162 105 42-4 2019-07-04

Installation and Maintenance Manual

CTC Expansion Energyflex

accessories for CTC EcoHeat 400/
CTC EcoZenith i250/ CTC GSi 8-12-16 /CTC GS 6-8/
CTC EcoVent i350F

IMPORTANT
READ CAREFULLY BEFORE USE
KEEP FOR FUTURE REFERENCE

Installation and Maintenance Manual

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CTC Expansion Energyflex

Delivery includes

1 x electrical connection box with expansion card

2 x RJ-45 communication cables

2 x NTC 22k sensors

1 x manual

Table of Contents

As your own reminder

Fill in the information below. It may come in useful if anything should happen.

Product :	Manufacturing number :
Installer:	Name:
Date:	Tel. no.:
Electrical installer:	Name:
Date:	Tel. no.:

Enertech AB provides the information with reservation for any typing errors and subject to modification.

Free with your new product

CTC Expansion Energyflex

With a CTC Expansion card you can control your solar collectors directly from your CTC product, and that gives you an integrated control system.

Positioning

Place the control unit indoors on a wall next to the CTC EcoZenith i250 or CTC EcoHeat 400. The control unit must be positioned so that normal service procedures can be carried out. There should be at least 0.5 m of free space in front of the unit. Ensure that the screws fixing the cover to the unit are easily accessible.

Safety instructions:

Installation must be carried out by a qualified electrician.

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

Children should be supervised to ensure that they do not play with the appliance.

System requirements:

Program version for the display card must be 2014-12-19 or later.

The CTC Expansion Energyflex provides the following products with solar and pool controls:

CTC EcoHeat 406	CTC EcoZenith i250L	CTC GSi 16
CTC EcoHeat 408	CTC EcoZenith i250H	CTC GS 6
CTC EcoHeat 410	CTC GSi 8	CTC GS 8
CTC EcoHeat 412	CTC GSi 12	CTC EcoVent i350F

(Diff thermostat function included as standard in the above products)

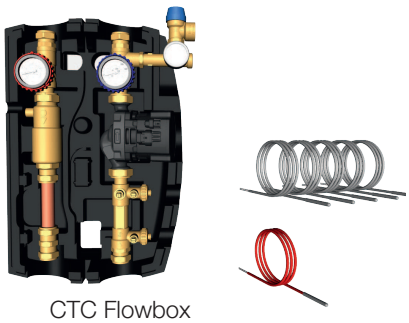
1. Technical data

Supply	230V 1N~
Max. fuse size	10 A
Total max. load CTC Expansion Energyflex	10 A
Max. load relay output	4 A
Electrical data diverting valve	230V 1N~
Sensor (protective extra low voltage), NTC 22k, °C/ohm	0/66k, 10/41.8k, 15/33.5k, 20/27.1k, 25/22k, 30/18k, 35/14.8k, 40/12.2k, 50/8.4k, 60/6.0k, 70/4.3k, 80/3.1k, 90/2.3k, 100/1.7k
Solar panel sensors*, PT1000 type, °C/ohm	-10/960, 0/1000, 10/1039, 20/1077, 30/1116, 40/1155, 50/1194, 60/1232, 70/1271, 80/1309, 90/1347, 100/1385, 120/1461, 140/1535
Measurements (w x h x d)	479 x 283 x 121 mm

Accessories

CTC's product range includes a number of accessories for simple installation and optimum operating performance.

The most important accessories for solar energy and Energyflex are shown below.



CTC Flowbox

Installation kit GSi 12 EVK

Energyflex kit 400

Pipe kit, pre-bent pipes, connections and insulation for "solar output".

2. Energyflex

This section is for CTC EcoHeat 400 / CTC EcoZenith i250. See the manuals for CTC GSi 8-12-16, CTC GS 6-8, CTC EcoZenith i350 and CTC EcoVent i350F for more information.

Energyflex is a collective term that describes CTC's unique opportunity for maximum flexibility and combining difference heat sources in a simple way. The most common combination is a heat pump and electric boiler.

It is worth noting here that when installed the CTC EcoZenith i250 can serve as an electric boiler alone, but it can subsequently be augmented with:

- CTC EcoPart Heat Pump (ground source))
- CTC EcoAir Heat Pump (air to water)
- Solar Energy

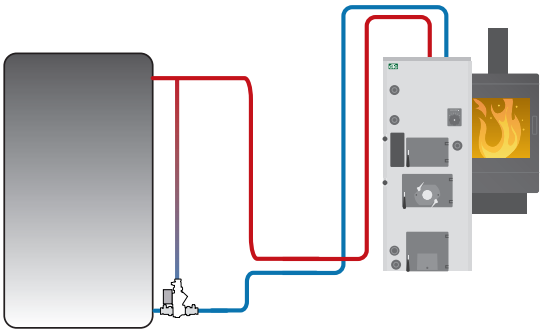
The CTC EcoHeat/EcoZenith now has integrated functionality for simple augmentation with

- Solar Energy
- Pool
- Wood-Fired Heating

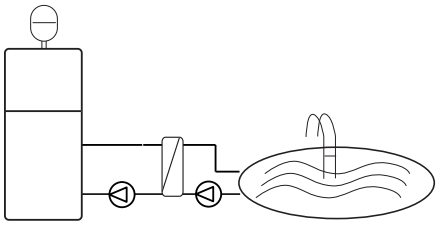
Regarding wood-fired heating:
The integrated "Differential thermostat function" control initiates the charge from, e.g., the existing wood-fired system or fireplace when the temperature is higher than it is in the CTC EcoHeat/EcoZenith i250

Bear in mind that it can also be a good idea to install an automatic charger that can protect the wood-fired system from condensation, etc

If the wood-fired system needs more water than the 223 l contained in the product, the system needs to be supplemented with an accumulator tank.



Example of wood-fired system with group of chargers



Energyflex can also be used to draw energy, e.g. to heat a swimming pool

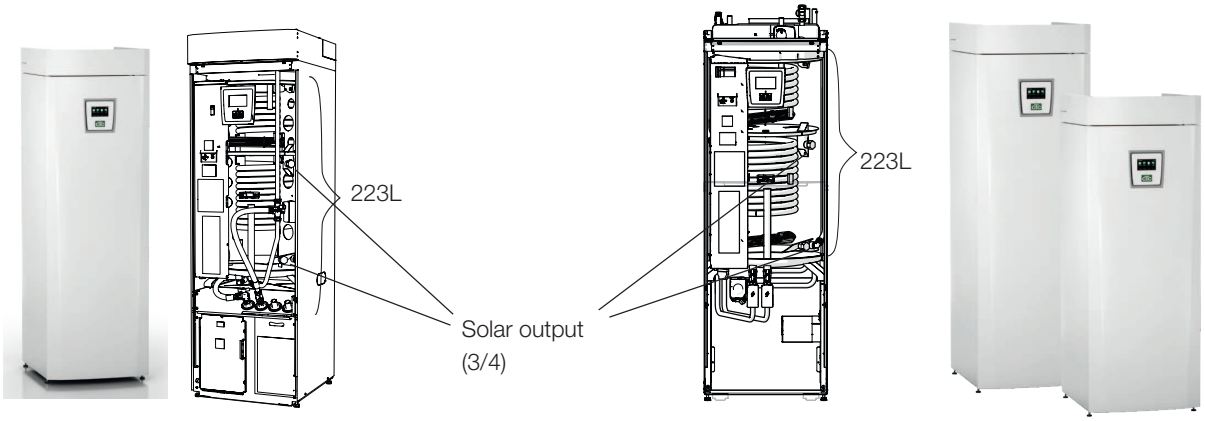
! Connecting external systems can seriously affect the EcoZenith's operation and performance and can therefore produce undesirable effects if the system is not installed correctly.

If you are unsure how to make the connection, contact CTC for suggestions on how to install the system.

Schematic diagram only The installer adds expansion vessels, safety valves, etc., and sizes the system.

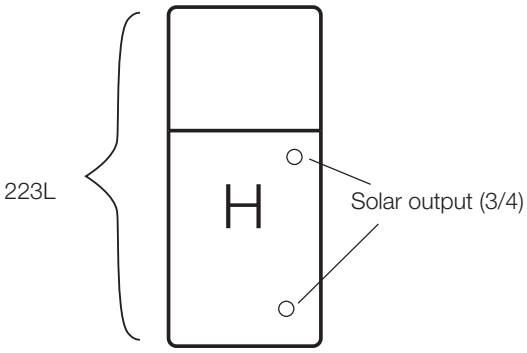
Introduction Energyflex - EcoSol

The CTC EcoHeat and CTC EcoZenith i250 H/L have a water volume of 223 l with layered disc and solar output. Solar output (3/4) is a part of Energyflex.



CTC Ecoheat 400
(223L with solar output and layered disc).

CTC EcoZenith i250 H/L
(223L with solar output and layered disc).

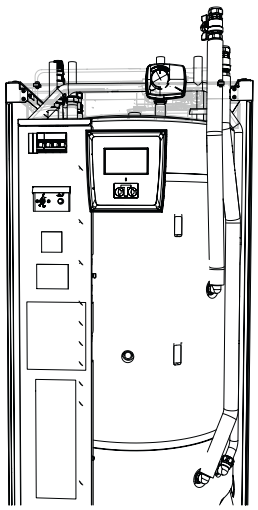


H. Symbol of tank volume in CTC EcoHeat 400 and CTC EcoZenith i250.
The tank in the CTC EcoHeat 400 and CTC EcoZenith i250 will be called the H-tank (main tank).

Energy can be collected through the solar outputs (solar panels, wood-fired boiler) or generated (swimming pool).

Available as accessories are pre-bent pipes with couplings and insulation to facilitate installation.

Also available as accessories are CTC Solar Control/Expansion Card



Accessory pipe kit Energyflex kit 400 fitted to H-tank

System options, Energyflex

The flexibility in the CTC EcoHeat and CTC EcoZenith i250 is optimised because the products contain functionality for five basic systems. These are:

Solar "system 1"

Solar "system 2"

Solar "system 3"

Diff thermostat function

Pool

Solar also offers the facility to recharge the drill hole or collect energy for an extra tank, with or without a solar coil.

*The differential thermostat function can be connected to an existing PCB in the CTC EcoHeat 400/CTC EcoZenith i250, while Solar systems 1, 2, 3 and Pool require the product to be supplemented with the CTC Solar Control/ Expansion Card accessory.

Explanations of system options

Solar system 1
Charge from solar panels only to the H-tank (H) in the CTC EcoHeat 400 or CTC EcoZenith i250

Solar system 2
Charge from solar panels only to the EcoTank buffer tank + CTC EcoHeat 400/CTC EcoZenith i250.

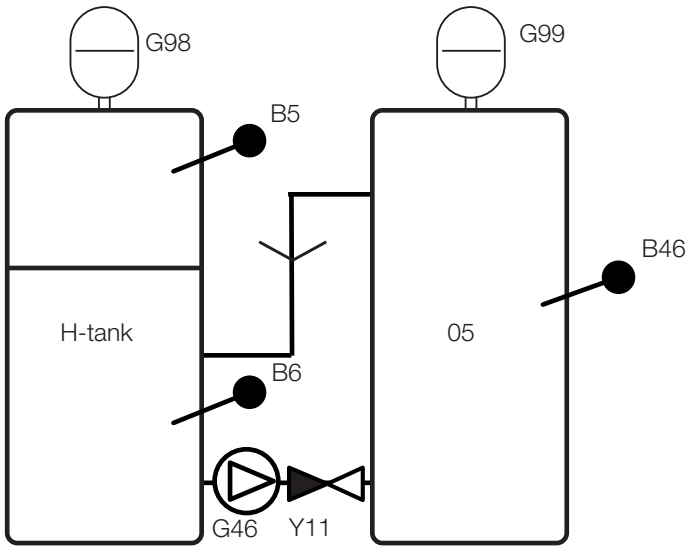
Solar system 3
Charge from solar panels either to X-Volume or CTC EcoHeat 400/ EcoZenith i250.

Using a diverting valve, the charge is prioritised either to the H-tank in the EcoHeat/EcoZenith i250 or to the external X-volume

Diff thermostat function
The differential thermostat function is used if you want to charge your EcoHeat/EcoZenith from an existing wood-fired boiler, a water-jacketed stove or another cheap heat source.

The function compares the temperature in the EcoHeat/EcoZenith and the external heat source. Charging starts when it is warmer in the external heat source.

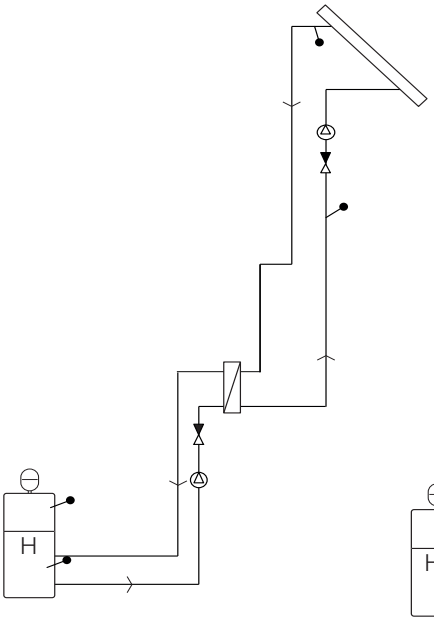
NB: For certain heat sources, e.g. solid fuel boilers, automatic chargers are recommended, among other things to counteract condensation in the fire box.



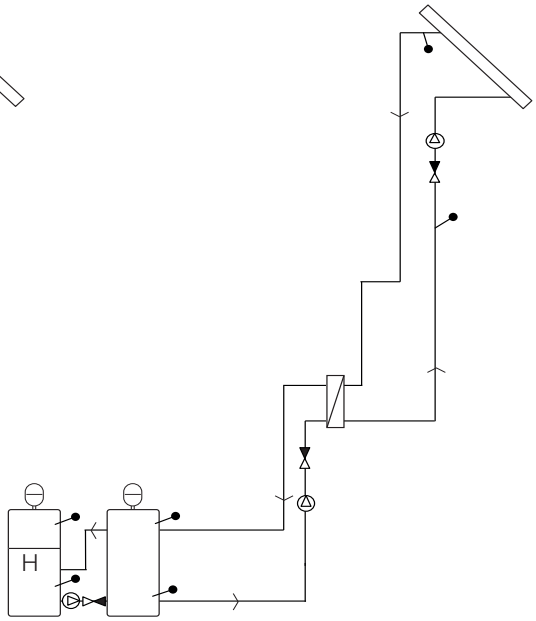
Schematic diagram for differential thermostat function

Schematic diagram only The installer adds expansion vessels, safety valves, etc., and sizes the system.

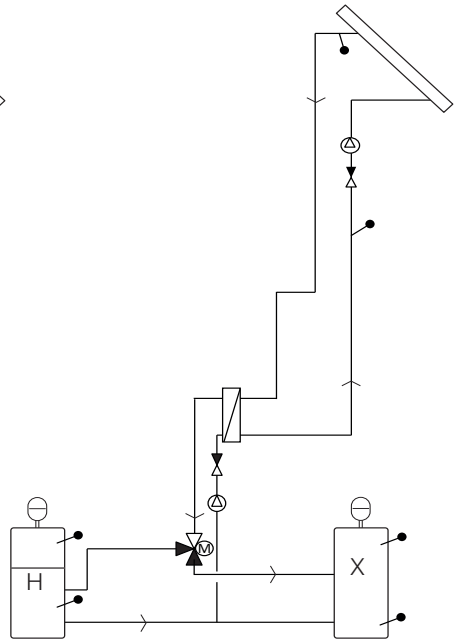
Energyflex-schematics-overview



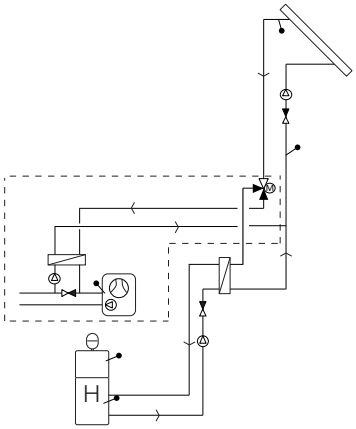
Solar: System 1



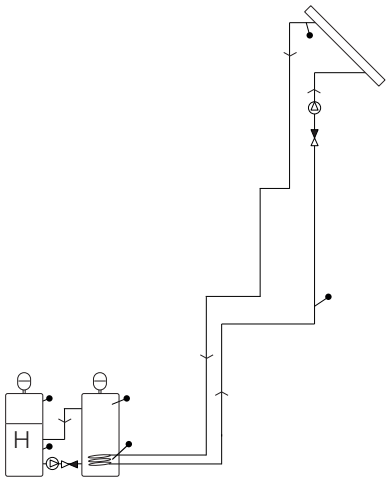
Solar: System 2



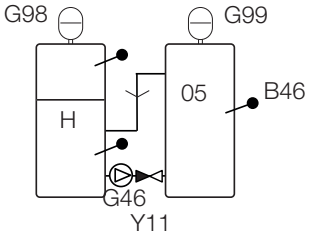
Solar: System 3



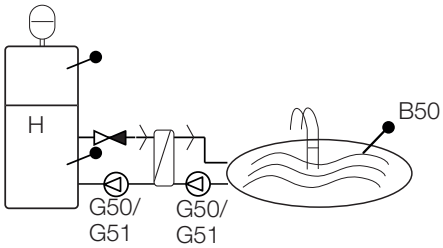
Solar: Heat drill hole option



Solar: alternative solar coil
(only system 2 with CTC EcoTank)



Differential thermostat system



Pool system

Schematic diagram only Installation engineer fits expansion tank, safety valves, bleeders etc. and sizes the system.

3. System structure

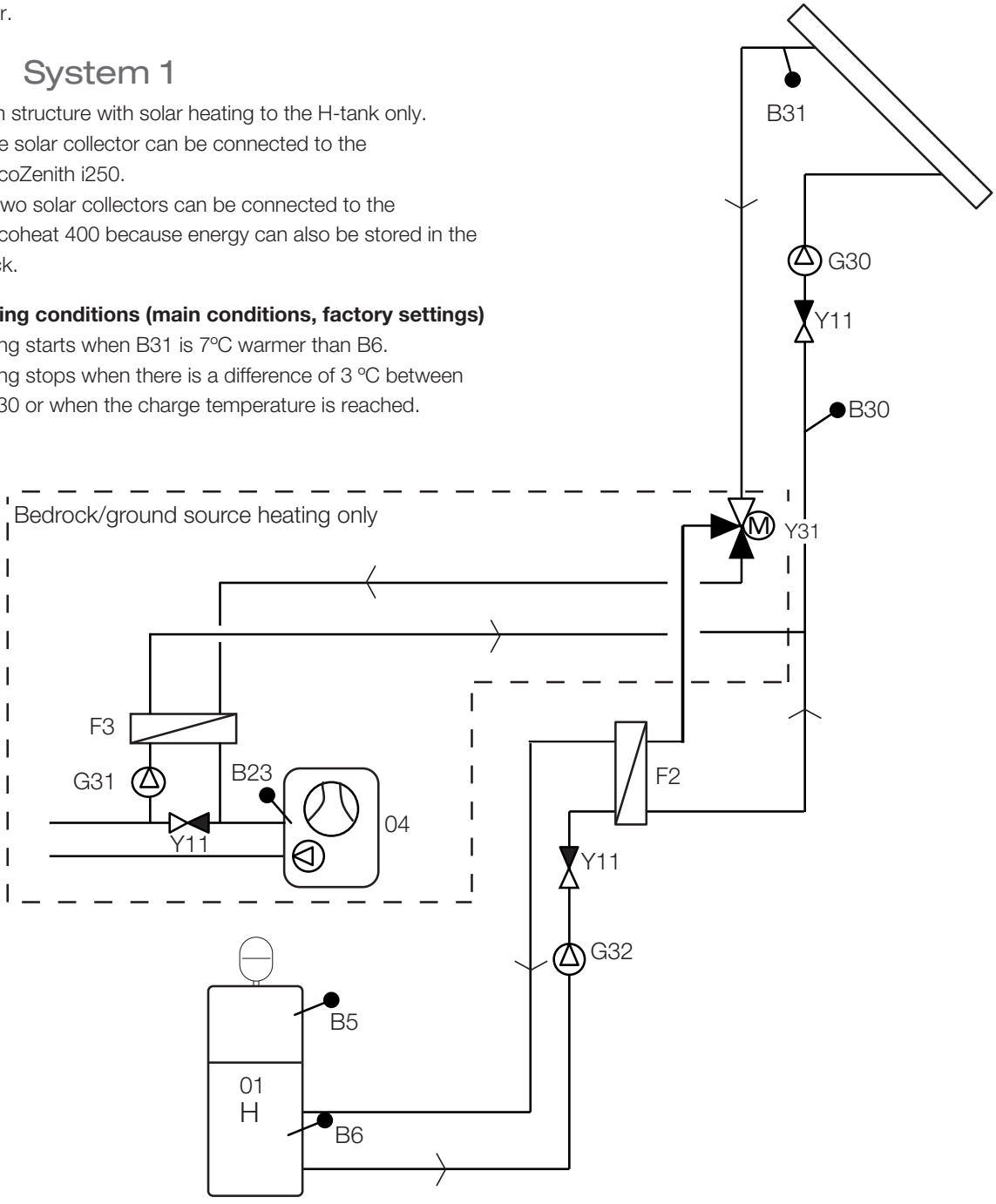
This section is for CTC EcoHeat 400 / CTC EcoZenith i250. See the manuals for CTC GSi 12, CTC GS 6-8, CTC EcoZenith i350 and CTC EcoVent i350F for more information.

The various systems which can be connected to the product are shown here. The number of solar panels which can be connected depends on the volume of water in the product/ tanks to which the solar panels are to be connected. These diagrams are just basic outlines, so the exact positioning may vary in reality. The system should be supplemented with bleeders, expansion tanks and safety valves etc. in suitable locations. You will find a list of components at the end of this chapter.

3.1 System 1

System structure with solar heating to the H-tank only.
A single solar collector can be connected to the CTC EcoZenith i250.
Up to two solar collectors can be connected to the CTC Ecoheat 400 because energy can also be stored in the bedrock.

Charging conditions (main conditions, factory settings)
Charging starts when B31 is 7ºC warmer than B6.
Charging stops when there is a difference of 3 ºC between B31/B30 or when the charge temperature is reached.



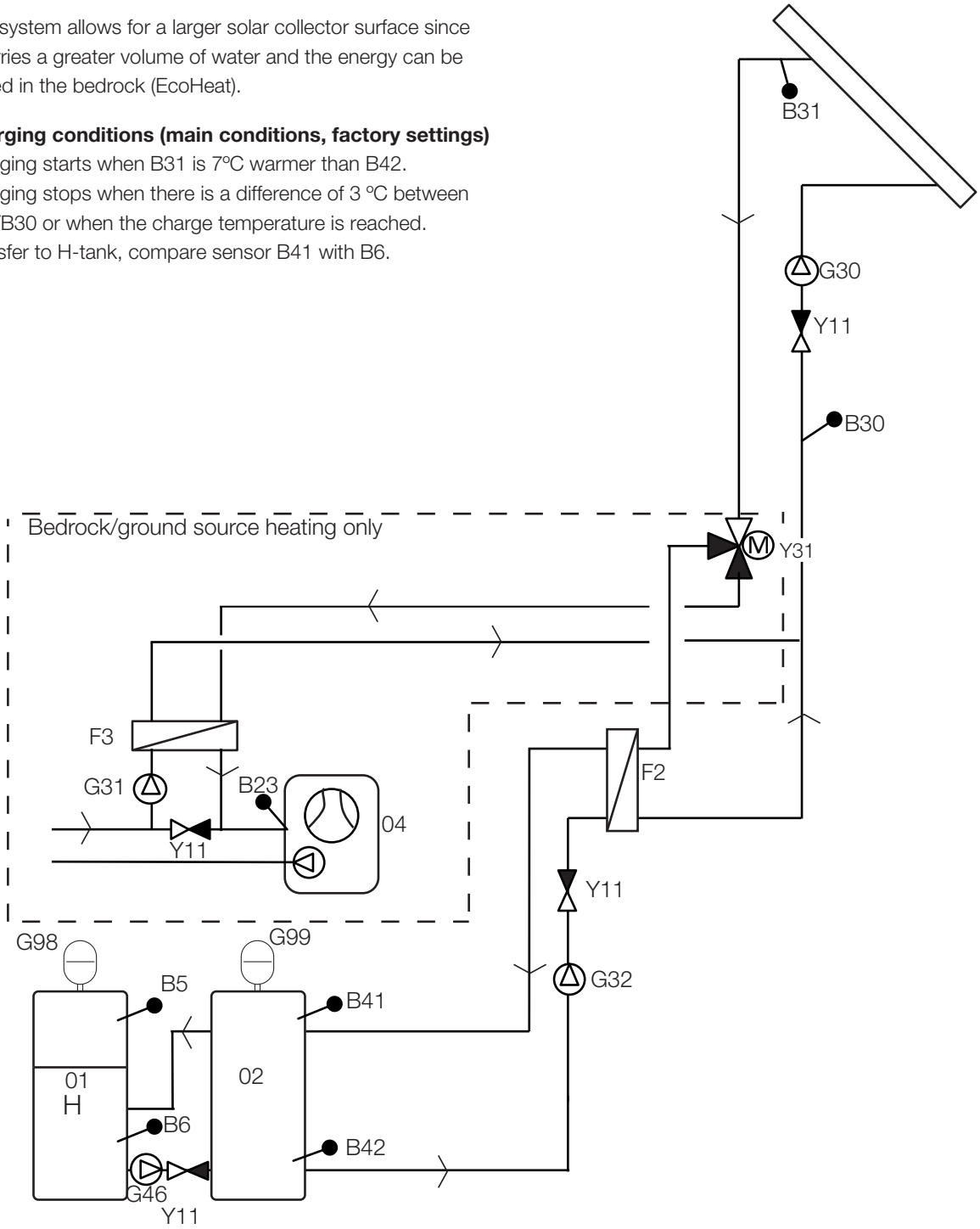
Schematic diagram only Installation engineer fits expansion tank, safety valves, bleeders etc. and sizes the system.

3.2 System 2

System structure with CTC Ecoheat 400 or
CTC EcoZenith i250 and EcoTank (buffer tank).

This system allows for a larger solar collector surface since it carries a greater volume of water and the energy can be stored in the bedrock (EcoHeat).

Charging conditions (main conditions, factory settings)
Charging starts when B31 is 7ºC warmer than B42.
Charging stops when there is a difference of 3 ºC between B31/B30 or when the charge temperature is reached.
Transfer to H-tank, compare sensor B41 with B6.

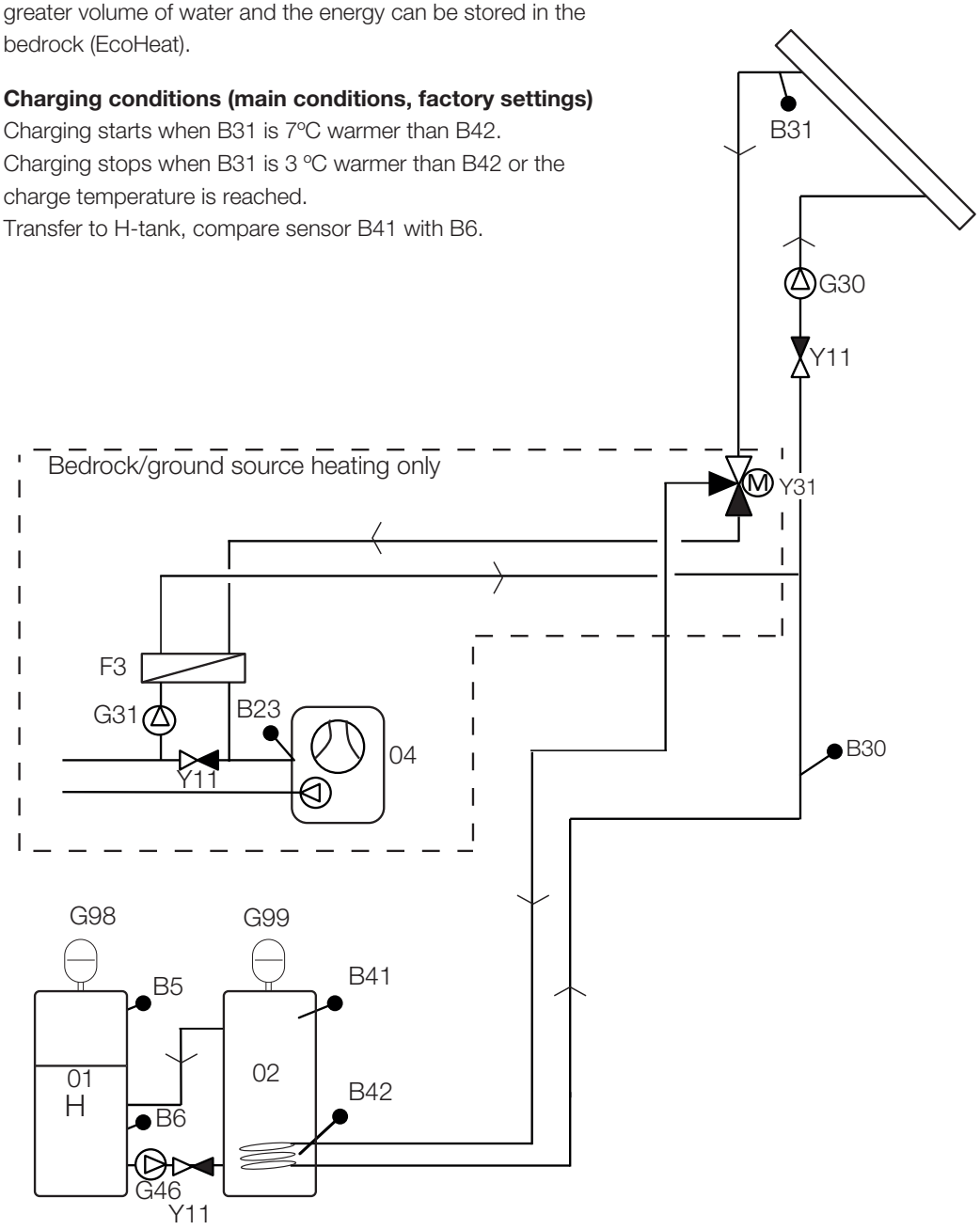


Schematic diagram only Installation engineer fits expansion tank, safety valves, bleeders etc. and sizes the system.

3.3 System 2b with solar coil

System structure with CTC Ecoheat 400 or CTC EcoZenith i250 and EcoTank (buffer tank). This system allows for a larger solar collector surface since it carries a greater volume of water and the energy can be stored in the bedrock (EcoHeat).

Charging conditions (main conditions, factory settings)
Charging starts when B31 is 7ºC warmer than B42.
Charging stops when B31 is 3 ºC warmer than B42 or the charge temperature is reached.
Transfer to H-tank, compare sensor B41 with B6.

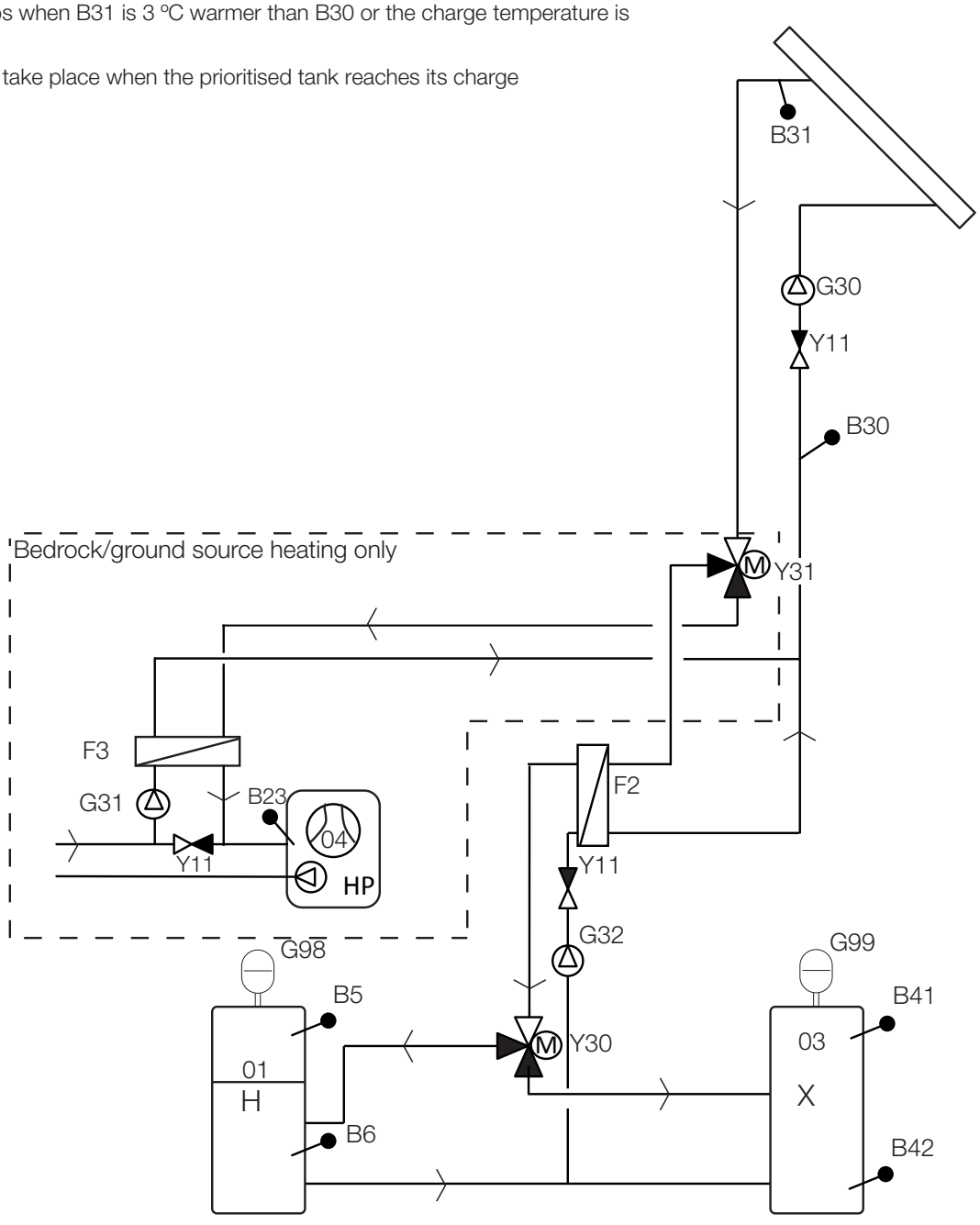


Schematic diagram only Installation engineer fits expansion tank, safety valves, bleeders etc. and sizes the system.

3.4 System 3

CTC EcoHeat400/CTC EcoZenith i250 with an extra volume tank (acc. tank, pool, etc.). This system allows for a very large solar collector surface since it carries a greater volume of water.
Select this option if you want to prioritise the H-tank or the X-volume.
If (03) is a connected pool, its chlorinated water should be separated by means of a pool exchanger fitted between diverting valve Y30 and the pool. Sensors B41 and B42 should be installed in the pool.

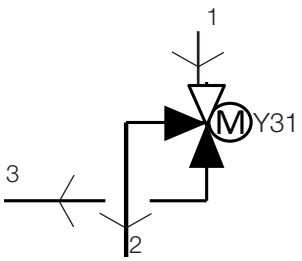
Charging conditions (main conditions, factory settings)
Charging starts when B31 is 7ºC warmer than B42, or B6.
Charging stops when B31 is 3 ºC warmer than B30 or the charge temperature is reached.
Exchange will take place when the prioritised tank reaches its charge temperature.

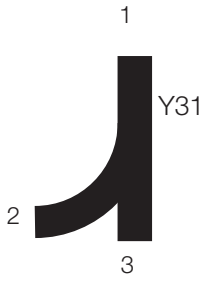


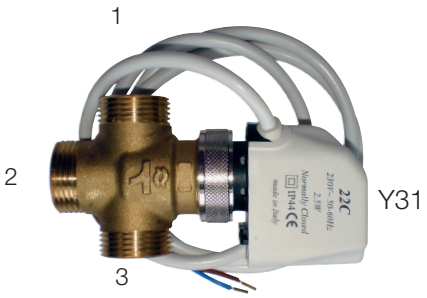
Schematic diagram only Installation engineer fits expansion tank, safety valves, bleeders etc. and sizes the system.

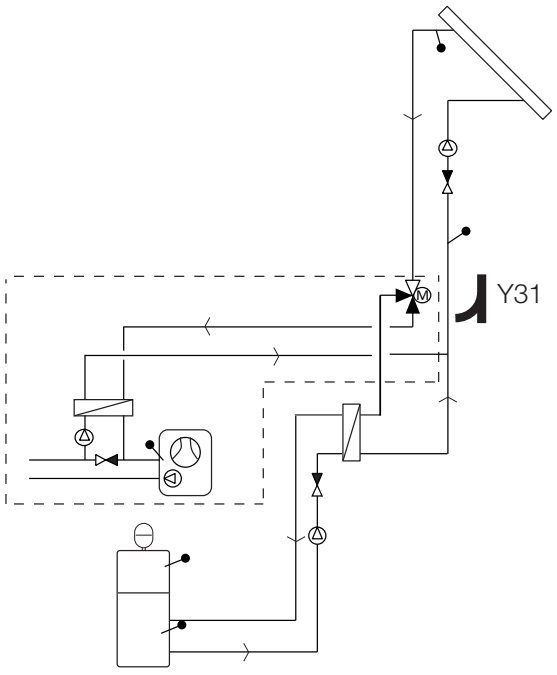
3.5 System option: bedrock heating

Charging of bore holes can be activated in solar systems 1, 2 and 3.
Pipe installation for diverting valve Y31
1. Flow from solar collector
2. Flow to tank
3. Flow to bore hole
Diverting valve for bedrock heating installed with normal flow to the tank. (2)
Connection 2 is without power (NC).
When relay operates, valve should switch flow to (3) and also start the brine pump (G31).









Example charging of bore hole with solar system 1.
Charging of bore holes can also be activated in solar systems 2 and 3.

Schematic diagram only Installation engineer fits expansion tank, safety valves, bleeders etc. and sizes the system.

Parts list

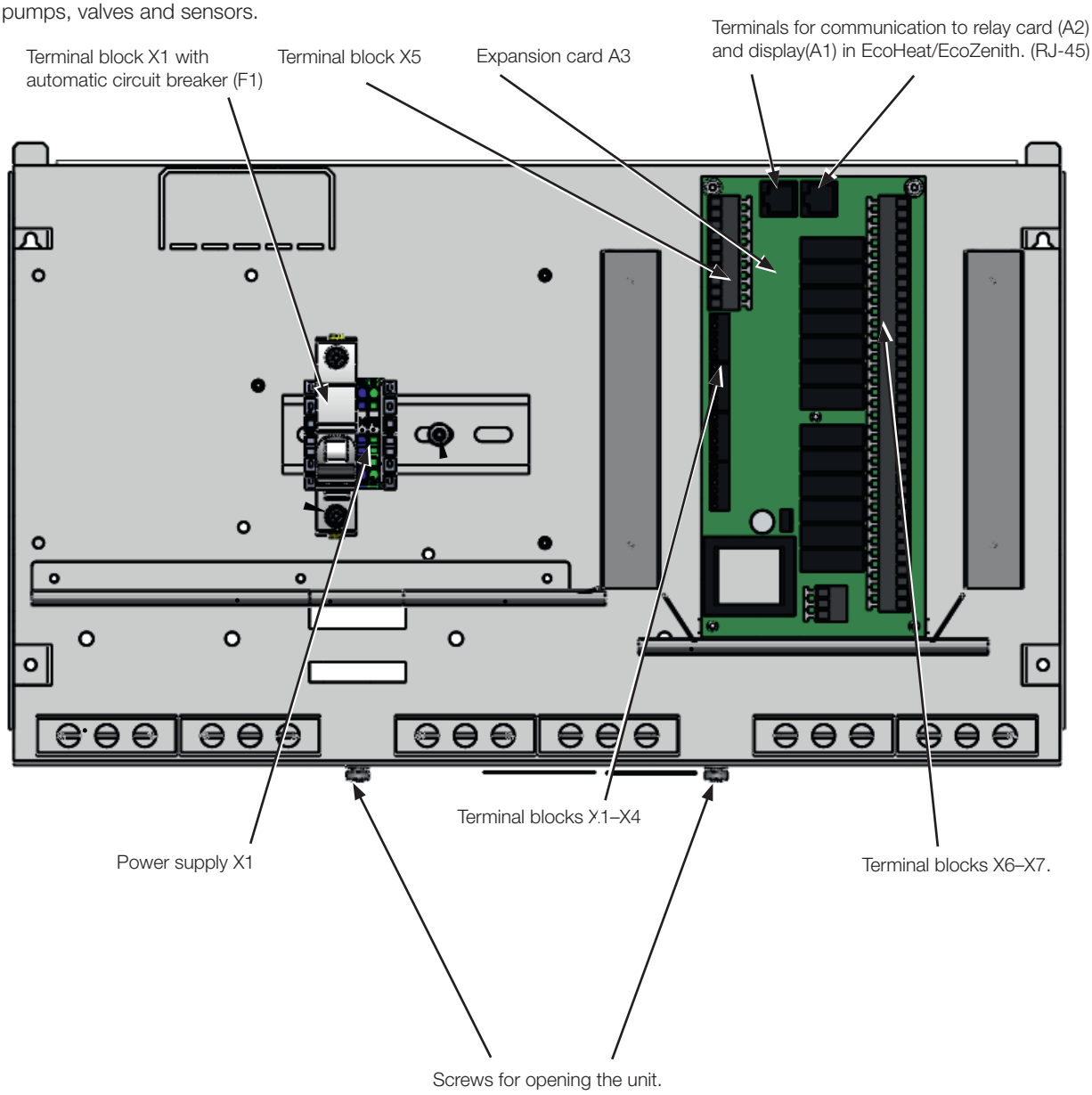
Designation	Designation	Comment
01	H-tank	Main tank (EcoHeat/EcoZenith)
02	EcoTank	Buffer tank (EcoTank or similar)
03	X-volume	Extra volume tank (or pool)
04	Heat pump	Cooling module in CTC EcoHeat or CTC EcoPart.
05	Tank for diff thermostat function	The water volume in the wood-burning system that energy is taken from with the diff thermostat function.
B5	Upper sensor H-tank	Measures the temperature in top section of EcoHeat/EcoZenith (factory-installed)
B6	Lower sensor H-tank	Measures the temperature in bottom section of EcoHeat/ EcoZenith (factory-installed)
B23	Brine sensor	Measures the brine temperature in the heat pump (factory-installed)
B30	Sensor solar panel in	Measures the return temperature to the solar panel, installed in expansion card.
B31	Sensor solar panel out	Measures the temperature from the solar panel, installed in expansion card.
B41	Upper X-volume/EcoTank sensor	Measures the temperature in the top section of the X-volume/ EcoTank, installed in expansion card.
B42	Lower X-volume/EcoTank sensor	Measures the temperature in the bottom section of the X-volume/EcoTank, installed in expansion card.
B46	Sensor for diff thermostat function	Installed in EcoHeat/EcoZenith i250.
B50	Sensor pool	Installed in expansion card.
F2	Solar/tank exchanger	Heat exchanger for charging the tank.
F3	Solar/brine exchanger	Heat exchanger for charging the brine.
G30	Circulation pump solar panel	Pump from exchanger to solar panel, fitted in expansion card
G31	Circulation pump bore hole charging	Pump from brine to exchanger, installed in expansion card.
G32	Circulation pump exchanger	Pumps from tank to exchanger, installed in expansion card.
G46	Pump tank transfer	Pumps between H-tank and EcoTank/tank for diff thermostat function. Installed in EcoHeat/EcoZenith i250.
G50	Circulation pump, pool	
G51	Circulation pump, pool	
G98	Expansion tank	
G99	Expansion tank	
Y11	Non-return valve	
Y31	Brine diverting valve	Diverting valve, charging brine or tank, installed in expansion card.
Y30	Valve 2 tanks	Diverting valve, charging H-tank or X-volume, installed in expansion card.

4. Installation

This section is for CTC EcoHeat 400 / CTC EcoZenith i250. See the manuals for CTC GSi 12, CTC GS 6-8, CTC EcoZenith i350 and CTC EcoVent i350F for more information.

Installation and connection must be undertaken by a qualified electrician. All wiring must be installed according to applicable local regulations.

Open the control unit by undoing the two screws and unhooking the plastic casing upwards. Install the power supply, circulation pumps, valves and sensors.



! NB: Do not touch the PCB's components. The PCB can be damaged by static discharge.

5. Electrical installation

This section is for CTC EcoHeat 400 / CTC EcoZenith i250. See the manuals for CTC GSi 8-12-16, CTC GS 6-8, CTC EcoZenith i350 and CTC EcoVent i350F for more information.

Installation and connection must be undertaken by a qualified electrician. All wiring shall be installed according to applicable local requirements.

Safety switch

The installation should be preceded by an omnipolar safety switch according to overvoltage category III, which ensures disconnection from all electric power sources.

5.1 Communication between expansion card and EcoHeat/EcoZenith

Use the RJ-45 cable provided as the communication cable. This must be installed between the expansion card/Ws and the relay and display cards in EcoHeat/EcoZenith, from which control takes place. Remove the existing RJ-45 cable between the relay and display cards and connect the RJ-45 cable provided.

Connection: Relay card A2 **->** Expansion card A3 **->** Display card A1.

5.2 High voltage

Supply:
230 V 1N~.
Max. fuse size (group fuse) 10A.
Connected to terminal block marked L1, N, PE

5.2.1 Pump solar panel (G30, PWM) - Wilo Stratos Para

230 V 1N~
Circulation pump G30 is powered separately (not from this unit).
The solar PWM pumps (G30 and G32) of model WILO Stratos PARA differ from the other PWM pumps. If the PWM control signal is interrupted, the solar pumps stop, whereas the other PWM pumps work at 100% power if the signal is interrupted.
The PWM control signal is connected to the following terminal blocks:
Expansion card X5:
Note the cable colours!

PWM+:	white	Terminal block X5: 1
GND:	brown	Terminal block X5: 2

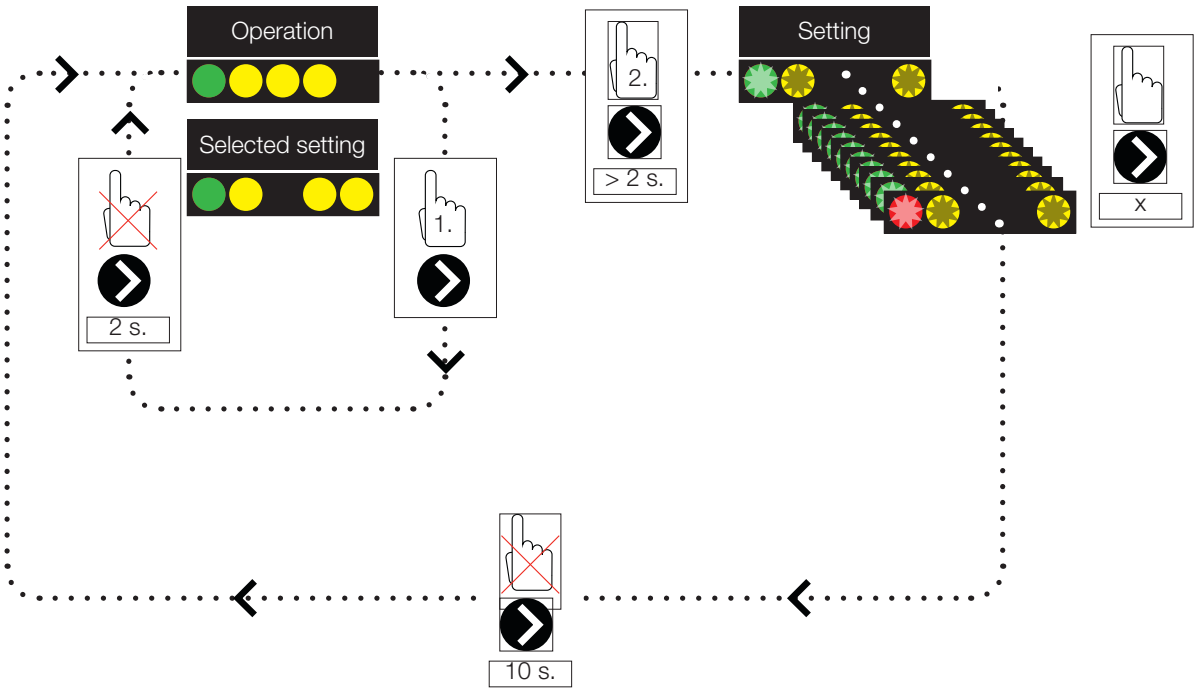
Check the function by test running the pump in the menu “Installer/Service/ Function test/Solar” in the control system.

5.2.2 Pump solar panel (G30, PWM) - Grundfos UPM3 Solar

230 V 1N~
Circulation pump G30 is powered separately (not from this unit).
The PWM control signal is connected to the following terminal blocks:
Expansion card X5:
Note the cable colours!

PWM+:	brown	Terminal block X5: 1
GND:	blue	Terminal block X5: 2

Check the function by test running the pump in the menu “Installer/Service/ Function test/Solar” in the control system.



1. Briefly press the circulation pump arrow to show the operating mode to which the pump is set. After 2 seconds, the operational information screen will be displayed again.

2. Pressing the circulation pump arrow for 2 seconds will cause the LEDs to flash and the mode setting can then be changed. Press repeatedly until the desired mode flashes. After 10 seconds, the operational information screen will be displayed again.

Operation:

	Standby (flashing)
	0% - P1 - 25%
	25% - P2 - 50%
	50% - P3 - 75%
	75% - P4 - 100%

Selecting mode setting

Control Mode	Mode	xx-75	xx-105	xx-145	
Constant Curve		4.5 m	4.5 m	6.5 m	
Constant Curve		4.5 m	5.5 m	8.5 m	
Constant Curve		6.5 m	8.5 m	10.5 m	
Constant Curve		7.5 m	10.5 m	14.5 m	
Control Mode	**Mode**	**xx-75**	**xx-105**	**xx-145**	
PWM C Profile					
PWM C Profile					
PWM C Profile					
PWM C Profile					

Alarminfo:

	Blocked
	Supply voltage low
	Electrical error

5.2.3 Pump bore hole charging (G31, on/off)

230 V 1N~.
Circulation pump G31 is connected to the following terminal blocks:
Expansion card X6:
Note the cable colours!

Phase:	brown	Terminal block X6:8
Zero:	blue	Terminal block X6:11
Earth:	yellow/green	Terminal block X6:10

Check the function by test running the pump in the menu “Installer/Service/ Function test/Solar” in the control system.

5.2.4 Pump intermediate exchanger solar panels - Wilo Stratos Para (G32, PWM)

230 V 1N~.
Pump G32 is powered separately (not from this unit).
The PWM control signal is connected to the following terminal blocks:
Expansion card X5:
Note the cable colours!

PWM+:	vit	Terminal block X5:3
GND:	brown	Terminal block X5:4

Check the function by test running the pump in the menu “Installer/Service/ Function test/Solar” in the control system.

5.2.5 Pump tank transfer (G46, on/off)

230 V 1N~.
Circulation pump G46 is connected to the following terminal blocks:
Relay card in EcoZenith or EcoHeat (see wiring diagram for the relevant product).
Note the cable colours!

Phase:	brown	Terminal block A:11(CTC EcoZenith i250) Terminal block A:12 (CTC EcoHeat 400)
Zero:	blue	
Earth:	yellow/green	

Check the function by test running the pump in the menu “Installer/Service/ Function test/**Diff thermostat function** or /Solar” in the control system.

5.2.7 Valve 2 tanks (Y30)

230 V 1N~.
Diverting valve Y30 is connected to the following terminal blocks:
Expansion card X6:

Control voltage:	black	Terminal block X6:4
Phase:	brown	Terminal block X6:5
Zero:	blue	Terminal block X6:7

Check the function by test running the valve in the menu "Service/Function test/Solar" in the control system.

5.2.8 Valve bore hole charging (Y31)

230 V 1N~.
Diverting valve Y31 is connected to pump G31 on the following terminal blocks:
Expansion card X6:

Control voltage:	black	Terminal block X6:8
Phase:	brown	Terminal block X6:9
Zero:	blue	Terminal block X6:11

Valve 582581001 (see image) must only be connected with relay output, X6 pole 8 and neutral, X6 pole 11.

Check the function by test running the valve in the menu "Service/Function test/Solar" in the control system.

582581001 22 3/4"

5.2.6 (G50) and (G51) Circulation pumps, pool

230 V 1N~.
Both pumps (G50) & (G51) are connected to the following terminal blocks:
Pool pumps (G50) and (G51)
Connected to the expansion card X7:

Phase:	brown	Terminal block X7:33
Zero:	blue	Terminal block X7:35
Earth:	yellow/green	Terminal block X7:34

Pole 33 is connected to an external connection box which distributes voltage to the charge pump (G50) and circulation pump (G51).

Check the function by test running the pump in the menu "Installer/Service/ Function test/Pool" in the control system.

5.3 Sensor installation

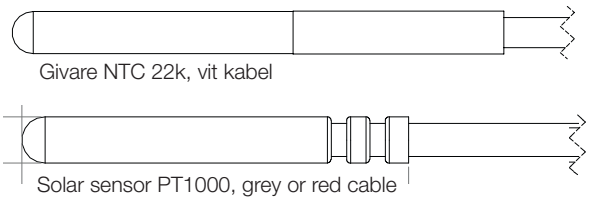
Depending on the system that is to be connected, 3–6 sensors are required. The sensors used are PT1000 and NTC 22k type sensors. Some sensors are connected at the factory. Connect each sensor to the correct terminal block on the control unit. Ensure that the sensors are installed in the correct location and with good contact. Incorrectly installed sensors result in the system not working as intended.

There are few things to bear in mind when installing sensors:

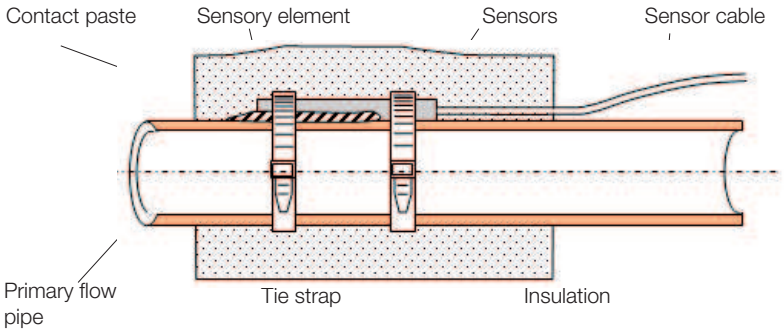
- Ensure that the sensors are mounted with good contact. If possible, use some type of thermal conduction paste on the contact surface.
- To achieve optimum function, ensure that the sensors are insulated.
- Some of the sensors will need to be extended. The following cable types must be used depending on the length of the extension cable:

  Up to 15 m ➔ 2 x 0.5 m^2

  Up to 50 m ➔ 2 x 0.75 m^2
- Avoid positioning sensor cables next to high-voltage cables.



! Only use sensors in the solar collector that are suitable for a temperature of 180°C. (Red colour coding)



5.3.1 Sensor connection

The sensors that form part of each system solution should be fitted to the PCB/ terminal block as follows: All sensors are temperature sensors.

Sensor solar panel in (B30, PT1000)

Measures the return temperature to the solar panel. Mounted on the copper piping on the return line to the solar collectors. Secured with a heat-resistant cable tie and thermal conduction paste.
Connected to expansion card X1:

Terminal block X1: 3
Terminal block X1: 4

Sensor solar panel out (B31, PT1000)

180 ºC Red colour coding:
Measures the temperature from the solar collector. It is important for this sensor to be installed so that it detects the panel temperature even when fluid is not circulating. This sensor is installed in the solar collector. For the exact positioning, see the solar panel manual.
If it is difficult to position the sensor in the solar collector, the “Sensor test” function should be activated.
Connected to expansion card X1:

Terminal block X1: 1
Terminal block X1: 2

> ! Only use sensors in the solar collector that are suitable for a temperature of 180°C. (Red colour coding)

Upper sensor X-volume (B41, NTC 22k)

Measures the temperature in the upper part of the extra volume tank (acc. tank, pool). Mounted in the upper part of the acc. tank or in the pool.

Connected to the expansion card X2:

Terminal block X2: 9
Terminal block X2: 10

Lower sensor X-volume (B42, NTC 22k)

Measures the temperature in the lower part of the extra volume tank (acc. tank, pool). Mounted in the lower part of the acc. tank or in the pool.
Connected to the expansion card X2:

Terminal block X2: 11
Terminal block X2: 12

EcoTank sensor, upper (B41, NTC 22k)

Measures the temperature in the upper part of the EcoTank.
Mounted in the upper part of the EcoTank.

Connected to the expansion card X2:

Terminal block X2: 9
Terminal block X2: 10

EcoTank sensor, lower (B42, NTC 22k)

Measures the temperature in the lower part of the EcoTank.
Mounted in the lower part of the EcoTank.

Connected to the expansion card X2:

Terminal block X2: 11
Terminal block X2: 12

Sensor for differential thermostat function, lower (B46, NTC 22k)

Measures the temperature in the lower part of the EcoTank.
Mounted in the lower part of the EcoTank.

Installed in EcoHeat 400/EcoZenith i250.

Terminal block G65
Terminal block G66

Sensor, lower (B50, NTC 22k)

Measures the temperature in the pool water.
Positioning: In the pool water.
Connected to the expansion card X3:

Terminal block X3:15
Terminal block X3:16

5.3.2 Factory-installed sensors in CTC EcoZenith i250 and CTC Ecoheat 400.

Upper sensor H-tank (B5, NTC 22k)

Measures the temperature in upper section of CTC EcoHeat/EcoZenith i250.
Factory-installed in EcoHeat/EcoZenith i250.

Lower sensor H-tank (B6, NTC 22k)

Measures the temperature in bottom section of CTC EcoHeat/EcoZenith i250.
Factory-installed in EcoHeat/EcoZenith i250.

Sensor brine temperature (B23, NTC 22k)

Measures the brine temperature in the heat pump. Factory-installed in EcoHeat/EcoPart.

5.3.3 Resistance level of the temperature sensors

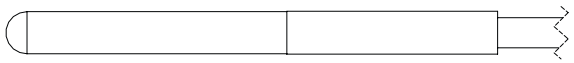
The resistance that the sensors need to have at different temperatures is described below. The table can be useful for identifying a poor sensor when troubleshooting.

PT1000

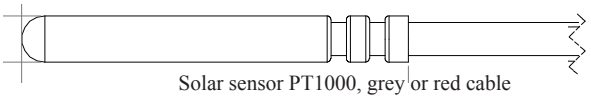
Temperature °C	Resistance Ω
-10	960
0	1000
10	1039
20	1077
30	1116
40	1155
50	1194
60	1232
70	1271
80	1309
90	1347
100	1385
120	1461
140	1535

NTC 22 kΩ

Temperature °C	NTC 22 k Resistance Ω
130	800
125	906
120	1027
115	1167
110	1330
105	1522
100	1746
95	2010
90	2320
85	2690
80	3130
75	3650
70	4280
65	5045
60	5960
55	7080
50	8450
45	10130
40	12200
35	14770
30	18000
25	22000
20	27100
15	33540
10	41800
5	52400
0	66200
-5	84750
-10	108000
-15	139000
-20	181000
-25	238000

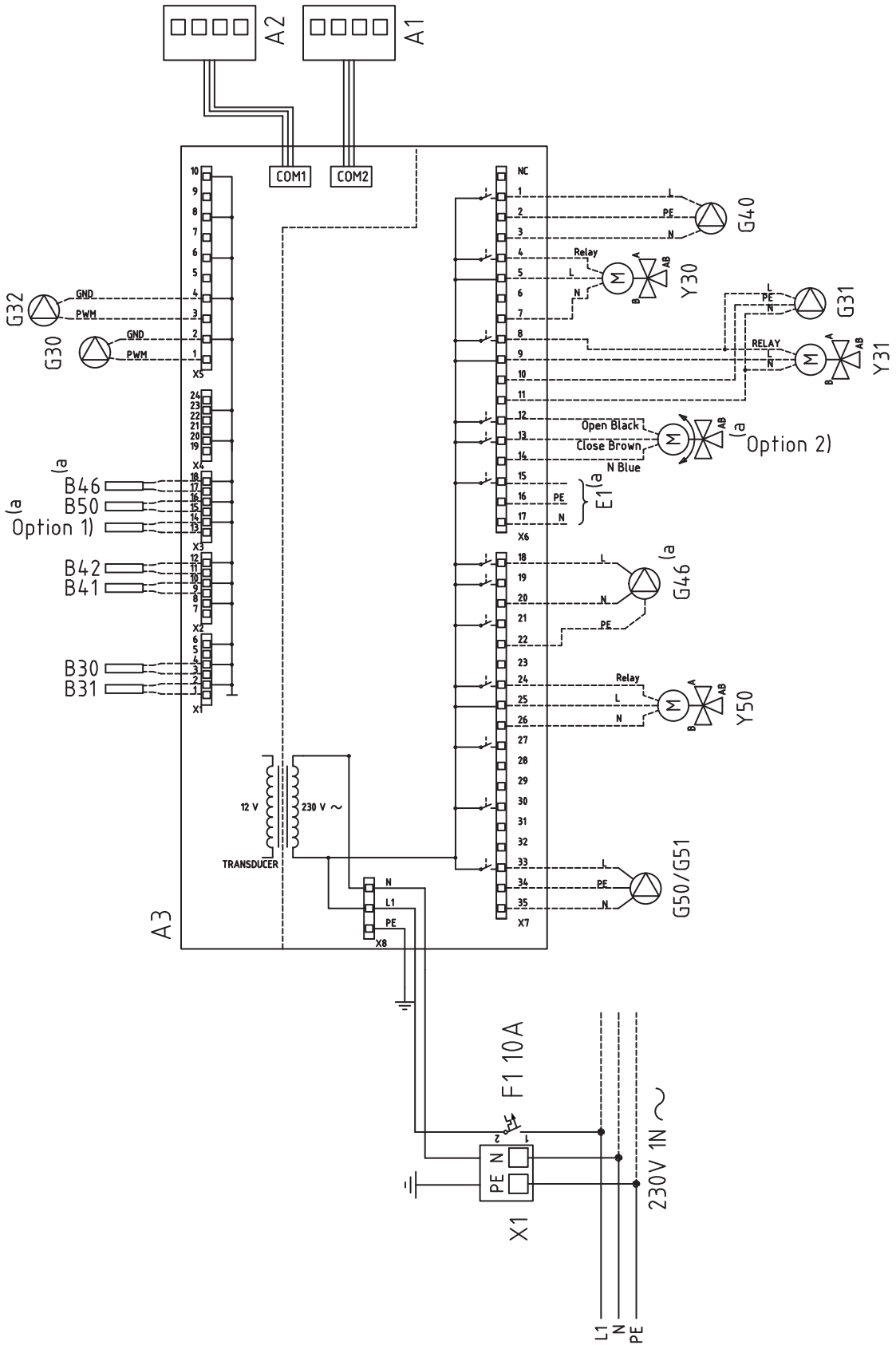


Sensor NTC 22k, white cable



Solar sensor PT1000, grey or red cable

5.4 Wiring diagram



6. Menu settings.

This section is for CTC EcoHeat 400 / CTC EcoZenith i250. See the manuals for CTC GSi 12, CTC GS 6-8, CTC EcoZenith i350 and CTC EcoVent i350F for more information.

The solar panel system must be defined before you can access the different menus for the solar panels.

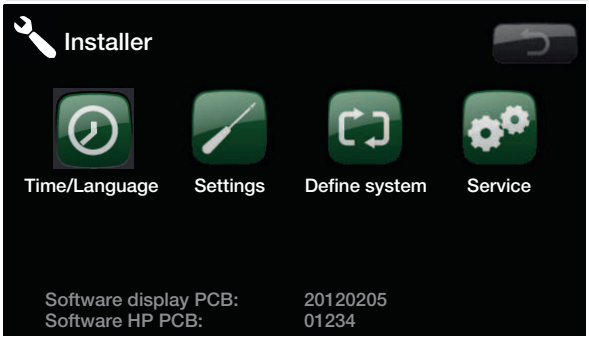
6.1 Installer

First go to Installer and select “Define system”.

6.2 Define system

This is for selecting whether solar panels have been installed in the system.

NB: If the expansion card has not been installed and solar panels are defined, the product will emit an alarm:
Comm. fault expansion card.



6.2.1 Define solar panels

Solar panels used **No (No/Yes)**
Specify here whether solar panels are used.

Recharging bedrock **No (No/Yes)**
Specify here whether recharging to bedrock is installed (only possible for bedrock heat pumps).

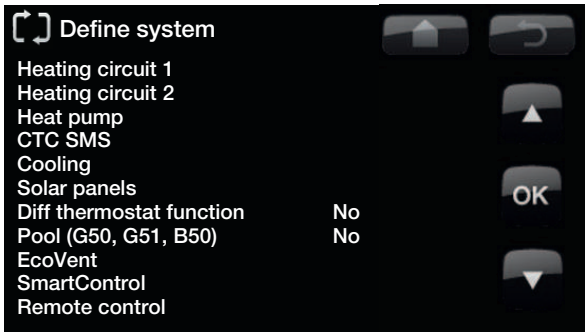
Alternate charging **No (No/Yes)**
This function activates system 3.

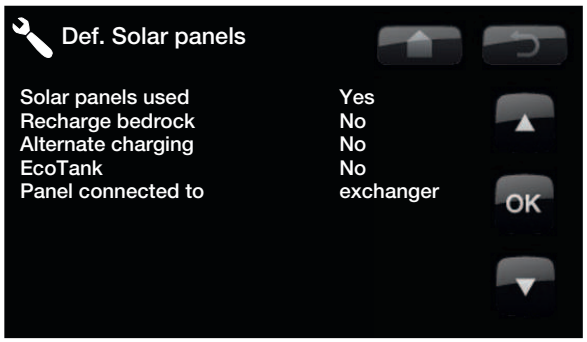
The function lets you choose to prioritise charging of the H-tank or X-volume.

See also introduction with schematic diagrams.

EcoTank **No (No/Yes)**
This function activates system 2 with EcoTank buffer tank (or equivalent).

Panel connected to: exchanger (coil/exchanger)
Specify here whether there is a solar coil in the EcoTank or an intermediate exchanger is installed.





6.2.2 Define differential thermostat and pool

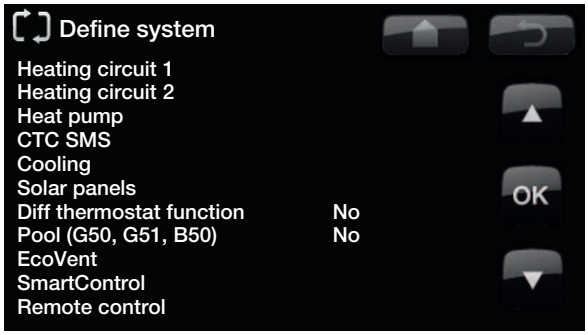
When “Diff thermostat function” and/or “Pool” are to be used, this should be defined by selecting “Yes” from the menu

“Installer/Define system/Diff thermostat function”

or:

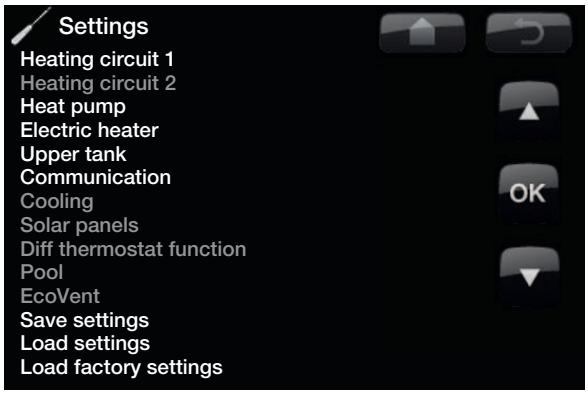
“Installer/Define system/Pool”

NB: “Diff thermostat function” and solar system 2 with EcoTank cannot be used at the same time.

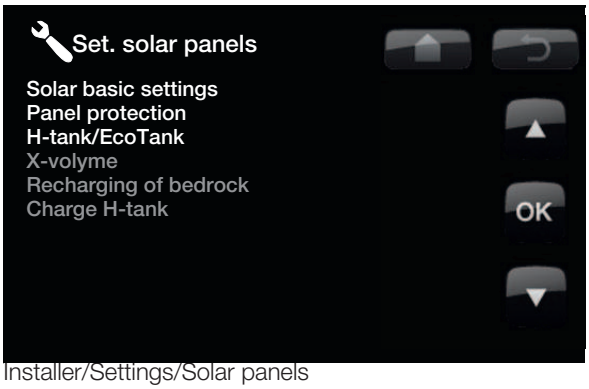


6.3 Settings

The settings needed for the solar heating system to function optimally are entered under the menu called solar panels. It is important that this default setting is adjusted for your heating system. Incorrectly set values may lead to the intended energy saving being lower. The menu names that are shown in grey are not active and do not show in white until they are activated. Activated in the “Define system” menu.



Installer/Settings



Installer/Settings/Solar panels

6.3.1 Default settings, solar

Charge start diff temp, °C **7 (3...30)**

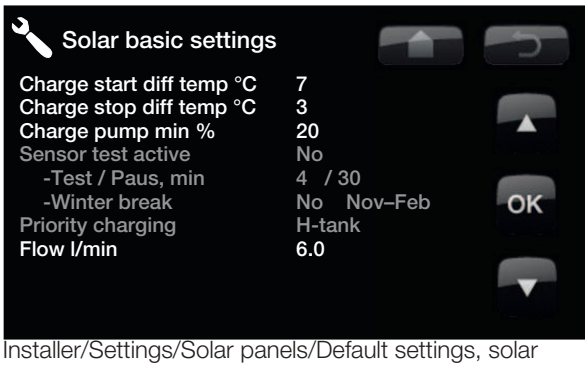
Here you can set the temperature difference at which charging of solar energy should start. The solar panel must be this many degrees warmer than the tank temperature for charging to start.

Charge stop diff temp, °C **3 (3...30)**

Here you can set the temperature difference at which charging of solar energy should stop. When the temperature difference between the solar panel and the tank falls below this set value, the charging stops.

Charge pump min speed, % **20 (20...100)**

The lowest permitted speed of the charge pump is indicated here.



Installer/Settings/Solar panels/Default settings, solar

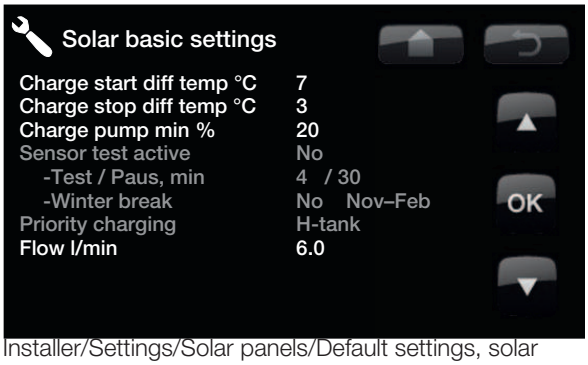
Sensor test active **No (No/Yes)**
Whether or not the solar sensor should be activated is indicated here. If the solar panel sensor cannot can be installed in such a way that the actual panel temperature can be detected, the charge pump needs to run for a while for the panel's fluid to have an effect on the sensor.

-Test/Pause, min 4 (1...20)/30 (80...180)
Test (4): This is where you indicate the duration of the sensor test so that awkwardly positioned sensors have enough time to detect the correct temperature. The length of the sensor test should be as short as possible prevent heat being taken from the tank unnecessarily in situations when the solar panel cannot charge.
Pause (30): The time between the sensor tests is indicated here. A new sensor test will start after the pause.

-Winter break **No (No/Yes) Nov–Feb**
The months during which there will not be a sensor test are indicated here. During the winter, when the panel (as a rule) cannot heat the tank, there is no need to carry out sensor tests. A sensor test carried out at that time of year can lead to some tank heat being dumped in the solar panel, which should be avoided.

-Priority charging of: **H-tank/X-volume**
This is where you indicate whether the H-tank or the X-volume (acc. tank, pool) should be prioritised when charging (shown only if alternate charging has been defined).

Flow l/min **6.0 (0.1...50.0)**
The flow circulating through the solar collectors should be indicated here. (This can be read from the flow meter in the system unit.) The flow must be read when the solar panel pump is running at 100%. NB: The flow is used as the basis for calculating the power and cumulative energy. Incorrect flows will therefore produce incorrect values for these parameters. The pump can be set manually to 100% flow in the menu: Installer/Service/Function test to take a reading.



Installer/Settings/Solar panels/Default settings, solar

6.3.2 Panel protection functions

This is where you set the functions that protect the solar panels from overtemperatures and the risk of freezing.

Overtemp protect panel **No (Yes/No)**
The protection function is activated here to protect the solar panel against overtemperatures. This is done by cooling the solar panel.

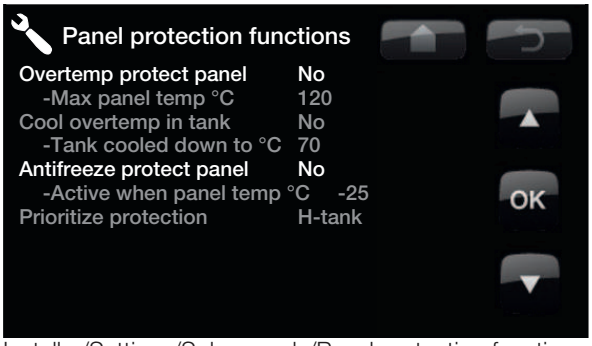
-Max panel temp, °C **120 (100...150)**
The maximum temperature that the panel may reach is indicated here; the cooling function starts after it is reached. When cooling is active, heat is dumped 1) in the bore hole if there is bore hole recharging and 2) then in the tanks up to their maximum permitted temperature.

When the temperature in the solar panel goes above 120 ºC, the circulation pump will start and the test “cooling panel” will be displayed in operating data.

When the temperature in the solar panel drops, but remains high in the tank: The circulation pump will continue to run and the text “cooling tank” will be displayed in operating data. This will continue until the tank has reached 60 ºC.
(charge temperature, factory setting)

Cool overtemp in tank **No (No/Yes)**
If energy has been transferred to the tank in order to cool the panel, the function to cool the tank by conveying energy to the panel is activated here. This is to enable the system to receive panel cooling (e.g. on the next day).

-Tank cooled down to, °C **70 (50...80)**
This is where it is indicated what temperature the tank is to be cooled to once it has reached overtemperature. When this happens, “extra cooling” will be displayed in operating data.



Installer/Settings/Solar panels/Panel protection functions

Antifreeze protect panel **No (No/Yes)**
Winter time; at extremely cold outdoor temperatures there is a risk of the panels freezing (despite antifreeze fluid). The function to take heat from the tank to the panel is activated here.

-Active at outdoor temp, °C **-25 (-30...-7)**
This is where the temperature in the solar collector at which the frost protection starts is indicated. When the panel sensor shows a temperature below the frost protection limit, the charge pump starts until the sensor temperature is 2 degrees warmer than the limit value (hysteresis 2 ºC).

Prioritize protection with: **H-tank / X-volume**
This is where the specific tank that the protection functions should protect is indicated.

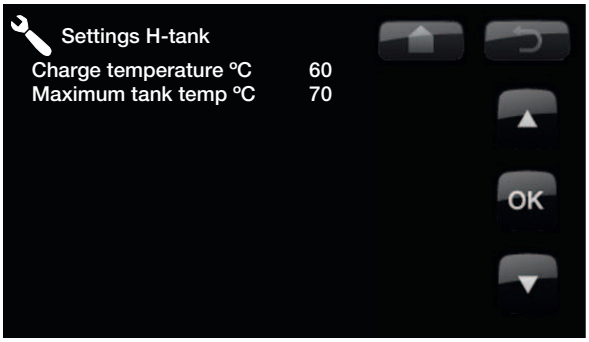
This is only applicable if system 3/X-volume is activated

6.3.3 Settings for H-tank

Settings applicable only when H-tank is activated. (systems 1 and 3 only)

Charge temperature, °C **60 (10...95)**
Setting the maximum permitted temperature in the H-tank. Charging stops once the set temperature has been reached.

Maximum tank temp ºC **70 (60...125)**
If the solar panel temperature exceeds “max. panel temp”, energy is allowed to be transferred to the panel up to this set tank temperature.
Check that the protection function “Overtemp protect panel” is activated.



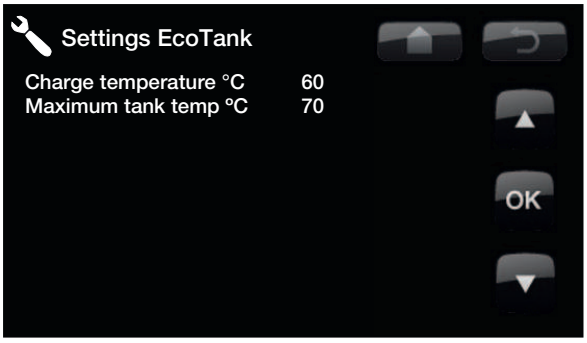
6.3.4 Settings for EcoTank

Settings applicable when EcoTank is activated.

This is also called system 2.

Charge temperature, °C **60 (10...70)**
Setting the maximum permitted temperature in the H-tank. Charging stops once the set temperature has been reached.

Maximum tank temp ºC **70 (60...80)**
If the solar panel temperature exceeds its maximum set temperature, energy is permitted to be transferred to the tank up to this set tank temperature.
Check that the protection function “Overtemp protect panel” is activated.



Installer/Settings/Solar panels/EcoTank

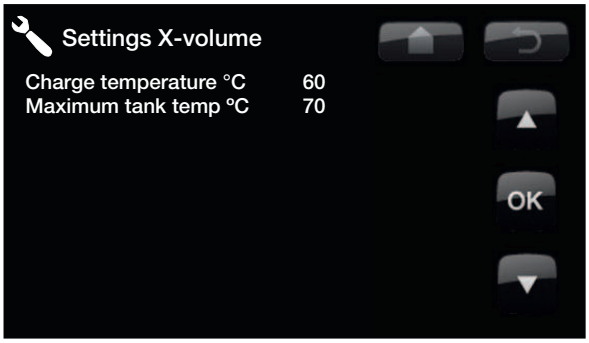
6.3.5 Settings for X-volume

Settings applicable when X-volume is activated.

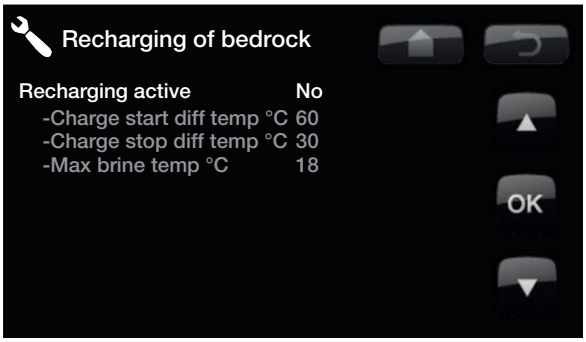
This is also called system 3.

Charge temperature, °C **60 (10...95)**
Setting the maximum permitted temperature in the X-volume. Charging stops once the set temperature has been reached.

Maximum tank temp ºC **70 (60...125)**
If the solar panel temperature exceeds its maximum set temperature, energy is permitted to be transferred to the tank up to this set tank temperature.
Check that the protection function “Overtemp protect panel” is activated.



6.3.6 Settings for recharging of bore hole



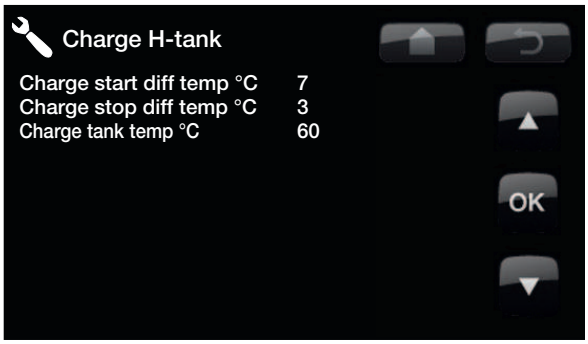
Recharging active **No (No/Yes)**
The “recharging of bore hole” function is activated here. The function is designed to protect the solar panel against overtemperatures, but it can also charge the bore hole with energy.

-Charge start diff temp, °C **60 (3 to 120)**
Here you can set the temperature difference at which charging of the bore hole should start. The solar panel must be this many degrees warmer than the brine in the bore hole for charging to start. If the panel is charging or can charge the tank, tank charging is prioritised.

-Charge stop diff temp, °C **30 (1 to 118)**
Here you can set the temperature difference at which charging of the bore hole should stop. When the temperature difference between the solar panel and the brine falls below this set value, the charging stops.

-Max brine temp, °C **18 (1 to 30)**
Setting the maximum permitted brine temperature. Charging of the bore hole ceases when this value has been reached.

6.3.7 Transfer to main tank



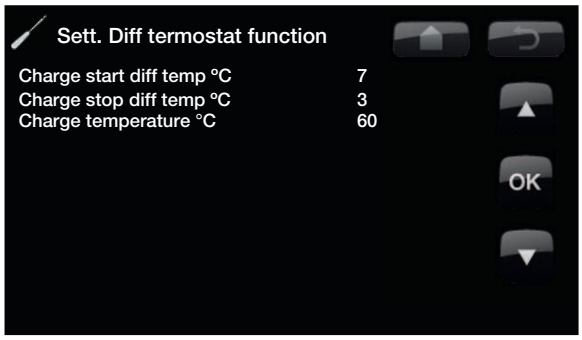
Function applicable to charging conditions between EcoTank and H-tank in solar system 2.
Function CANNOT be combined with “Diff thermostat function”.

Charge start diff temp, °C **7 (3...30)**
Here you can set the temperature difference at which transfer to the H-tank should start. The EcoTank in system 2 must be this many degrees warmer than the H-tank for charging to start.

Charge stop diff temp, °C **3 (2...20)**
Here you can set the temperature difference at which transfer to the H-tank should stop. When the temperature difference between the EcoTank and the H-tank falls below this set value, charging stops.

Charge temperature, °C **60 (10...80)**
Setting the maximum permitted temperature in the H-tank. Transfer stops once the set temperature has been reached.

6.3.8 Diff thermostat function



The function must be defined before the settings can be entered. The diff thermostat function is used if you want to charge your H-tank from e.g. a water-jacketed stove or another water source.

However, this function cannot be combined with solar system 2 with EcoTank. This is because the same circulation pump (G46) is used.

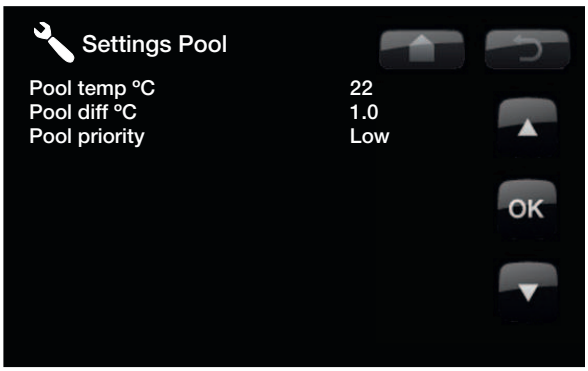
Operating data displays the information “Ext. tank pump/ºC".

Charge start diff temp, °C **7 (3...30)**
Here you can set the temperature difference at which charging from the heat source should start. The heat source must be this many degrees warmer than the tank temperature for charging to start.

Charge stop diff temp, °C **3 (2...20)**
Here you can set the temperature difference at which charging from the heat source should stop. When the temperature difference between the product and the tank falls below this set value, the charging stops.

Charge temperature, °C **60 (10...80)**
Here you can set EcoZenith/EcoHeat’s maximum permitted temperature in the lower tank. The charging stops if this temperature is exceeded.

6.3.9 Settings for pool



Pool temp ºC **22 (20...58)**
The required pool temperature is set in this menu.

Pool diff ºC **1.0 (0.2...5.0)**
The permitted difference between the stop and start temperature in the pool is specified here.

Pool priority **Low (Low/High)**
The priority between pool heating and the heating circuit is specified here. If the Low setting is selected, the pool is not charged when additional heating is being used.

6.4 Operating data, solar panels

This menu displays current temperatures and operating data for your solar collectors. The menu is only shown if solar collectors are defined.

Status

The operating status of the solar controls is shown here. The different operating modes that can be shown are: heating, no heating, charging H-tank, charging X-volume, charging bore hole, (charging bore hole), cooling panel, cooling tank, pre-cooling tank, sensor test and frost protect panel.

Solar panel in/out, °C
Shows the solar panel's incoming and outgoing temperatures.

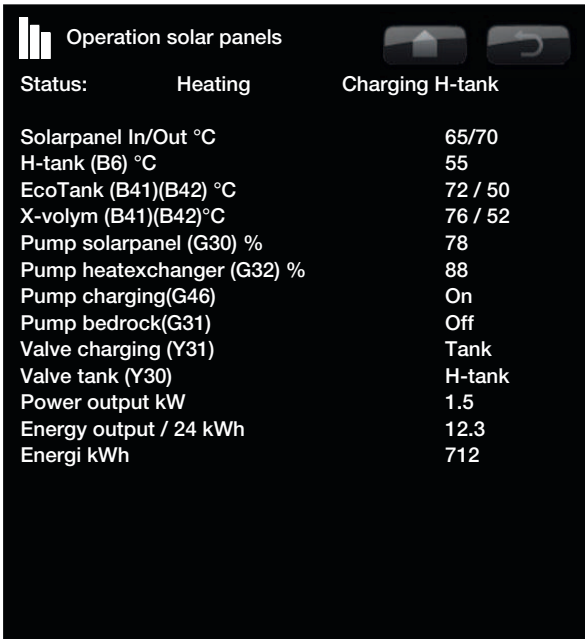
H-tank (B6)°C
Shows the setpoint and current temperature in CTC EcoZenith i250 / CTC Ecoheat 400.

EcoTank (B41)(B42) °C
Shows EcoTank's top temperature, the setpoint and the tank's bottom temperature.

X-volume (B41)(B42) °C
Shows the X-volume tank's top temperature, the setpoint and the tank's bottom temperature.

Pump solar panel (G30) %
The speed of the solar panel's charge pump is shown here (or Off).

Pump heatexchanger (G32) %
If the intermediate exchanger is used, the speed of the charge pump between the intermediate exchanger and tank is shown here (or Off).



Pump charging (G46)
Whether the charge pump is in operation during transfer is shown here.

Pump bedrock (G31)
Whether the charge pump is in operation during bore hole charging is shown here.

Valve charging (Y31)
Shows whether charging is to tank or bore hole.

Valve tank (Y30)
When two tanks are being charged by solar power, the position of the diverting valve between the tanks is shown here.

Power output (kW)
Shows the panel's output.

Energy output / 24 hrs (kWh)
Shows the amount of energy absorbed in the last 24 hours. If energy is taken from the tanks (e.g. if a panel is being protected against frost), negative energy is calculated. During bore hole recharging no useful energy is calculated. The value is updated at the end of the day (00:00).

Energy, kWh
Shows accumulated amount of energy absorbed in kWh.

Negative values are displayed if energy is taken from the tank, e.g. when sensors are being checked and panels are being protected against frost.

The panel output is displayed during bore hole recharging but the energy is not classed as accumulated.

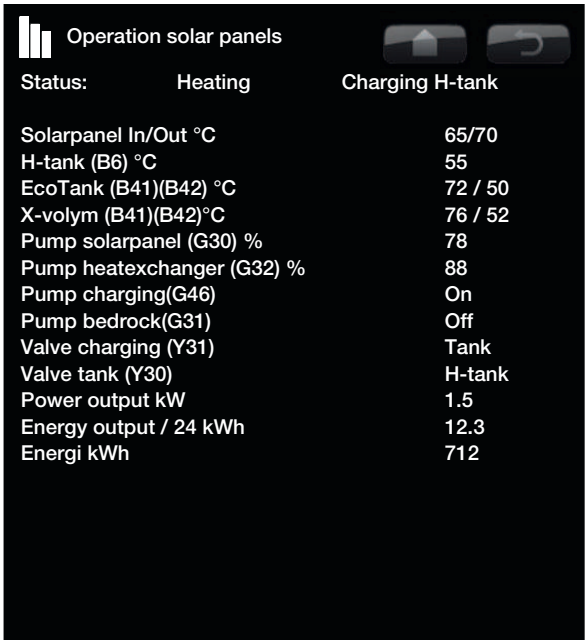
heating/not heating
Status: Shows whether the solar collector is heating or not. heating (not heating).

charging H-tank/charging EcoTank/charging X-volume/charging bore hole
Status: Shows whether H-tank, EcoTank, X-volume and/or bore hole is being charged.

sensor test
Status: Displays "sensor test" when circulation pump is running, to check whether solar panel can heat up.

(charging bore hole)
Status: Shows whether circulation pump is stopped to check whether panel can charge tank

cooling panel/cooling tank/pre-cooling tank/frost protect panel
Status: Displayed when any protection function has been activated.

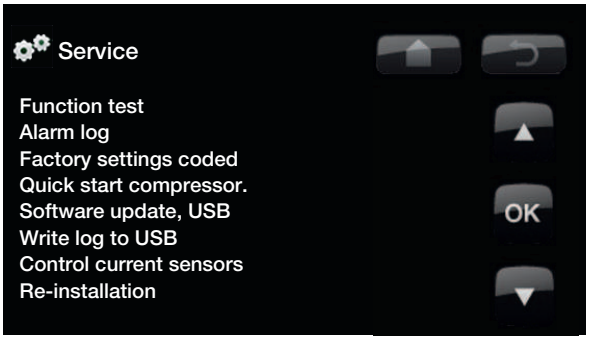


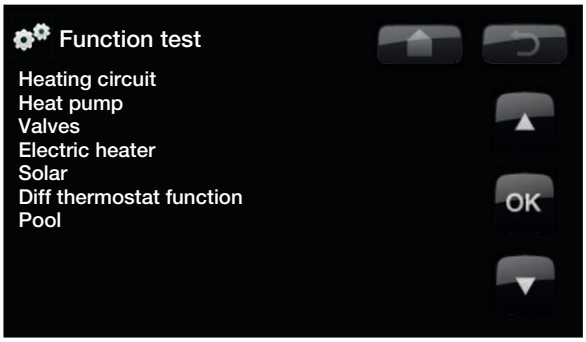
6.4.1 Function test

NB: This menu is intended for the installer and service engineer only.

Function test

This menu is accessed via the service menu and is intended to test the function of the various components in the product. When the menu is activated, all the product's functions stop. Each component can then be tested separately or together. The sensors are checked to ensure that they are connected and displaying a reasonable temperature. When you exit the menu, EcoHeat/EcoZenith returns to normal operation. If no button is pressed for 10 minutes, the product automatically returns to normal operation.





Solar panel pump (G30) % **0 (0...100)**
Function test of circulation pump to solar panel 1.

Heatexchanger pump (G32) % **0 (0...100)**
Function test of circulation pump to intermediate exchanger.

Bedrock (Y31/G31) **Tank (Tank/Bore hole)**
Function test of diverting valve and circulation pump to bore hole charging. When "Bore hole" is selected, the flow should go to the bore hole, and the circulation pump (G31) should start.
When "Tank" is selected, (G31) should be closed.

Valve 2 tanks (Y30) **H-tank (H-tank/X-volume)**
Function test of diverting valve between the tanks.

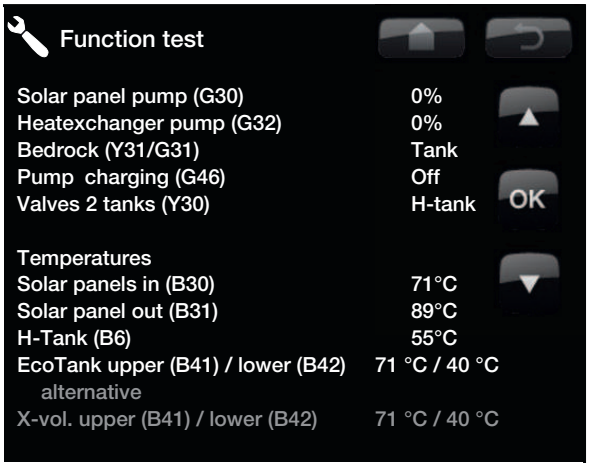
Pump charging (G46) **Off (Off/On)**
Function test of circulation pump to tank transfer.

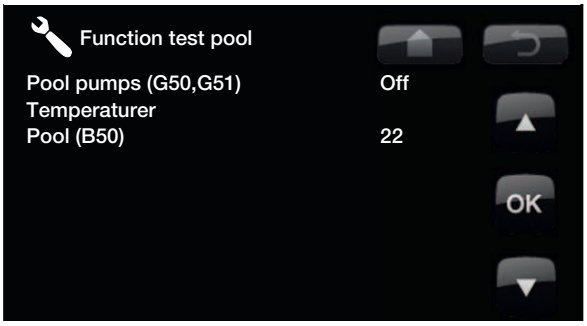
Temperatures
This displays the current temperature.

Pool pumps (G50, G51) **Off**
Function test for pool pumps.

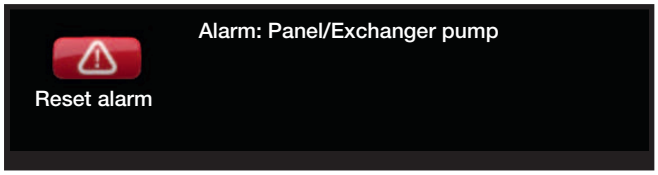
Pool (B50) **20°C**
Example for pool temperature of 20°C.

When you exit the menu, CTC EcoHeat/EcoZenith returns to the start page.





6.5 Alarm texts and troubleshooting / appropriate measures



If a fault occurs with a sensor, for instance, an alarm is triggered. A message appears on the display with information about the fault.

You reset the alarm by pressing the Reset alarm button on the display. If several alarms are triggered, they are displayed one after the other. An outstanding fault cannot be reset without being rectified first. Some alarms are reset automatically if the fault disappears.

For solar collectors, it is important for the system to be bled. However, you cannot bleed a hot solar collector. The solar collector system is bled when it is cold, e.g. in the morning.

! NB: If the expansion card has not been installed and solar panels are defined, the product will emit an alarm:
Comm. fault expansion card.

Alarm text	Description
Sensor	An alarm is displayed if a fault occurs with a sensor that is not connected or has short-circuited and if the value is outside the sensor's range of measurement. The sensor in question is indicated on the display. If a solar sensor or tank sensor is faulty the charging stops. Action: Check the cable connection or sensor; replace the faulty sensor.
Panel freezing risk	When the panel temperature is 3°C lower than the frost protection temperature. Action: Check that the protection function "Frost protect panel" is activated (Menu: Panel protection functions).
Panel/Exchanger pump	When the panel temperature is 60°C higher than the tank temperature. The circulation pump for the solar panel and/or tank is unable to transfer energy to the tank. Action: Check the function of the pumps.
Panel pump	The panel temperature is 60°C higher than the tank temperature. The circulation pump for the solar panel is unable to transfer energy to the tank. Action: Check the function of the pump.
Panel overheated	Panel temperature is above 160°C. Action: Check that the protection functions "Overtemp protect panel" and "Cool overtemp" are activated. (Menu: Panel protection functions).
Comm. fault expansion card	When the "Comm. fault expansion card" alarm flashes, this indicates that the communication between the display card and the expansion card is not working. Action: Check the connection between the cards.

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