

SOLAR THERMAL SYSTEM CONTROLLE

EKOSOL 400

User Manual



Safety precautions and installation guidelines

- ❑ The controller is for solar thermal systems.
- ❑ Only a qualified person may install the controller.
- ❑ The controller can be connected only to a circuit with a PE contact.
- ❑ The solar thermal system must have an independent overheating safeguard system to protect against incorrect regulator or auxiliary equipment operation.
- ❑ The controller must be installed in a location where it will not heat up to more than 40°C.
- ❑ Protect the controller against water and conditions for condensation (such as rapid changes in ambient temperature).
- ❑ Install and operate the device as per the installation procedure and protocols for handling electrical devices.
- ❑ Fuses blown due to an incorrect connection or a short circuit are not covered by warranty.
- ❑ Make sure all electrical connections are correct before turning the controller on.
- ❑ The status indicator has a 2.5 A fuse.
- ❑ Always disconnect the power and the controller from the grid before connecting power leads or replacing a fuse. Risk of electrical shock when connecting devices and replacing fuses with connected controller power plug.
- ❑ Only the manufacturer or its authorised service centre may replace the leads of the controller.
- ❑ Do not use a damaged controller.
- ❑ Any damage due to lightning, incorrectly supplied power, overvoltage, or acts of God are excluded from warranty repairs (see the warranty terms).



Note: Always turn the device off and unplug it from the mains before replacing a fuse.

Contents

1. Controller overview.....	5
2. Controller connections.....	6
3. Controller interface.....	6
4. Display.....	7
5. Heating system connection diagram.....	7
6. Controller installation.....	8
7. Commissioning and clock settings.....	8
8. Adjusting the water temp. setpoint for the DHW storage tank.....	9
9. User menu: structure.....	9
10. User menu: functionalities.....	10
10.1 Manual mode.....	10
10.2 Energy meter.....	10
10.3 Temperatures.....	11
10.4 Parameters.....	11
10.5 Parameters: DHW circulation pump.....	11
10.6 Parameters: electric element.....	12
10.7 Parameters: auxiliary DHW storage tank.....	13
10.8 Language.....	13
10.9 Clock.....	13
10.10 Timer.....	14
11. Storage tank cooling function - HOLIDAY.....	15
12. Service menu: structure.....	16
13. Service menu: functionalities.....	17
13.1 Parameters.....	17
13.2 Parameters: auxiliary collector array.....	17
13.3 Parameters: DHW storage tank hysteresis.....	18
13.4 Parameters: solar collector protection.....	18
13.5 Parameters: solar collector protection temperature.....	18
13.6 Parameters: solar collector maximum temperature.....	18
13.7 Parameters: solar collector pump timer.....	19
13.8 Parameters: solar collector pump maximum power.....	19
13.9 Parameters: solar collector pump minimum power.....	19
13.10 Parameters: solar collector pump modulation 1.....	19
13.11 Parameters: solar collector pump modulation 2.....	19
13.12 Parameters: modulation 1 step.....	20
13.13 Parameters: solar collector pump freeze protection.....	20

Contents

13.14 Parameters: circulation.....	20
13.15 Parameters: auxiliary output.....	20
13.16 Errors.....	21
13.17 Energy meter.....	21
13.18 Energy meter: on/off.....	21
13.19 Energy meter: sensor selection.....	21
13.20 Energy meter: maximum flow.....	22
13.21 Energy meter: heat transfer fluid.....	23
13.22 Energy meter: meter reset.....	23
13.23 Factory defaults.....	23
14. Error messages.....	23
15. Sensor characteristics.....	24
16. Technical data.....	26
17. Recycling.....	27

1. Controller overview

The solar thermal system controller is designed to control solar thermal system pumps (and another optional device) to ensure efficient domestic hot water (DHW) storage tank heating.

By measuring the solar collector and storage tank temperatures, the controller can control solar collector pumps that transfer heat to the hot water storage tank. They are turned on when the storage tank temperature is below the user-defined setpoint and the solar collector reached a temperature sufficiently higher than the current storage tank temperature.

Controller's features:

- ❑ control of the solar collector pump according to the solar collector temperature
- ❑ dual solar collector array zoning with independent pumps
- ❑ energy meter
- ❑ maintaining the set temperature in the storage tank
- ❑ auxiliary control output for any device (DHW circulation pump, electric element, or a pump for another storage tank)
- ❑ three programmes for the DHW circulation pump
- ❑ a custom programme for the DHW circulation pump to suit your needs and preferences
- ❑ clear menu and user-friendly operation



2. Controller connections

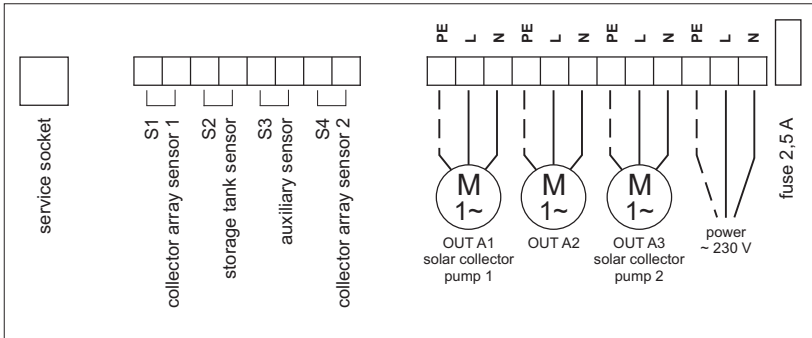
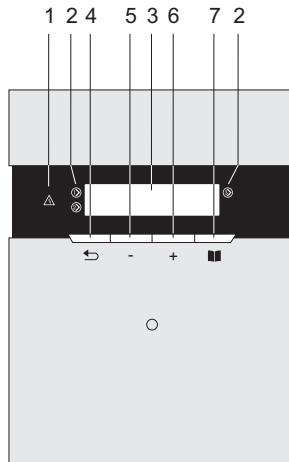


Fig. 1 Wiring diagram for power leads

3. Controller interface



1. FAILURE LED
2. Output symbols
3. Display
4. Back one menu level - BACK / HOLIDAY activation
5. Change/decrease setting
6. Change/increase setting
7. Up one menu level - NEXT

Fig. 2 Controller interface

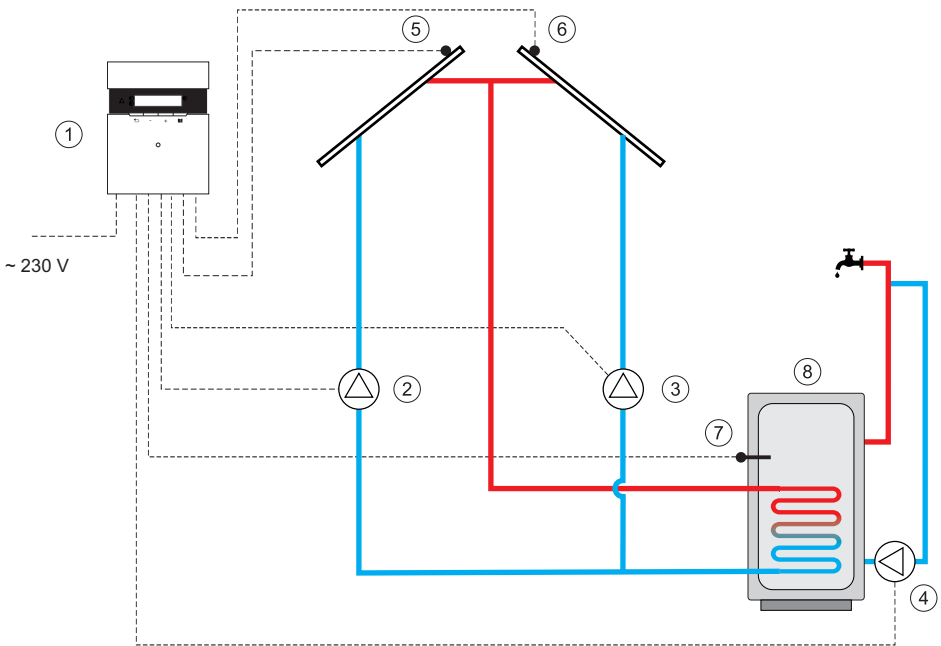
4. Display

Solar collector temp.
Storage tank temp.

Coll: 24° **22:17**
Tank: 50° **Tue**

Current time
Day of the week

5. Heating system connection diagram



1. EKOSOL 400 Controller
2. Solar collector pump 1
3. Solar collector pump 2
4. Circulation pump

5. Collector array sensor 1
6. Collector array sensor 2
7. DHW temperature sensor
8. Storage tank

Fig. 3 Example diagram of a water heating system with the EKOSOL 400, cut-off and safety devices not included. It is not a replacement for a professional design at the installation site.

6. Controller installation

1. Drive a wall plug with a screw into the wall.
2. Remove the front panel of the housing.
3. Hang the controller on the screw and mark the location of the other plug. Fix the controller with both plugs.
4. Insert cable connections in their respective sockets and run the cables through the housing.
5. Replace the front panel.
6. Plug the controller into 230 V mains.
7. Turn on the main switch.



Note: If the screen remains blank after the main switch is turned on, check:

- whether the leads are connected correctly to the mains,
- the condition of the fuse.



Note: Replace the fuse only if the device is unplugged.

7. Commissioning and clock settings

When the controller is first turned on, the time and day are blinking.

To set the correct time and date, press **■** and then use “+” and “-” to set the day of the week. Confirm your choice with **■**.

Repeat the procedure for the hour and minutes.

After the settings are complete, press **↶** twice to return to the home screen.



Coll: 24°	22:17
Tank: 50°	Tue

▼▼▼	
Tue	12:00

	▼▼
Tue	12:00

Coll: 24°	22:17
Tank: 50°	Tue

8. Adjusting the water temperature setpoint for the DHW storage tank

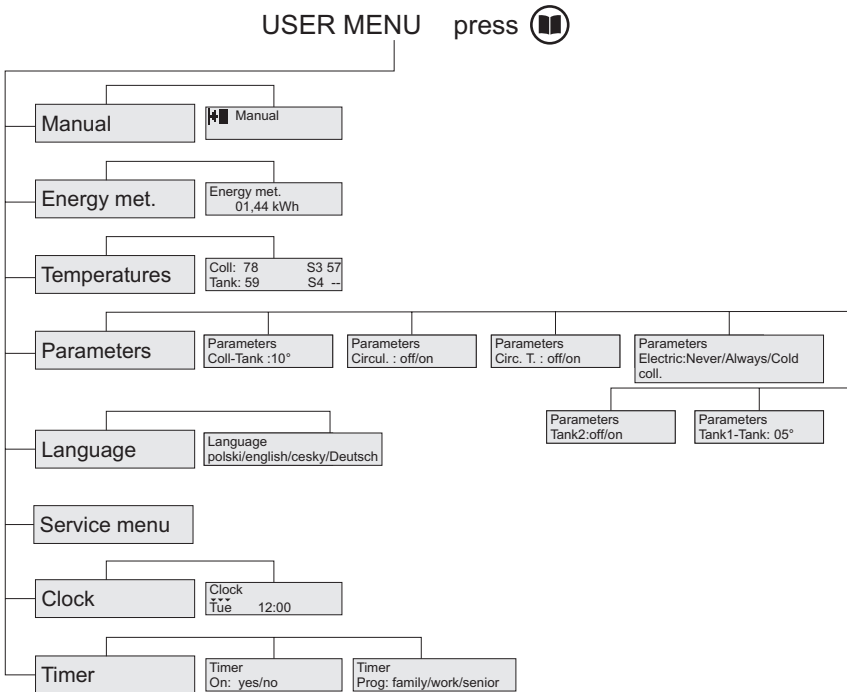
You can change the storage tank temperature setting at any time. It is done on the home screen with the “+” and “-” buttons. During the adjustment, the screen displays “SET” and a number representing the current storage tank temperature setting.

After the adjustment is complete, the controller automatically displays the solar collector temperature and the storage tank temperature

Coll: 24° 14:36
 Tank: 50° Tue


Coll: 24° 14:36
 Set: 50° Tue

9. User menu: structure






10. User menu: functionalities

You can set controller parameters for the solar collector pump, energy meter, storage tank, etc. in the user menu.

Use the “+” and “-” buttons to navigate the menu items. To change a specific setting, use the  button.

10.1 User menu: Manual mode

Here, you can test whether each output is operational (solar collector pumps and OUTA2).

The output to be tested is selected with . Turn it on and off with “+” and “-”. The output that is being tested is marked with . When it is on, it is marked with  next to the output number.



Note: When you force output 1 (solar collector pump) on, its 30-minute timer is also activated.

10.2 User menu: Energy meter

Menu item for the Energy meter.



The amount of energy gained is displayed here



This screen shows that the energy meter is turned off (characters ---).



10.3 User menu: Temperatures


The menu item for the Temperature preview.



This screen displays the current actual temperatures measured by sensors.



10.4 User menu: Parameters

With PARAMETERS, you can set the parameters of the solar collector pump by storage tank temperature and parameters of the other device (DHW circulation pump, electric element, or a pump for another hot water storage tank). Press  to adjust respective settings.

The COLL-TANK parameter is the minimum temperature difference between the solar collector and the storage tank at which the solar collector pump is turned on. It can be adjusted with “+” and “-”. For instance, when the parameter is set to 10° and the temperature in the storage tank is 40°C, the solar collector pump will be activated when the solar collector temperature exceeds 50°C.



Press  to proceed to the other device.




Note: The content of the screens for the other device depends on the type of device connected to the auxiliary output (OUTA2) and specified in SERVICE MENU/Parameters/auxiliary output. See page 20.

10.5 User menu: Parameters: DHW circulation pump

The CIRCUL parameter turns the DHW circulation pump on or off. It is changed with “+” and “-”.



Press  to proceed to the next setting.

10.5 User menu: Parameters: DHW circulation pump (continued)

Parameter Circ. T specifies the temperature difference between the storage tank and the DHW circulation loop for the activation of the DHW circulation pump. For more on programmes, see section 10.10 User menu: Timer on page 14.

**Parameters
Circ. T : off**



Note: When the energy meter is off and the sensor is set to T2, you cannot change Circ.T, and the circulation pump follows the Circ.T: OFF mode. It can follow the TIMER programme described in section 10.10 User menu: Timer on page 14.

10.6 User menu: Parameters: electric element

Here you can define when the electric heating element is turned on. The parameter is changed with “+” and “-”.

When it is set to ALWAYS, the electric element is turned on any time the temperature in the storage tank drops by the defined hysteresis value. See section 13.3 SERVICE MENU: PARAMETERS: storage tank heating hysteresis on page 18.

**Parameters
El. elem. : Never**

**Parameters
El. elem.: Always**

When the parameter is set to COLD COLL., the electric element is turned on when the solar collector pump is off because of an insufficient temperature difference between the solar collector and the storage tank. For how to set the temperature difference required to turn on the solar collector pump see section 10.4. User menu: Parameters on page 11.

**Parameters
El. elem: Cold coll.**


10.7 User menu: Parameters: auxiliary DHW storage tank

Here you can enable or disable a pump for an auxiliary storage tank. Make your selection with “+” and “-”.

Parameter TANK1-TANK defines the minimum difference between temperatures of the main and auxiliary storage tanks for the pump of the auxiliary tank to be activated. The value of the difference is set with “+” and “-”.

**Parameters
Tank2 : On**

**Parameters
Tank2 : Off**

Press  to proceed to the next setting.


**Parameters
Tank1 - Tank: 05°**



Note: When the energy meter is turned on and the sensor is set to T2, you can no longer edit the parameters of the auxiliary storage tank, and its pump will not start. For more on selecting the sensor, see section 13.19 ENERGY METER: Sensor selection on page 21.

10.8 User menu: Language

In LANGUAGE, you can select the menu language.

Press  to adjust respective settings. Make your selection with “+” and “-”.

< Language >

10.9 User menu: Clock

In CLOCK, you can set the time and day of the week as described in section 7. Commissioning on page 8.

10.10 User menu: Timer

The TIMER controls the operation of the DHW circulation pump.

Press **■** to adjust respective settings. Make your selection with “+” and “-”.

Press **■** again to navigate to the item where you select one of the four programmes for the DHW circulation pump (family, work, senior, custom) toggled with “+” and “-”.



Programme parameters

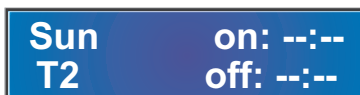
family		work		senior	
Sun	07:00 - 22:00	Sun	08:00 - 22:00	Sun	05:30 - 22:00
Mo	05:30 - 22:00	Mo	06:00 - 08:00, 16:00 - 22:00	Mo	05:30 - 22:00
Tue	05:30 - 22:00	Tue	06:00 - 08:00, 16:00 - 22:00	Tue	05:30 - 22:00
Wed	05:30 - 22:00	Wed	06:00 - 08:00, 16:00 - 22:00	Wed	05:30 - 22:00
Thu	05:30 - 22:00	Thu	06:00 - 08:00, 16:00 - 22:00	Thu	05:30 - 22:00
Fri	05:30 - 22:00	Fri	06:00 - 08:00, 15:00 - 23:00	Fri	05:30 - 22:00
Sat	05:30 - 22:00	Sat	07:00 - 23:30	Sat	05:30 - 22:00

With CUSTOM you can create your own DHW circulation pump cycle. You can define two active periods for every day of the week.

Change settings with “+” and “-” and confirm each time with **■**.



When you set the on/off parameters to ‘--:--’, no time for turning the DHW circulation pump on or off is set for this period.



10.10 User menu: Timer (continued)



Note:
DHW circulation pump cycles depending on the settings:

- a) Timer off
- Circ.T off

The DHW circulation pump is on all the time.

- b) Timer off
- Circ.T on

The DHW circulation pump is turned on depending on the minimum temperature difference between water in the storage tank and water in the DHW loop, Out-In, see section 13.14 PARAMETERS: circulation regardless of the Timer settings. The function is available if the DHW circulation temperature sensor is installed. (OPTION).

- c) Timer on
- Circ.T off

The DHW circulation pump is activated based on the selected schedule regardless of the Out-In temperature difference.

- d) Timer on
- Circ.T on

The DHW circulation pump is activated according to the schedule as long as the minimum temperature difference Out-In is detected.

11. Storage tank cooling function - Holiday mode

When the HOLIDAY function is enabled, the controller turns on the solar collector pump when the collector is cooler than water in the storage tank, which is most often at night so that the storage tank can accept the next portion of heat the next day.

It protects the solar collector and the storage tank from overheating when no hot water from the storage tank is used.



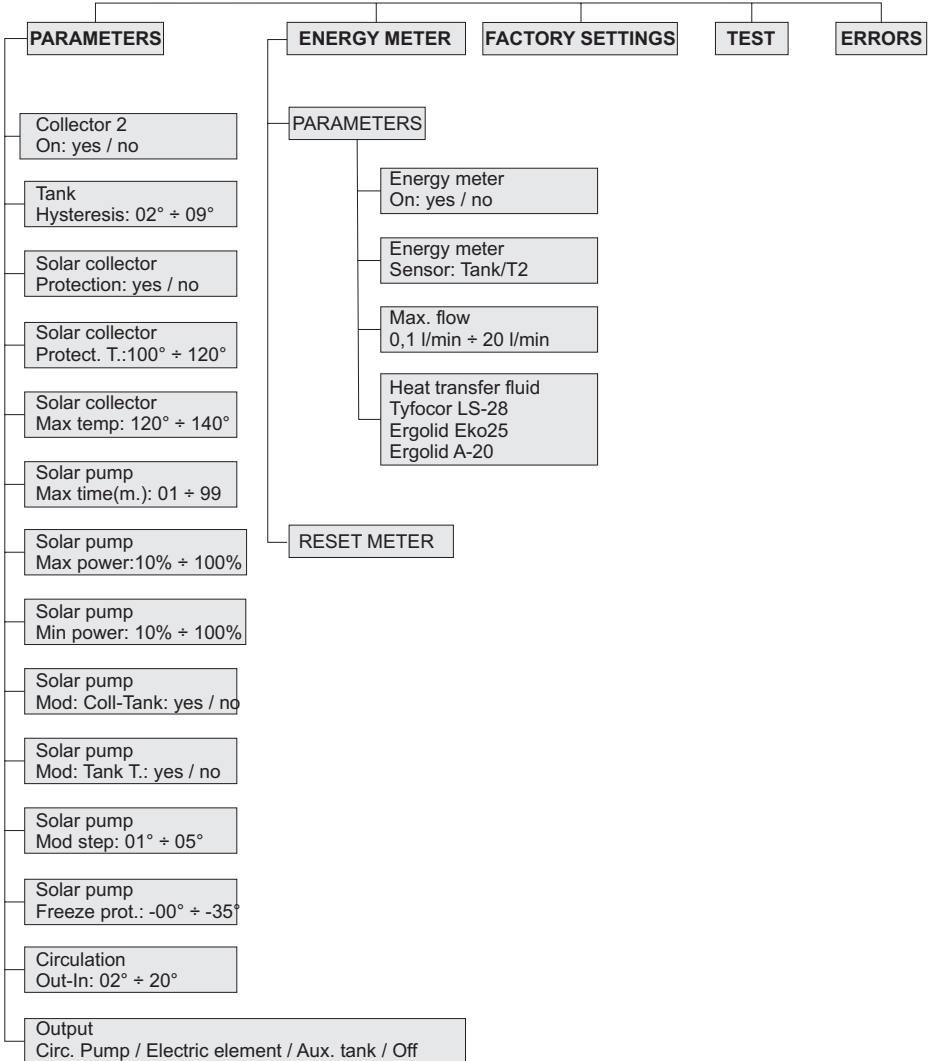
The function is enabled (and then disabled) by pressing the button for more than 4 seconds. When it is enabled, the display shows H (HOLIDAY). The function is active from 7 p.m. to 6 a.m..

12. Service menu: structure

The service menu is where you can set in-depth parameters of the solar collector, DHW storage tank, and pumps.

The structure of the service menu is shown in the diagram below.

Service Menu



13. Service menu: functionalities

The SERVICE MENU function offers extensive settings available to the installer only.

To navigate to SERVICE MENU:

- press **■** and then several times press “+” until <Service menu> is displayed.
- press **■** . The controller requests an access code.
- set the code with “+” and “-” and confirm with **■** .

< Service menu >

Service menu
Enter code: 00

The controller opens the PARAMETERS submenu. To navigate to the next item, FACTORY SETTINGS, press “+” or “-” and confirm with **■** .

13.1 Service menu: Parameters

In the PARAMETERS menu, you can define in-depth settings for individual components of your solar thermal system.

< Parameters >

13.2 Service menu: Parameters: auxiliary collector array

This parameter enables and disables the auxiliary collector array with its auxiliary pump. It is changed with “+” and “-”.

Collector2
On: no

13.3 Service menu: Parameters: DHW storage tank hysteresis

This parameter defines the number of degrees centigrade the storage tank temperature has to drop for the solar collector pump to be activated (as long as the Coll-Tank difference is satisfied as well). It is changed with “+” and “-”.

**Storage tank
Hysteresis: 02°**



Note: The precondition for this mode of operation is that modulation 2 is disabled, see section 13.11 PARAMETERS: Modulation 2 of solar collector pump.

13.4 Service menu: Parameters: solar collector protection

You can enable or disable the solar collector protection function here. It is changed with “+” and “-”.

**Solar collector
Protection: yes**

Solar collector protection turns the solar collector pump on when the temperature in the collector exceeds the value set in section 13.5 PARAMETERS: Solar collector protection temperature.

13.5 Service menu: Parameters: solar collector protection temperature

This parameter defines the acceptable solar collector temperature. It is changed with “+” and “-”.

**Solar collector
Protection T. : 120°**


When this value is exceeded, the solar collector pump is turned on to cool down the solar collector. For the pump to be activated, you need to set Solar collector protection to yes.

13.6 Service menu: Parameters: solar collector maximum temperature

This parameter defines the maximum acceptable solar collector temperature. It is changed with “+” and “-”.

**Solar collector
Max Temp : 125°**

13.6 Parameters: solar collector maximum temperature (continued)

When this value is exceeded, the  LED is on and an intermittent alarm is sounded. For the alarm to be activated, you need to set Solar collector protection to yes (see section 13.4).



Note: The solar collector pump is turned off when the maximum solar collector temperature is exceeded to protect the system.

13.7 Service menu: Parameters: solar collector pump timer

This parameter defines the time the pump is on in the MANUAL OPERATION mode.

**Solar pump
Max Time (m)30**

13.8 Service menu: Parameters: solar collector pump maximum power

This parameter defines the maximum power of the solar collector pump.

**Solar pump
Max power : 100%**

13.9 Service menu: Parameters: solar collector pump minimum power

This parameter defines the minimum power of the solar collector pump.

**Solar pump
Min power : 10%**

13.10 Service menu: Parameters: solar collector pump modulation 1

This parameter enables and disables the solar collector pump modulation over the range of the growing difference between the solar collector temperature and the storage tank temperature.

**Solar pump
Mod:Coll-Tank: yes**

13.11 Service menu: Parameters: solar collector pump modulation 2

With the modulation enabled, the solar collector pump gradually reduces the RPM as the temperature in the storage tank approaches the set temperature (and vice versa).

**Solar pump
Mod: Tank T. : no**

13.12 Service menu: Parameters: modulation 1 step

This parameter determines the required temperature change in degrees for the solar collector pump to increase or decrease its power by 10% of its range set in section 13.8 PARAMETERS: solar collector pump maximum power and in section 13.9 PARAMETERS: solar collector pump minimum power.

**Solar pump
Modul. step : 02°**

13.13 Service menu: Parameters: solar collector freeze protection

This parameter defines the solar collector temperature below which the solar collector pump is activated to prevent heat transfer fluid freezing in the system.

**Solar pump
Freeze prot.: -20°**

13.14 Service menu: Parameters: circulation

This parameter defines the minimum difference between the storage tank and the circulation loop for the circulation pump to be turned on.

**Circulation
Out-In: 10°**

13.15 Service menu: Parameters: auxiliary output


Here, you can define the device connected to the auxiliary output (DHW circulation pump, electric element, or pump for an auxiliary DHW storage tank). When it is set to OFF, the controller does not control the auxiliary output.

**Output
Off**

13.16 Service menu: Errors

This item contains the number of errors due to the exceeded maximum temperature in solar collectors (main: C1 and auxiliary: C2) from the time the counter was last reset. The value is reset by pressing “+” and “-” simultaneously.



When the maximum solar collector temperature is exceeded, the  symbol is displayed on the home screen.



13.17 Service menu: Energy meter

In ENERGY METER, you can:

1. Define specific settings to ensure the energy generated by the thermal solar system is computed correctly.
2. Reset the energy meter.



13.18 Service menu: Energy meter: on/off

This parameter enables and disables the energy meter. It is changed with “+” and “-”.



13.19 Service menu: Energy meter; sensor selection

With this parameter, you can decide whether the sensor for the storage tank is also the solar thermal system return sensor (required to measure energy). It is changed with “+” and “-”.



13.19 Service menu: Energy meter; sensor selection (continued)

When you select Tank, the storage tank sensor serves also as the return line sensor for the solar thermal system for computing energy consumption, see Fig. 4 Sensor wiring diagram - Tank version. This leaves an additional sensor T2 to be used to control an additional device (a circulation pump or a pump for an auxiliary storage tank).

If you select T2, it is the additional sensor that measures the solar thermal system return line temperature, and the temperature in the storage tank is measured by an independent storage tank sensor, see Fig. 5 Sensor wiring diagram - T2 version.

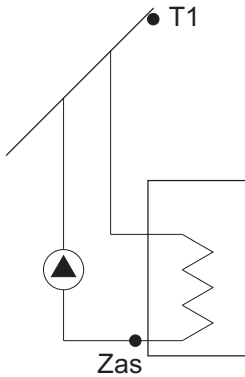


Fig. 4 Sensor wiring diagram
- Tank version

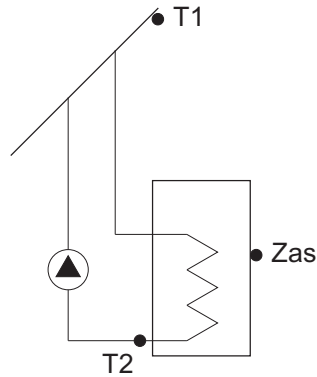


Fig. 5 Sensor wiring diagram
- T2 version



Note: Install the return line sensor right at the connector pipe of the storage tank.

13.20 Service menu: Energy meter: maximum flow

This parameter defines the maximum allowed flow of the heat transfer fluid in the system. The value should conform to the technical specification of the solar thermal system or the values indicated by a flow meter. It is changed with “+” and “-”.

Max. flow
5.0 l/min

13.21 Service menu: Energy meter: solar fluid

This parameter defines the type of heat transfer fluid used in the solar thermal system. It is changed with “+” and “-”.

**Solar fluid
Tyfocor LS-28**

13.22 Service menu: Energy meter: meter reset

This item can reset the meter value. It is done with the “+” button.

< Reset meter >

**Reset meter
+Confirm**


13.23 Service menu: factory defaults

You can restore the default factory settings. To do this, navigate to FACTORY DEF. and confirm with “+”.

<Factory def.>

**Factory def.
+Confirm**


14. Error messages

If a temperature reading error occurs for a solar collector or storage tank sensor, the display shows ERROR instead of temperature value for solar collectors (COLL, S4) or the storage tank (TANK). The  LED lights up (see section 3. Controller interface), and a sound alarm is emitted.

**Coll: Err. 22:17
Tank: 50° Tue**

**Coll: 124° 22:17
Tank: Err. Tue**

14. Error messages (continued)

A temperature reading error of the DHW circulation pump or auxiliary storage tank sensor results in the 'S' message blinking on the display. The  LED lights up (see section 3. Controller interface), and a sound alarm is emitted.

Coll: 124° 22:17
Tank: 50° C Tue



Note: If a reading error or a failure of the DHW circulation pump sensor occurs, the pump runs continuously.



Note: Consider installing a thermostatic mixing valve for DHW because the water in the storage tank can heat up to above 50°C.

15. Sensor characteristics

Resistance-temperature characteristics of the solar collector sensor

Temp. (°C)	Rezyst. (Ω)	Temp. (°C)	Rezyst. (Ω)	Temp. (°C)	Rezyst. (Ω)
-30	882	35	1136	100	1385
-25	902	40	1155	105	1403
-20	922	45	1174	110	1422
-15	941	50	1194	115	1441
-10	961	55	1213	120	1460
-5	980	60	1232	125	1479
0	1000	65	1251	130	1498
5	1019	70	1270	135	1517
10	1039	75	1289	140	1535
15	1058	80	1308	145	1554
20	1078	85	1328	150	1573
25	1097	90	1347	155	1591
30	1116	95	1366	160	1610

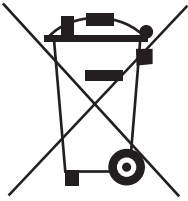
15. Sensor characteristics (continued)**Resistance-temperature characteristics of the
storage tank or auxiliary device sensor**

Temp. (°C)	Rezyst. (Ω)	Temp. (°C)	Rezyst. (Ω)	Temp. (°C)	Rezyst. (Ω)
-30	1247	20	1922	60	2597
-20	1367	25	2000	70	2785
-10	1495	30	2080	80	2980
0	1630	40	2245	90	3182
10	1772	50	2417	100	3392

16. Parameters

Rated supply voltage	230 V, 50 Hz
Relative air humidity	95%
Enclosure protection level	IP 20
Insulation class	II
Controller dimensions	175 x 136 x 46 mm
Ambient temperature	0°C to + 40°C
Electrical safety device:	1 x 2.5 A

17. Information on the disposal of waste electrical and electronic equipment



Disposal of waste electrical and electronic equipment (applicable to EU countries and other European countries where collection schemes are in place).

This symbol on the product or its packaging (under the Act of 29.07.2005 on waste electrical and electronic equipment) means that used electrical and electronic products should not be mixed with general household waste. Please take this product to a designated collection point for waste electrical and electronic equipment. Disposing of this product correctly will help prevent any potential negative effects on human health and the environment. Recycling helps conserve natural resources. Please contact our office or our distributors for further details on recycling this product, the collection scheme for waste electrical and electronic equipment, or a list of processing plants.



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