pipe (right side) and is delivered through the supply pipe (left side).

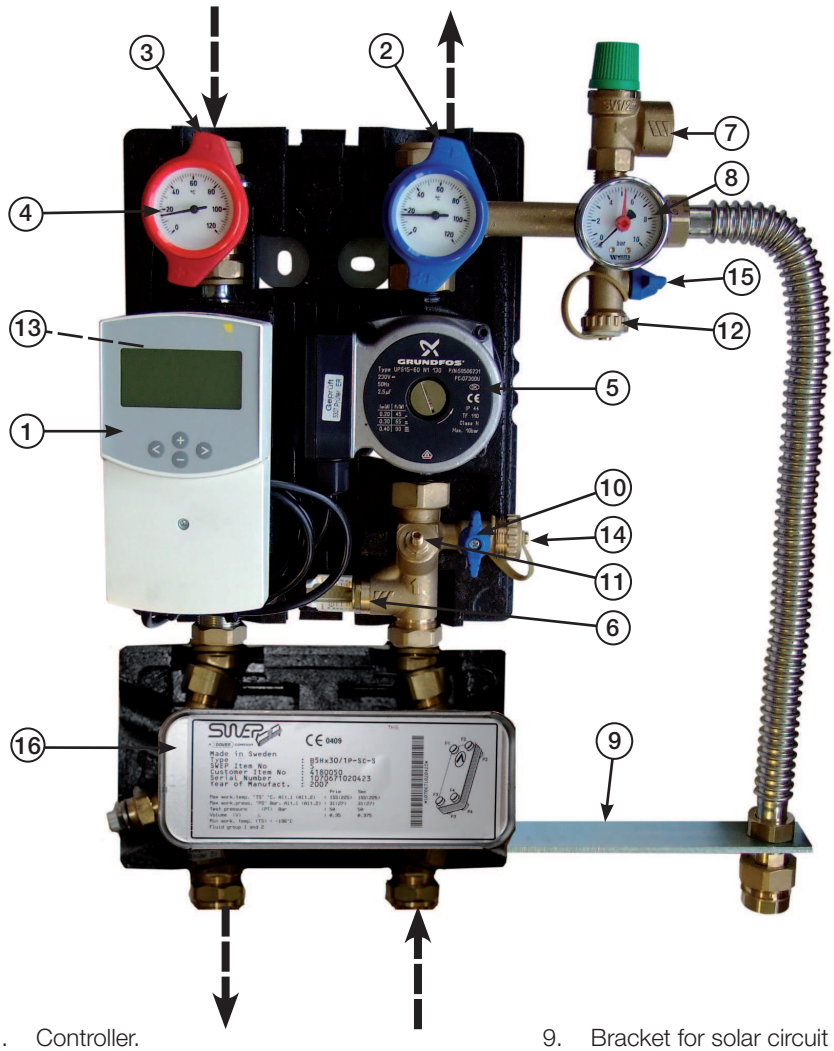
   C. Some EcoHeat/EcoEl models have solar circuit connections pointing towards the rear. If there is space, it is preferable to use these connections. The direction of flow must be such that water is supplied through the bottom connection and is returned through the upper.
   In cases where these connections are difficult to access, connection may be made in the manner described in point B above.som beskrivs i punkt B ovan.

6. Carry out the connection between EcoTank and EcoHeat/EcoEl (applies to systems 2 and 4). Connection to EcoHeat/EcoEl is performed in the manner described in the above point. The direction of flow must be such that water is taken from the upper EcoTank connection and is returned to the upper EcoHeat/EcoEl connection. To avoid self-circulation and consequent emptying of EcoHeat/EcoEl during slow operations with low solar energy supply, a non-return valve should be fitted between the products.
7. Fill the radiator system and vent thoroughly.
8. If connection to the heat pump's brine system must be carried out (systems 3 and 4), secure the flow rate in the brine system. Use copper pipe of at least ø22 mm for the connection. The direction of flow must be such that the solar heating system is connected at the ground return before entering the heat pump. Connection is most suitably made at the filling connectors delivered with EcoHeat. For connections where brine fluid filling will take place, use two pcs. T-connectors as shown in the system figure. Take-offs to the solar collector are made through these T-connectors.
   Fill and bleed the system according to the instructions in the EcoHeat manual. Close one of the valves in the solar circuit to avoid flow taking this route. When the brine system is completely air-free, the valves to this circuit are closed at the same time as the valves in the solar circuit are opened. This circuit is then vented in the same manner. Note: Before start-up, check that the valves are set so that the direction of flow is as described in the system description (the entire flow must pass through the solar circuit heat exchanger).
9. The heating system may now be started again. Check that EcoHeat/EcoEl are functioning normally. If the ground source heat pump is connected to the solar circuit, check that the in/out brine fluid temperature differential is at a suitable level. Much too high a temperature differential can mean that flow to the heat pump is too poor. The temperature differential should normally not exceed 7 °C.
10. Connect the solar collector to the main unit. Use copper pipes of the correct dimensions (dependent on number of solar collectors; see manual). Connection must take place according to the instructions in the chapter "Installing solar collectors". To facilitate installation there is an accessory kit comprising 15 m ready-insulated double pipes.
    Note: Do not install extra shut-off valves in the solar circuit (to avoid system damage in the event of faulty settings).
    In smaller systems (one to two solar collectors) extra bleed valves need not be installed in the solar circuit, but in larger systems it is preferable to install an extra bleed valve (not automatic) at the highest point on the roof.
    Note: To avoid risk of damage due to high temperatures, this system should not be filled until all sensors are installed.
11. Run through the entire installation and ensure that flow directions and valve settings are correct. Also check that all pipes are properly insulated and that the right type of insulation has been used.

11. System module

The system module is the heart of the system. The central controller, solar collector circulation pump, flow meter, expansion tank and the safety valve are all located here. For a detailed description of where the various components are situated, see the illustration below.

The main unit must be installed using the screws included or other fasteners suitable for the underlying structure. The safety assembly must be screwed in place as shown in the illustration under chapter Connection. The expansion tank must be attached to the safety assembly with the corrugated hose. The tank must be installed hanging in the included attachment bracket, item No. 10.



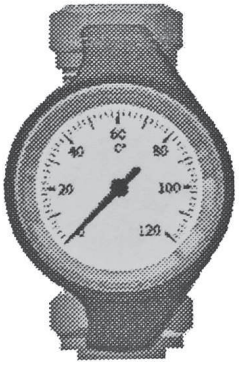
1. Controller.
2. Thermometer valve for solar collectors.
3. Thermometer valve from solar collectors.
4. Temperature measuring, supply line.
5. Circulation pump.
6. Flow meter.
7. Safety valve 8 bar.
8. Pressure gauge.
9. Bracket for solar circuit expansion tank.
10. Bleed valve, for filling.
11. Throttle valve.
12. Filling connection.
13. Bleed valve, return line (obscured).
14. Return connection.
15. Filling valve.
16. Solar heat exchanger.

11.1 Shut-off valves/thermometers

There is an analogue temperature gauge in the system module which displays the temperature of the fluid to and from the solar collector. The hot fluid pipe from the solar collector must be connected to the red valve. In the same way, the return pipe with the cold flow must be connected to the blue valve. The valves can be set in two different positions, as described in the figures below:

- In normal operational circumstances, the valves must be set according to figure 1. The flow then passes right through the valve, which is open to the expansion tank and the safety valve.
- When service is to be carried out on the system (e.g. change of circulation pump), the valves must be set in the position shown in figure 2.
  Note: It is still open to the expansion tank to avoid the risk of a system burst owing to high temperatures in the solar collector.

Figur 1
0° = operating position

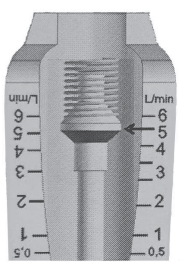


Figur 2
90° = closed

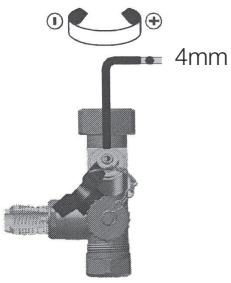
11.2 Flow meter/adjustment valve

An illustration of the flow meter is shown below. Suitable system flow is governed by the temperature differential between the solar collector supply/return. During good insolation the differential must be at least 10°C. Flow is adjusted primarily by circulation pump speed. For fine adjustments the valve by the flow meter may be used. When a suitable flow has been set, the central controller must be adjusted in order for output and energy metering to be correct.

Flow meter

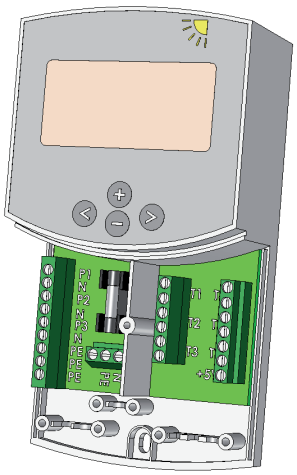


Liter/min



11.3 Central controller

The central controller contains all the electronics necessary for running the installation. Temperature sensors, circulation pumps and the valves are connected to it. The central controller should be installed with its own main circuit breaker and earth leakage circuit breaker. Ensure that the main unit is not installed in a location which will expose the central controller to the risk of damp. A description of how the central controller works can be found in the chapter “How the central control system works”. **Note**: Before commencing work on the central controller, read the following instructions carefully:

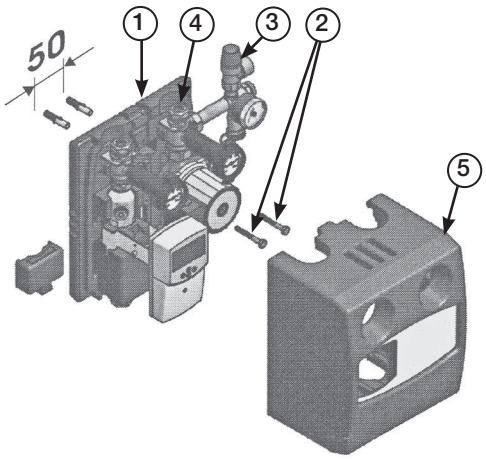


- Always switch off the power before starting work on the centre. Sensors must not be installed if the central controller is live.
- All electrical installations must be carried out by a qualified electrician.
- The central controller is sensitive to water and is not damp-proof.
- If the central controller appears damaged it must absolutely not be started.
- Ensure that all wiring is properly installed with strain relief.
- Never start the central controller without its protective cover being properly secured.

11.4 Connection

Installing the system module

1. Open the system module’s cover by removing the front (5), then attach the operations unit with the screws (2) at a suitable eye level.
2. Then attach the safety assembly (3) to the connection point (4); the assembly is packed separately in the box. Attach the tank bracket, bearing in mind that the hose must reach.
3. When all pipes have been run, and no leaks are present, replace the cover.



Depending on which system is in use, varying numbers of power-consuming components will be switched on. The description below applies to system 4. In cases where systems 1–3 are in use, disregard those components and sensors not required.

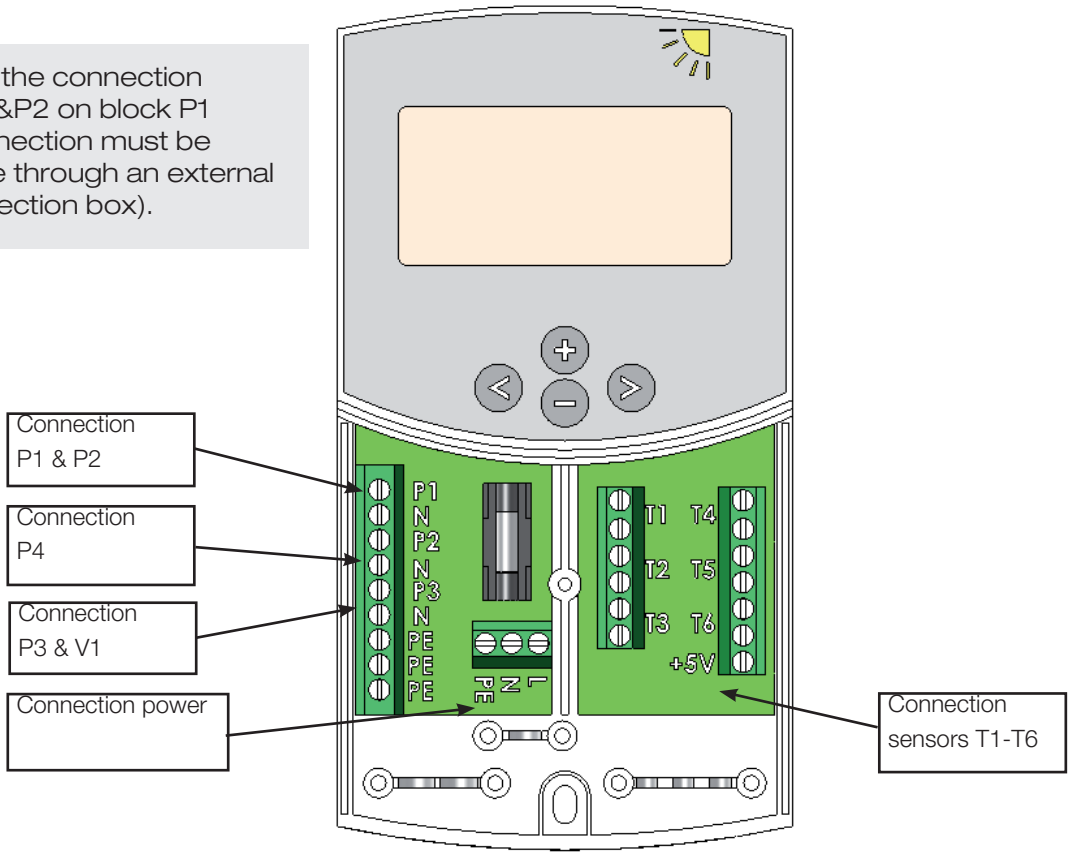
Note: Ensure that positive and negative are not transposed on any of the terminals, as this will result in faulty pump directions.

(For nomenclature, see descriptions of respective systems under Systems configuration).

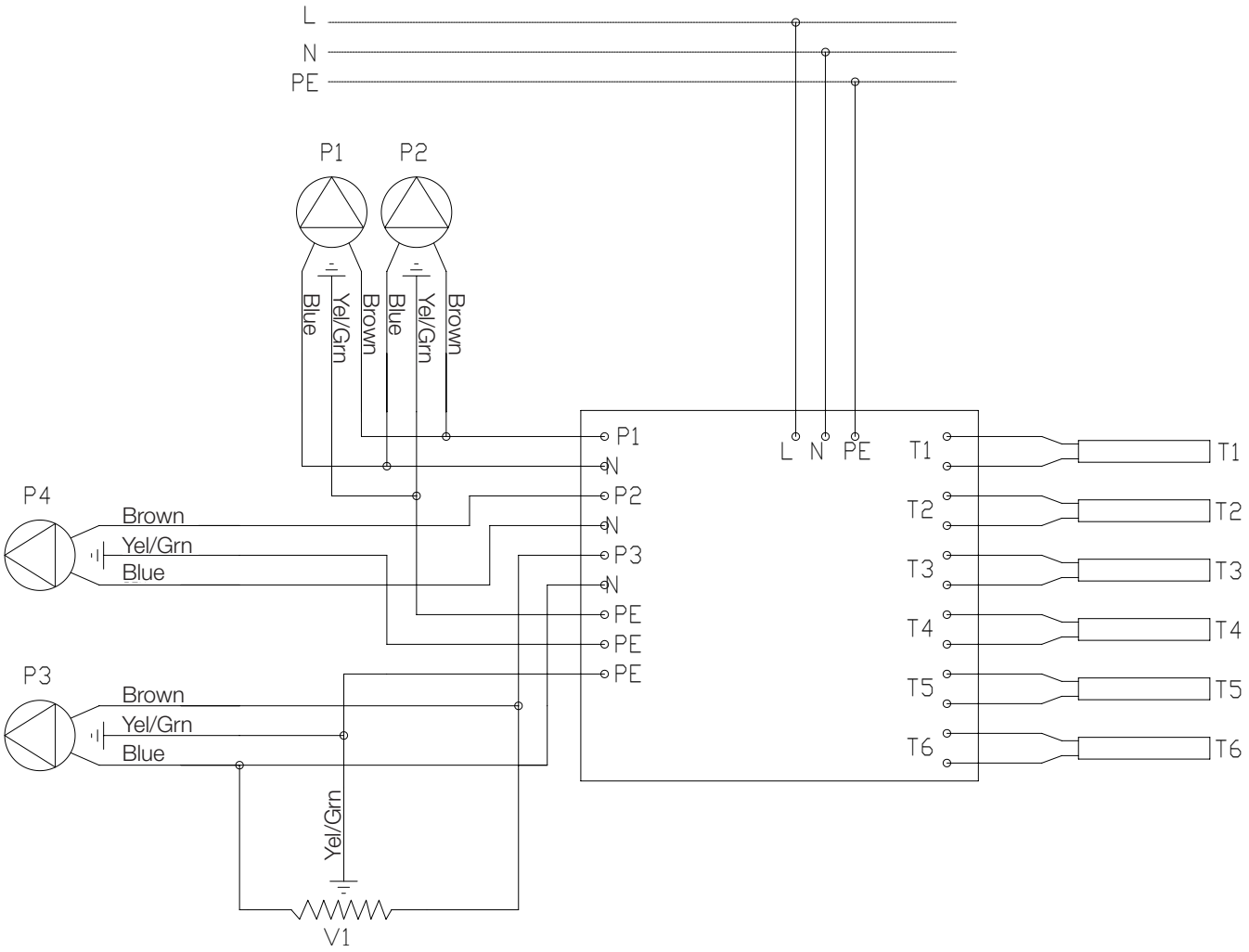
Terminals:	Power-consuming components:	Comments:
P1, N & PE	Charge pump P1 & laddpump P2	rpm controlled
P2, N & PE	Charge pump P4	rpm controlled
P3, N & PE	Charge pump P3 & Ventil V1	
L, N & PE	Supply, ~ 230 V, 50 Hz	

! If different circulation pumps than included are used be aware of maximum allowed currents. Low energy (A-classed) circulation pumps must not be used with the solar controller!

! Note the connection of P1&P2 on block P1 (Connection must be made through an external connection box).



12. Circuit diagram



Circuit diagram showing how circuit breakers are connected and how sensors are installed (system 4). Some components not required for systems 1–3.

13. Sensors

Depending on the system to be connected, three to six sensors are required. The sensors are of type PT1000. The resistance the sensors should have at various temperatures is shown below. The table can be useful for identifying a defective sensor during troubleshooting.

13.1 Temperature sensor resistances

Temperature in ºC	Resistance Ω	Temperature in ºC	Resistance Ω
-10	960	60	1232
0	1000	70	1271
10	1039	80	1309
20	1077	90	1347
30	1116	100	1385
40	1155	120	1461
50	1194	140	1535

When installing sensors there are a couple of things to remember:

- Ensure that good physical contact is made when the sensor is installed. Preferably, use some form of heat conduction compound on the mating surface.
- Some of the sensors will require extensions. Depending on the length of the extension wiring, the following materials should be used:

  Up to 15 m ➔ 2 x 0,5m^2

  Up to 50 m ➔ 2 x 0,75m^2

- Avoid running sensor wiring alongside high voltage cables.

Sensors installation:

T1: Solar sensor: (Red color) install in the solar collector. For placement see the manual for the solar panel.

T2: Tank sensor: Install in the bottom section of the extra buffer tank (systems 2, 4).

T3: EcoHeat/EcoEl: Install in immersion tube on EcoHeat/EcoEl (in the middle of the tank). Ensure that contact with the immersion tube wall is good.

T4: Temperature in to collector: Install on the copper pipe in to the solar collector. Fasten with heat resistant cable ties and heat conduction compound.

T5: Brine temperature: Install on brine pipe in flow direction toward the heat pump. Use cable ties and heat conduction compound. (Systems 3, 4)

T6: Tank sensor: Install in the lower section of the extra buffer tank (systems 2, 4).

Connect each sensor to its respective terminal posts on the central controller. Ensure that the sensors are installed in the correct locations and with good surface contact. Faulty sensor installation will result in the system not performing as it should.

! Only use the sensors on the solar panels that can resist temperatures up to 180 °C (Red color).

14. Dimensioning

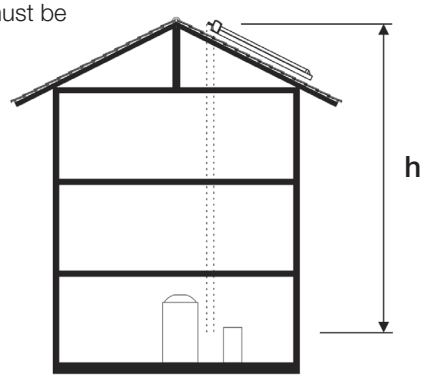
General recommendations.

14.1 Expansion vessel

The expansion vessel absorb excess water pressure, caused by thermal expansion as the water is heated. The main task for the expansion vessel is to host the whole systems expansion and all the fluid in the solar panels, in case of stagnation.

An 18 litre expansion vessel is recommended for 1-6 flat solar panels, with a (double) pipe length up to 15 m (CU Ø12 - Ø18 or stainless DN 16)

For Vacuum panels an 18 litre expansion vessel is enough for 1-4 solar panels, with a (double) pipe length up to 15 m (CU Ø12 - Ø18 or stainless DN 16).
For larger systems and other pipe dimensions, the expansion vessel must be dimensioned based on given conditions.



Height conditions (m)	Primary pressure (bar)	Working pressure (bar)
0 - 5	2,0	2,5
5 - 10	2,5	3,0
10 - 15	3,0	3,5
15 - 20	3,5	4,0

14.2 Flow and pressure drop

Flat plate collectors								
Aperture area	m²	2,3	4,6	6,9	9,2	11,5	13,8	16,1
Flow	l/min.	1,5	2,5	3,5	4,5	5,5	6,5	8
Pipe dimension	mm	12	15	18	18	22	22	22
Δ T	°C	14	17	18	19	19	20	19

Vacuum collectors								
Aperture area	m²	2,2	4,5	6,7	8,9	11,2	13,4	15,6
Flow	l/min.	1	2,5	3,5	4,5	5,5	6,5	7,5
Pipe dimension	mm	12	15	15	18	22	22	22
Δ T	°C	14	16	18	18	19	19	19

Pressure drop EcoSol										
q [l/h]	50	100	150	200	250	300	350	400	450	500
q [l/min]	0,83	1,67	2,50	3,33	4,17	5,00	5,83	6,67	7,50	8,33
q [l/s]	0,01	0,03	0,04	0,06	0,07	0,08	0,10	0,11	0,13	0,14
Δp [kPa]	11,50	13,00	14,50	16,00	17,50	19,00	20,50	22,00	23,50	25,00
Δp [mVp]	1,173	1,326	1,479	1,632	1,785	1,938	2,091	2,244	2,397	2,55

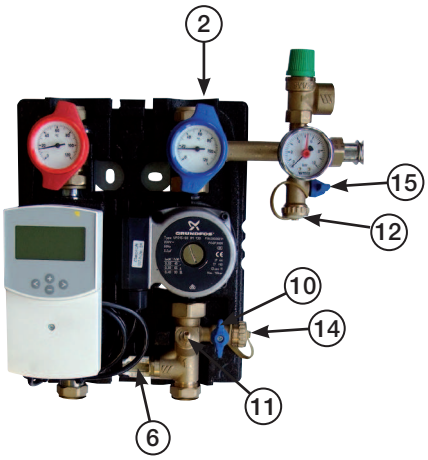
15. Filling the system

The heat-transfer fluid used is Tyfocor. The fluid is free from Amine-Nitrite and phosphates and is biodegradable. The fluid contains additives that are necessary for preventing corrosion and foaming. Tyfocor is ready to use and should not be mixed with other types or brands. Refilling and venting is done when the panel is cold i.e. in the morning. A high speed pump should be used when refilling the system to remove all air from the system.

> ! The heat transfer fluid is prone to ageing and will lose its protection over time. It is therefore necessary to replace the system heat transfer fluid after approx. 5 years' operations.

Filling and bleeding

1. The system package must be switched off when refilling.
2. Check the pressure in the expansion tank according to the table in the chapter Dimensioning.
3. Before refilling commences, shut the blue thermometer valve (2) on the system package.
4. Attach the refill hose from the filling pump to the refill connection (12) on the system package.
5. Attach the reservoir tank's return hose to the return connection (14) on the system package.
6. Open the small blue valves (10, 15)
7. Fill the filling pump reservoir with Tyfocor.
   N.B. The reservoir lid must be open.
8. Start the filling pump.
9. After about 30 minutes, check the expansion tank: Shut the vent valve (10) let the pressure build to approx. 5-6 bar. Tap and feel that the tank is now filled with fluid. Then open the tap again. Check that the pressure tank empties. This is also done to choke out any air; do this until all air is out of the system The fluid in the reservoir should not contain any foam.
10. The Tyfocor fluid must circulate for at least 30 minutes for flat-plate collectors and 60 minutes for evacuated tube collectors. Also vent the circulation pump by opening and closing the blue thermometer valve (2).
11. When the Tyfocor is completely ready, increase the pressure to approx. 5 bar by closing the vent valve (10). Once the pressure has reached approx. 5 bar, shut the filling valve (15) and switch off the filling pump.
12. Adjust the working pressure by opening the vent valve (10) until the working pressure is 0.5 bar above the set pressure in the expansion tank.
13. Now open the blue thermometer valve (2). The system is now full.
14. Power up the control panel, adjust the flow using the table in the chapter Dimensioning.
    N.B. the pump speed must be 100 % when the flow is adjusted on the throttle valve (11) with the flow meter (6). Go into the "OPERATION" menu and select manual, set the pump at 100 % once the flow is adjusted ensure that the pump is set at 0 % again.
15. Change the "OPERATION" menu from automatic to active. The controller is pre-set to system 1. After the controller is switched on, there is one minute in which this can be changed. Read more about various systems and system settings in the chapter Main menu.
16. After switching on, any further bleeding must be performed through the bleed valve on the return, located beneath the insulation behind the display. This is done using a radiator key. If a lot of air escapes and the pressure falls, this needs to be increased again.
17. The solar unit is now operational. After operating for a while, the pressure and flow should be checked.



High speed pump.

16. First start-up

Before the installation is put into use, the engineer should run through the following points::

Before first start

1. Ensure that all subsystems are properly filled and vented.
2. Check over the whole system to ensure there are no leaks. Also check that all pipes are properly insulated with the right type of insulation.
3. Check that all sensors are properly installed and connected according to instructions.
4. Check that all wiring is correctly connected to the system unit. Note: Don't forget to check strain reliefs!
5. Check the primary pressure in the expansion tank (see table page 51 for appropriate pressures).
6. Check flow directions are according to instructions.
7. Start the main component (EcoEl/EcoHeat) according to the instructions in the product's operating manual.
8. If the installation in question is of type 3 or 4, check the flow in the brine circuit (when the heat pump is running the temperature differential for the brine outlet/ return should not be greater than 7 °C).

First start

1. Power up the main unit with the safety breaker. The window in the central controller should illuminate.
2. Go to the menu "Information/Service/System" and step to the correct system (1–4).
   Note: Must be done immediately as this parameter will lock after a brief period if no selection is made. If the parameter locks, cut the power and start again.
3. Go to the menu "Information/Operation/Manual testing" Test manual start up of all circulation pumps to check for function and connection.
4. Go to the menu "Information/Operation/Automatic" and activate it. The system is now started.
5. If required: Make any adjustments necessary to optimize the system.
6. Walk through the installation and the central controller with the property owner. Discuss how operations and maintenance must be performed (see chapter "Operation and maintenance").
7. Note: If the system is inactive and the sun is shining, the pipes can get very hot (> 150°C) at start up.

Enertech Group

Försäkran om överensstämmelse

Déclaration de conformité

Declaration of conformity

Konformitätserklärung

Enertech AB

Box 313

S-341 26 LJUNGBY

försäkrar under eget ansvar att produkten,

confirme sous sa responsabilité exclusive que le produit,

declare under our sole responsibility that the product,

erklären in alleiniger Verantwortung, dass das Produkt,

CTC EcoSol

som omfattas av denna försäkran är i överensstämmelse med följande direktiv,
auquel cette déclaration se rapporte est en conformité avec les exigences des normes suivantes,

to which this declaration relates is in conformity with requirements of the following directive,

auf das sich diese Erklärung bezieht, konform ist mit den Anforderungen der Richtlinie,

EC directive on:

Pressure Equipment Directive 97/23/EC, § 3.3

(AFS 1999:4, § 8) Electromagnetic Compatibility (EMC) 89/336/EEC

Low Voltage Directive (LVD) 73/23 EEC, 93/68/EEC

Överensstämmelsen är kontrollerad i enlighet med följande EN-standarder,

La conformité a été contrôlée conformément aux normes EN,

The conformity was checked in accordance with the following EN-standards,

Die Konformität wurde überprüft nach den EN-normen,

EN 719
EN 729-2
EN 288-3
EN 1418
EN 287-1
EN 10 204, 3.1B
EN 10 025, S 235 Jr-G2

EN 55014-1 /-2
EN 55104
EN 61 000-3-2
EN 60335-1
EN 50165

Ljungby 2007-09-13

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Technical Manager

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Enertech Group