SDC 204

Microprocessor-controlled system control unit for solar thermal systems

Installation and Operating Instructions

IMPORTANT
Before installing and using this device, you must read through the instructions carefully.
Failure to observe the instructions and safety information contained in these installation and operating instructions will void the guarantee for the device described/installed.
STORE THESE INSTRUCTIONS IN A SAFE PLACE.

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i **Subject to change without notice**

1 SAFETY INSTRUCTIONS

This control unit must be disconnected from the mains before any installation and wiring work is carried out.
This device may only be opened, connected and commissioned by trained personnel. In so doing, the relevant safety regulations, especially VDE 0100 must be adhered to.

- **Prior to any installation or wiring work on the electric motors, always fully disconnect the device from the operating voltage and ensure that the mains supply cannot be reactivated.** Never mix up the connections for the protective safety low voltage area (sensor, flow meter) with the 230 V connections. This could result in damage and hazardous voltages to the device itself and to the attached sensors and devices.
- Solar thermal systems can become very hot. There is a risk of being burnt. Take care when installing the temperature sensor.
- Install the SDC 204 in such a way that no excessive operating temperatures (>50℃) result, e.g. as a result of heat sources.
- SDC 204 is not protected against splashing and dripping. You should therefore install it in a dry location.
- For safety reasons, the system may be manually operated only for test purposes. In this operating mode, there is no monitoring of maximum temperatures or sensor functions.
- If there are signs of damage to the control unit, cables or attached pumps and valves, the systems must not be operated.
- Check whether the materials used for the piping, thermal insulation, pumps and valves are suitable for the temperatures that will occur in the system.

If you have any questions concerning your solar thermal system or your control unit, please contact your installer or supplier for advice.

2 SYMBOLS AND ABBREVIATIONS

Explanation of symbols used in operating instructions:

	Warning! This symbol indicates potential dangers and errors
	Warning: 230 Volts This symbol indicates risk to life through high voltages.
•	List
i	Information on operation/special features
➲	Instructions/procedure
?	Test/check
	Keypad for control unit

Frequently used abbreviations

Abbreviation	Meaning	Abbreviation	Meaning
TColl	Temperature of collector [°C]	Min	Minimum value
TCyl	Temperature of storage cylinder [°C]	Max.	Maximum value
TTh	Temperature for thermostat [°C]	K	Kelvin unit, corresponds to 1 degree temperature difference
xxx	Miscellaneous display value	°C	Degree Celsius u nit
kWh	Energy yield in kWh	Td	Temperature difference
start	Start value	%	Percent
stop	Stop value	RLW	Return line monitor
		RLA	Increase in return line temperature

Term explanations

Combination storage cylinders	Combination storage cylinders consist of two storage cylinders, a buffer storage cylinder and a hot-water storage cylinder, the latter being integrated in the upper part of the buffer storage cylinder.
Unit	A unit is a component of a system and is responsible for part of its function.
Hysteresis	In control technology, the term hysteresis is used where an upper and lower threshold value is responsible for switching (see Td Start and Td Stop).
Condenser	Electrical component for storage of electrical energy.
Shield	Electrical shields reduce the influence of electrical and magnetic fields on the signals in the cables and wires. Coaxial cables are commonly used for this purpose.
Heat station	Place at which energy is stored or transferred. In solar thermal systems, the storage cylinder is the heat station.

3 DEVICE DESCRIPTION

3.1 Usage

The solar thermal controllers SDC 204 are high-performance, microprocessor-controlled control devices used to control the function of solar thermal systems.

The control units are suitable for common types of solar thermal systems. See system diagram.

These control units are designed for use in dry rooms, private homes, business and commercial premises.

Alternative use or use beyond this remit is not in accordance with its purpose. Incorrect usage can result in serious injury or death to the user or a third party and can harm the device or system and other material assets. The manufacturer/supplier shall not be liable for any damage arising from such misuse. The risk is borne by the user alone.

3.2 Device features

The SDC 204 range offers the following features and equipment:

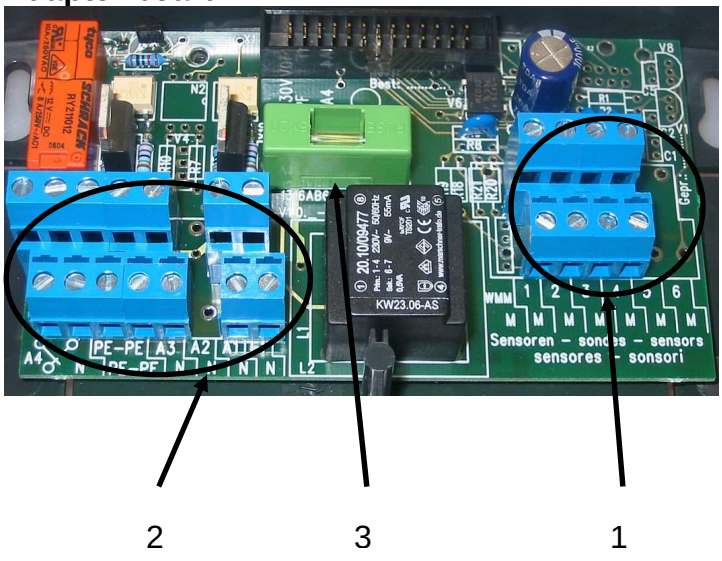
- **Self-explanatory, menu-driven operation**
- **Digitally adjustable control values**
- **System monitoring**
- **Energy yield estimation**
- **Storage of all entered values**
- **Generous amount of space for wiring**

Available accessories:

- Temperature sensor PT1000

4 OVERVIEW OF DEVICE COMPONENTS

Adapter board:



2 3 1

No.:	Function
1	Sensor attachment
2	Attachment of outputs/power supply
3	Fuse

5 DEVICE INSTALLATION

This control unit may be installed only in dry rooms where there is no risk of explosion. Installation on a flammable base is not permitted.

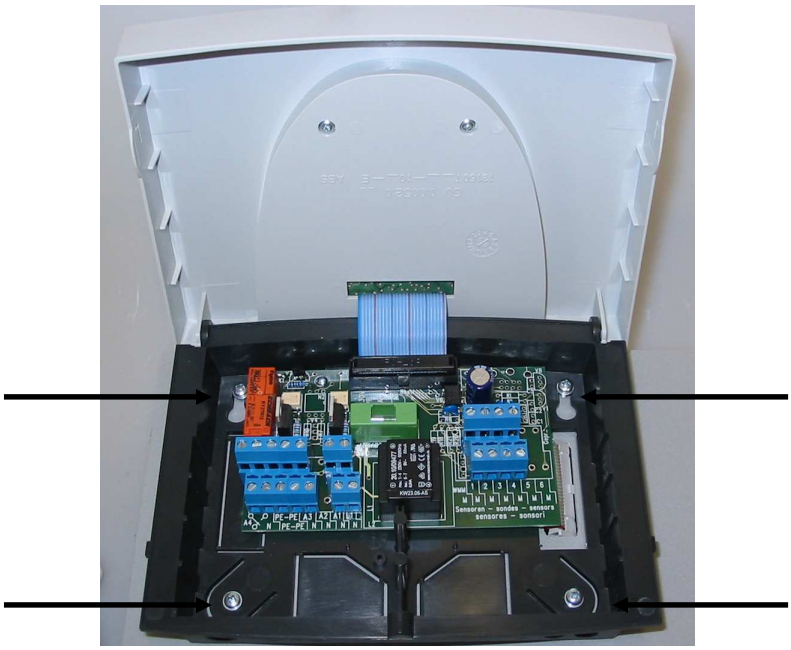
5.1 Opening the device (only by qualified personnel)

No tools are required to open the device. The upper part of the casing is locked to the lower part at two engagement points. The locking forces are such as to prevent the casing from being opened accidentally.

Holding the casing at each side, pull firmly towards you and then raise the top part of the casing until it engages. You can now install and wire up the control unit.

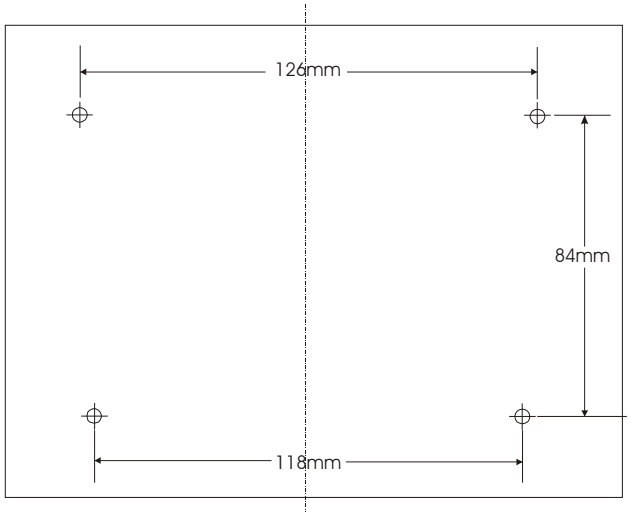
Prior to switching on or commissioning, you must ensure that the cover is closed properly such that you feel and hear it click into position on both sides.

5.2 Wall mounting



When mounting the device on a wall, proceed as follows:

- Drill the fixing holes using the drilling template shown.
- Screw in the two top screws leaving a gap of up to 6 mm.
- Open the device as described and hang it on the two screws. You can now fit the two bottom screws.
- **To avoid damage to the lower part of the casing, do not overtighten any of the screws.**



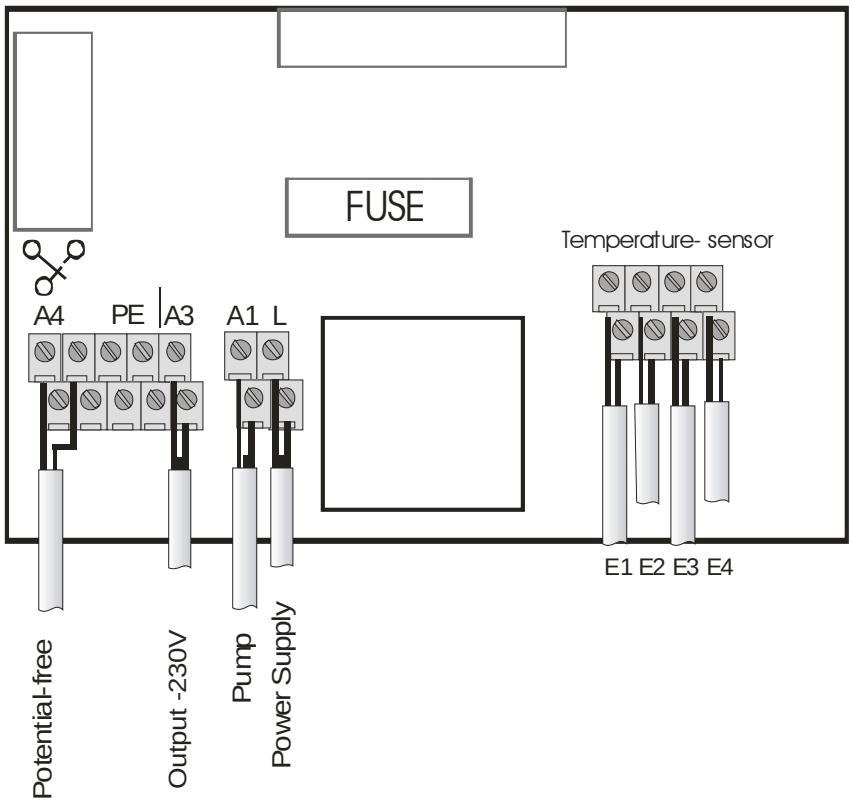
You drill into walls at your own risk. Prior to drilling, please check that there are no cables, pipes or shafts in the wall; contact the property owner if necessary.

6 ELECTRICAL CONNECTION

You must observe the safety instructions in chapter 1

The device may be opened only if it has been properly disconnected from the mains and there is no risk of reconnection.

All electrical cables are connected to the unit in the lower part of the casing. The terminals on the right-hand side are those for the (low voltage) connections for sensor and flow meter. The 230 V connections are located on the left-hand side. The figure below shows the terminal field for the SDC 204.



PE	Earth wire	E1	Temperature sensor for collector
L	Phase mains	E2	Temperature sensor for bottom of storage cylinder
N	Neutral cable for mains	E3	Temperature sensor for R2 control circuit
A1	Phase switching output 1	E4	Temperature sensor for R2 control circuit
A3	Phase switching output 2		
A4	Potential-free switching output		

General attachment regulations:

For all attachment wires, cut the wire sheath to a length of approx. 6 – 8 cm and unisolate the wires by approx. 10 mm from the ends.

- In the case of flexible cables, provision must be made inside or outside the device for strain relief. The wire ends must be fitted with wire-end sleeves. If necessary, PG9 screw fittings can be used for the feedthrough on the 230 V side.
- The wires are fed into the device through the designated openings.
- All earth wires must be fixed in the terminals indicated with “PE” (Earth potential).

6.1 230 V connections

The following points must be observed for the 230 V connections:

- Where there is a fixed mains connection, it must be possible to interrupt the mains supply to the control unit outside the control unit by means of a switch.
  Where the mains connection is effected by means of wire and plug with earthing contact, this switch may be dispensed with.
- The control units are designed for operation with a 230 V /50 Hz mains supply. The pumps and valves to be connected must be designed for this voltage.
- All earth wires must be connected to the terminals marked PE.

i The neutral terminals (N) are electrically connected and are not switched.

i The switching output (A4) is potential-free.

i The switching outputs (A1/A3) are 230 V closers.

6.1.1 Overview: 230 V connections for SDC 204

The table below shows the allocation of switching outputs for the different system types. The fields with a grey background are essential to the basic functions of the system. The white fields are designed for optional additional functions:

Configuration		Switching outputs	
Type	Description	Output	Description
1	1 collector array, 1 storage cylinder	**A1**	Solar circuit pump
		--	
2	1 collector array, 1 storage cylinder, auxiliary heating	**A1**	Solar circuit pump
		A4	Auxiliary heating (pump)
3	1 collector array, 2 storage cylinders (hot water), thermal transfer	**A1**	Solar circuit pump
		A3	Thermal transfer pump Sp2
4	1 collector array, 1 storage cylinder, increase in return line temperature	**A1**	Solar circuit pump
		A3	Increase in return line temperature (valve)
5	1 collector array, 1 storage cylinder, return line monitor	**A1**	Solar circuit pump
		A3	Return line monitor (valve)

6.2 Attachment of temperature sensor

The SDC 204 devices work with precise platinum temperature sensors of type PT1000. Between 2 and 4 sensors are required, depending on the scope of function.

Installation/wiring of temperature sensor:

- Install the sensors at the requisite places on the collector and the storage cylinder. In so doing, ensure good temperature transmission and, if necessary, use a thermally conductive paste.
- The cables of the temperature sensors can be extended. For lengths up to 15 m, a cross-section of 2 x 0.5 mm² is required; for lengths up to 50 m, a cross-section of 2 x 0.75 mm² is necessary. In the case of long connections (collector), shielded extension cables must be used. Do not attach the shield on the sensor side; instead cut it to length and insulate it.
- To protect the collector sensor within the control unit, the use of a lightning protection device (accessories) is recommended.
- The temperature sensors are connected in accordance with the system diagram. In the case of temperature sensors, there is no need to observe the polarity of the two wires.
- To protect the collector sensor within the control unit, the use of a lightning protection device (accessories) is recommended.

⚠ Sensor wiring must be laid separately from 230 V wires.

Prior to switching on or commissioning, you must ensure that the cover is closed properly such that you feel and hear it click into position on both sides.

7 COMMISSIONING

Commission your control unit in the following sequence:

? Are the collector and storage cylinder sensors correctly mounted

? Has the correct sensor type been selected (PT1000)?

Yes	No	➔	Select and install the correct sensor

↓

? Is the power cable for the pump connected correctly to the pump and the control unit?

Yes	No	➔	Connect the cables correctly

↓

➲ If the pump is powered directly via a mains cable: does the pump work?

Yes Unplug the mains plug	No Unplug the mains plug	➔	Test the pump cable, test the pump

↓

➲ Reconnect the pump to the control unit

? Are the sensor cables for the collector and storage cylinder sensors correctly connected to the relevant control unit terminals?

Yes	No	➔	Connect sensors correctly

↓

➲ With the mains supply switched off, connect the control unit and then switch on the mains supply (e.g. via a safety fuse):

? Does data appear on the display

Yes	No	➔	Test the fuse on the device Check the fuse protection on the mains

↓

➲ Using the programming menu, set the correct time.

➲ On the basic settings menu, enter the activation code (preset: 0000).

➲ On the basic settings menu, enter your system diagram.

➲ On the basic settings menu, change the parameters according to the required function.

➲ Enter the parameters (e.g. time window, hysteresis, etc.) on the program menu.

? Does the system run as it should?

Yes	No	➔	Check the parameters Rectify fault as described in section 12

↓

Control unit is ready for use.

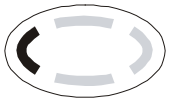
8 OPERATION / INDICATORS

8.1 Overview of displays and operating controls

The SDC 204 control unit is operated comfortably and simply by means of 4 buttons. The operating buttons allow you to:

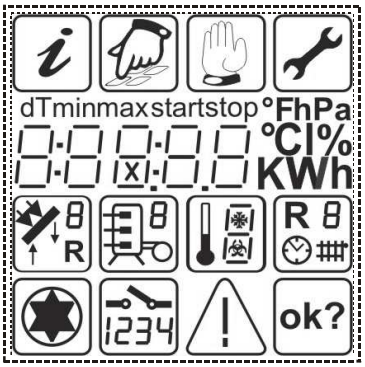
- Access display values
- Enter device settings

The graphic symbols on the display unit lead you simply through the operating structure and provide a clear overview of the current menu options, display values and parameters.

Description		
	"Up" „+"	• Upwards menu item • Change value: increase the displayed value by 1; press and hold the button to increase the values continuously
	"Access" "Down" „-"	• Access a main menu, downwards menu item • Change value: lower the displayed value by 1; press and hold the button to decrease the values continuously
	"Scroll left" "Exit" "Cancel" "ESC"	• Scroll to the left on the main menu • Exit a menu • Exit a menu item • Cancel a change to a value without saving
	"Scroll right" "Select" "OK"	• Scroll to the right on the main menu • Select a menu item • Confirm a change to a value by saving

8.2 Display – maximum display

In the following graphic, all symbols that can appear on the display during operation are displayed simultaneously. In real-time operation, depending on the menu position, only some of these symbols will appear.



Main menu

Display values

Allocation of measuring points

Status display

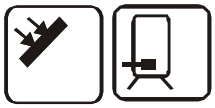
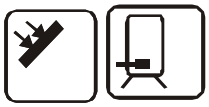
8.3 Explanation of graphic symbols

The meaning of the individual symbols is given in the table below.

Graphic symbol	Description	Display during operation
Main menu		
	“Info” menu	Symbol flashes if it can be selected
	“Program” menu	
	“Manual operation” menu	
	“Basic settings” menu	

During selection, the active symbol flashes. If the menu is selected using the  button, the corresponding symbol is displayed permanently. All others are hidden.

Graphic symbol	Description	Display during operation
Display values		
Td	Temperature difference	
start	Start value	Appears when start values are displayed
stop	Stop value	Appears when stop values are displayed
min	Min. value	Appears when minimum values are displayed
max	Max. value	Appears when maximum values are displayed
88888	5 x 7 segment display Display of numbers 00000 to 99999	Display of all numeric values, display flashes if value is changed
°C	Temperature in degrees Celsius	
%	Percentage value	Appears when glycol percentage is displayed
K	Temperature difference in Kelvin	
kWh	Display yield in kWh.	
Control circuit assignment		
	Control circuit 2 (switches 3 and 4 parallel)	Sensor number and position of sensors relate to the control circuit R2.
	Time slot for control circuit 2	“Start” and “Stop“ refer to the time slot for R2.
Sensor number		
	Temperature sensor 1	
	Temperature sensor 2	
	Temperature sensor 3	
	Temperature sensor 4	

Position of sensors		
	Collector array	Is displayed together with the relevant sensor number.
	Top of storage cylinder	Is displayed together with the relevant sensor number.
	Middle of storage cylinder	Is displayed together with the relevant sensor number.
	Bottom of storage cylinder	Is displayed together with the relevant sensor number.
	Centre of transfer storage cylinder	Is displayed together with the relevant sensor number.
	Sensor in return line if there is a return line monitor	Is displayed together with the relevant sensor number.
	Sensor in return line if there is increase in temperature through a return line monitor	Is displayed together with the relevant sensor number.
Adjustment parameters		
max 	Maximum storage cylinder temperature	Is displayed in the programming menu. Unit: ℃ (degrees Celsius)
Td start 	Switch on hysteresis for the solar circuit	Is displayed in the programming menu. Unit: K (Kelvin)
Td stop 	Switch off hysteresis for the solar circuit	Is displayed in the programming menu. Unit: K (Kelvin)
min 	Minimum temperature for auxiliary heating	Is displayed in the programming menu. Unit: ℃ (degrees Celsius) Sensor number and control circuit are also displayed
max 	Maximum temperature of the transfer storage cylinder (sensor in middle)	Is displayed in the programming menu. Unit: ℃ (degrees Celsius)

Adjustment parameters		
Td start 	Switch on hysteresis for control circuit 2	Is displayed in the programming menu. Unit: K (Kelvin) Reference sensors for source and sink flash alternately.
Td stop 	Switch off hysteresis for control circuit 2	Is displayed in the programming menu. Unit: K (Kelvin) Reference sensors for source and sink flash alternately.
	System time	Is displayed in the programming menu.
Status display		
	Solar circuit pump	Symbol rotates when the solar circuit pump is switched on
	Switching output 1 is active	Appears if switching output 1 is active (on).
	Switching outputs 3 and 4 are active (switched in parallel)	Appears if switching output 3 and 4 are active (on).
	Indicates a system error or incorrect code entry	Display flashes if an error occurs in the system. Lights up if the wrong code is entered.
	Safety question for value changes with save facility	Value input can be refused  or accepted  .
Other displays		
	Flow rate	
	Total yield for storage cylinder	
	Daily yield for storage cylinder	

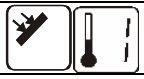
8.4 Example of device operation

Once you have familiarised yourself with the menu descriptions as described in the “Operating menus“ chapter, you can practice by carrying out the operating steps. An operational example is illustrated below.

The starting point is the current collector temperature on the “Info” menu. Aim: Change to “Solar circuit Td stop” circuit from 3K to 4K in “Program” menu

 White: symbol lights up continuously

 Grey: symbol flashes

Button	Function	Graphic display following operational step				Description
	“Exit“					Exit the “Info” menu
	“Scroll right“					Selection of “Programming” menu
	“Access”		**max 85℃**			Access of “Programming” menu; the first menu item appears
	“Down”		**Td stop 3 K**			Keep pressing until the menu item “Td stop” appears
	“Select”		**Td stop 3 K**			Select the parameter shown
	“Up”		**Td stop 4 K**			Increase the parameter value from 3K to 4K
	“Confirm ”		**Td stop 4 K**		**ok?**	Confirm the parameter
	“Confirm ”		**Td stop 4 K**			Store the parameter
	“Exit“					Exit “Programming” menu
	“Scroll left“					Select the “Info” menu
	“Access”		**60℃**			Access of “Info” menu

9 MENU STRUCTURE

To facilitate simple operation of the device, the device, operating and display functions are combined into 4 groups (= main menu).

The four menus
- Information
- Program
- Manual operation
- Basic setting

provide information on your solar thermal system.
The currently active menu is displayed by means of the relevant graphic symbol in the top row of the display.

Menu	Overview of functions contained
Information 	Main menu for the automatic control of the solar system. • Display of current measured values • Display of system status • Display of error messages • Display of energy yield (if existing)
Program 	Change and set the programmable setting values (parameters) **Note:** Changes can impede system functions
Manual operation 	Switching the connected pumps/valves on and off manually
Basic setting 	Information on the basic settings for the system function. **Note:** Settings and changes may only be carried out by trained personnel.

9.1 "Info" menu

In this operating mode, all measured values and operating states are displayed.

i **Only the configuration-specific symbols are displayed.**

Resettable values such as minimum and maximum temperatures, daily yield and overall yield can be reset as follows:

➲ Select value using  and  buttons

➲ Reset value using the  button

➲ Confirm "OK?" message with  = no or  = yes

9.2 “Program” menu

All changeable parameters can be checked in this menu and changed if necessary. Common values are set at the factory, which will generally ensure that the system functions correctly.

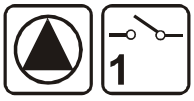
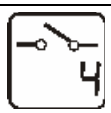
The number of displayed values depends on the type of controller and the additional functions set. Only the values required in each case are displayed.

i **Only the configuration-specific symbols are displayed**

Parameter	Value range	Factory setting
Timeframe R2 start	0:00 – 23:59	7:00
Timeframe R2 stop	0:00 – 23:59	22:00
Storage cylinder 1 maximum temperature	20℃ – 95℃	85℃
Solar circuit Td start	3K – 20K	6K
Solar circuit Td stop	2K – 18K	3K
Start temperature, auxiliary heating	5℃ - 90℃	60° C
RLA/RLM Td start	3K – 20K	4K
RLA/RLM Td stop	2K – 18K	2K
Maximum temperature for transfer storage cylinder	20℃ – 95℃	85℃
Transfer Td start	3K – 20K	6K
Transfer Td stop	2K – 18K	3K
Set time	0:00 – 23:59	12:00

9.3 “Manual operation” menu

For the purposes of servicing and testing, the solar thermal system can be operated manually. To facilitate this, the 230 V or switching outputs or the potential-free output can be switched on and off. During manual operation, there is no automatic control of the system. In order to prevent improper operating conditions, after approximately 8 hours of this type of operation, the program switches automatically to “Display” and automatic control is reactivated.

Display	Meaning	Value range
	Switching the switching output A1 (solar circuit pump) on or off manually	0 = off 1 = on
	Switching the switching output A3 on or off manually	0 = off 1 = on
	Switching the switching output A4 on or off manually	0 = off 1 = on

9.4 "Basic settings" menu

Settings and changes in this menu may only be made by the installer or trained personnel. Incorrect settings can impair the function of the control unit and the solar thermal system.

To prevent accidental changes in the "Basic settings" menu, it cannot be edited under normal operation; the data can be displayed only. **To be able to carry out changes, the activation code must be entered.** You are then able to edit data for an unlimited period. **This facility to edit is blocked once you exit the basic settings menu and can only be reactivated one you have entered the relevant code.**

i **Only the configuration-specific symbols are displayed!**

Display		Meaning	Value range	Factory setting
Parameter	Value			
C	**0000**	Code entry to activate facility to edit	0000 - 9999	0000
00	**0**	Activate factory setting/reset	0 - 1	0
01	**1**	Select configuration	1 - 4	1
10	**120**	Maximum collector temperature	90℃ -150℃	120℃
20	**0**	Yield estimate mode on/off	0 - 1	0
21	**0**	Volume flow (internal value)	0.0 – 50.0 l	0.0 l
23	**1**	Glycol type 1 - Tyfocor L5.5 2 - Tyfocor LS, ready mix 3 - Dowcal 10 4 - Dowcal 20 5 - Dowcal N	1 – 5	1
24	**40**	Glycol percentage	0% - 100%	40%
30	**10**	Tolerance for solar yield	0K – 80K	10K
70	**50**	Maximum temperature for sink	30℃ – 70 ℃	50℃
CodE	**----**	Change to code	0000 - 9999	----

The value range "Tolerance for solar yield" and the lower limit of the value range "Start temperature for auxiliary heating" are interdependent. This means that the value for "Start temperature for auxiliary heating" cannot be changed so as to be lower than that for "Tolerance for solar yield". Equally, the value for "Tolerance for solar yield" cannot be changed so as to be higher than that for "Start temperature for auxiliary heating".

9.4.1 Code entry

The “C” on the left flashes.
➲ Press the OK key.
➲ Does the first digit after the C flash?

Yes	No	➔	• System error

➲ Press the up button, then +1
➲ Press the down button, then -1
➲ Enter the required digit and confirm with OK
? First position entered correctly?

Yes	No	➔	Press the reset button

➲ Enter the 2nd, 3rd and 4th digits in exactly the same way as the 1st digit.
➲ Does the “OK?“ symbol flash?

Yes	No	➔	Press the OK button until the “OK?” symbol flashes

➲ Check whether the code was entered correctly.
➲ Is the authorisation code correct?

Yes	No	➔	Press the reset button; code entry starts again from the beginning

➲ Confirm by pressing the OK button.
i The code is checked.
? Was the code correct?

Yes	No	➔	The warning symbol and “C----“ light up for 2 seconds. The system once again prompts you to enter a code by means of a flashing “C”.

i “OK?” and “C0000” light up for 2 seconds. The “00” parameter (factory setting) then flashes.
➲ You can make the changes in the basic settings menu.

9.4.2 Code change

Once the basic settings menu has been activated, the “CodE” parameter starts to flash. If you wish to change the password, confirm with the OK button. The first digit flashes. Proceed as per code entry. Once you have entered the code, the “OK?“ symbol and “C0000” light up for approx. 5 seconds. The code has now been stored.

10 CONTROLLER FUNCTIONS

The SDC 204 controllers include comprehensive functions for controlling and monitoring the solar thermal system. A basic distinction is made between:

- Control functions for loading the storage cylinder
- Functions for system protection and system monitoring
- Additional functions

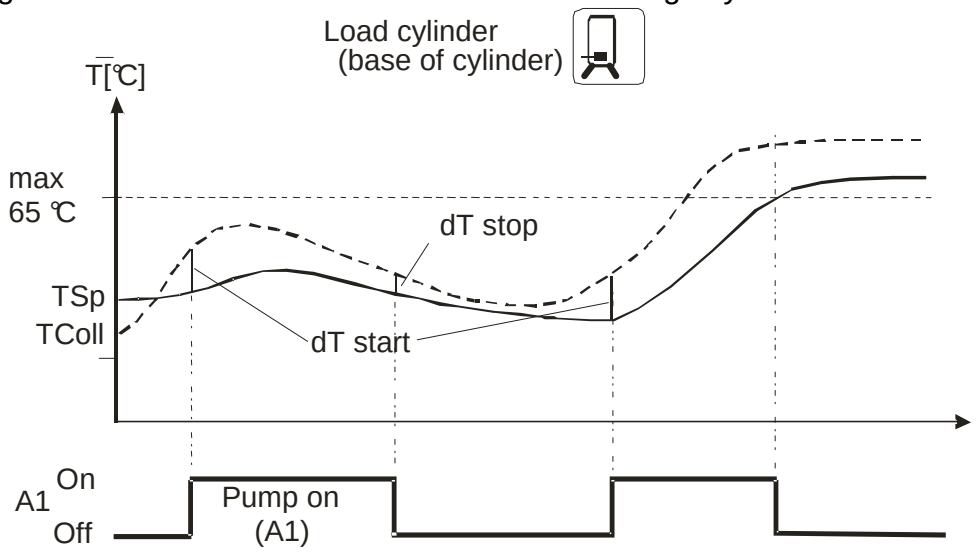
10.1 General control functions

The control unit records the temperatures from the various measuring points and calculates the correct time to load the storage cylinders, based on the programmed (additional) functions and control parameters. To prevent the pump from switching on and off due to only minimal differences in temperature, a switch-on hysteresis, e.g. 7K and switch-off hysteresis, e.g. 3K is preset.

10.1.1 Load storage cylinder

Relevant values in menu
"Program"
Maximum temperature
Td start Switch-on temperature difference
Td stop Switch-off temperature difference

The storage cylinder is loaded to the specified maximum temperature via the pump on output A1, provided the collector temperature is a certain amount higher than that of the storage cylinder temperature. The switching behaviour can be set via Td start and Td stop, whereby the value for Td start cannot be lower than that for Td stop + 1. To prevent the pump from switching on and off due to only minimal differences in temperature, a hysteresis of 5K is preset as the storage cylinder maximum temperature.



10.1.2 Yield estimation

For the purposes of yield estimation (heat quantity), the collector sensor serves as a reference sensor for the hot flow, the storage cylinder sensor at the bottom serves as a reference sensor for the cool return flow. The volume flow, type of glycol and glycol concentration are entered in the control unit. A daily yield value is calculated from these five values and can be displayed. Adding together the daily yields gives the total amount, which can also be displayed. The yields can be reset manually.

10.1.3 Password

The parameters contained in the “Basic settings” menu can be changed only following entry of a 4-digit numerical password. Parameters can be displayed at any time. Once the password has been entered, this can also be changed.

10.1.4 Auxiliary heating

For the upper part of the storage cylinder (standby capacity), a start temperature for auxiliary heating is preset. Once the temperature of the water reaches this temperature, the auxiliary heating is triggered so that the water cannot fall below this temperature. A clock timer is available for this function.
To prevent the pump from switching on and off due to only minimal differences in temperature, a hysteresis of 5K is preset.

10.1.5 Tolerance for solar yield

In the case of a solar yield from the collector, the “Start temperature for auxiliary heating” (minimum temperature) is reduced by the amount set for “Tolerance for solar yield”. In other words, if loading takes place between the collector array and the storage cylinder, the auxiliary heating is triggered to reach a reduced value (e.g. 60℃ – 10K = 50℃). If no loading takes place for at least 15 minutes, the reduction is removed again. This allows the solar thermal system to provide higher yields.

10.1.6 Increase in return line temperature

In the case of solar thermal systems with auxiliary heating, the solar energy from the storage cylinder can be used via a temperature increase in the boiler return. If there is a difference in temperature between the return flow of the heating circuit and the base/centre of the solar storage cylinder, a 3-way valve is activated so that the lower part of the combination storage cylinder runs in series to the heating return flow.
To prevent the pump from switching on and off due to only minimal differences in temperature, a hysteresis is preset.

10.1.7 Return line monitor

In the case of solar thermal systems with auxiliary heating and where there is a heat station, the return flow of the heating circuit is layered into the storage cylinder. Depending on the temperature difference between the return flow and the solar storage cylinder in the middle, a 3-way valve is triggered in order to layer the return flow at the bottom or centre of the solar storage cylinder. The heating flow is connected to the upper part of the solar storage cylinder.
To prevent the pump from switching on and off due to only minimal differences in temperature, a hysteresis is preset.

10.1.8 Thermal transfer

In the case of systems with a storage cylinder and an additional solar storage cylinder, this function transfers the water heated by solar power from the solar storage cylinder to the conventionally heated storage cylinder. A clock timer (timeframe) is available for this function. To prevent the pump from switching on and off due to only minimal differences in temperature, a hysteresis is preset.

10.1.9 Pump block protection

All pumps that have not run for 24 hours are switched on for approximately 5 seconds each day between 12.00 and 12.01.

10.2 System monitoring

If an error occurs, the  symbol will always flash.

10.2.1 Sensor monitoring

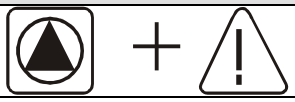
The sensors required for the control functions and their connection cables are monitored for breakage and short circuit. If a defective sensor is recognised by the software, the  symbol is displayed. The source of the error can be found by scrolling.

Important:

The use of incorrect temperature sensors can therefore also lead to one of the error messages.

Display	Meaning
	Short circuit of temperature sensor for current measuring point
	Interruption to temperature sensor of current measuring point, circulation error if energy yield estimation is activated

10.2.2 Flow monitoring

Display	Meaning
	No circulation in solar circuit

In the case of the controller SDC 204, the temperature difference between the collector and the storage cylinder is checked. If this exceeds the amount of (60K + Td start), this is interpreted as an error because such large differences should not arise given normal system dimensions and assuming that the pump is switched on.

In the case of the SDC 204 control unit, the flow quantity is checked when the pump is switched on. If, for a period of approx. 30 minutes, no flow is detected, this is interpreted as an error.
The error message is automatically reset once the fault has been removed.

10.2.3 System protection function

The system protection function switches the system off if the “maximum collector temperature” is exceeded. As soon as the temperature drops 15K below this value, the system is started up again.

11 SYSTEM DIAGRAMS

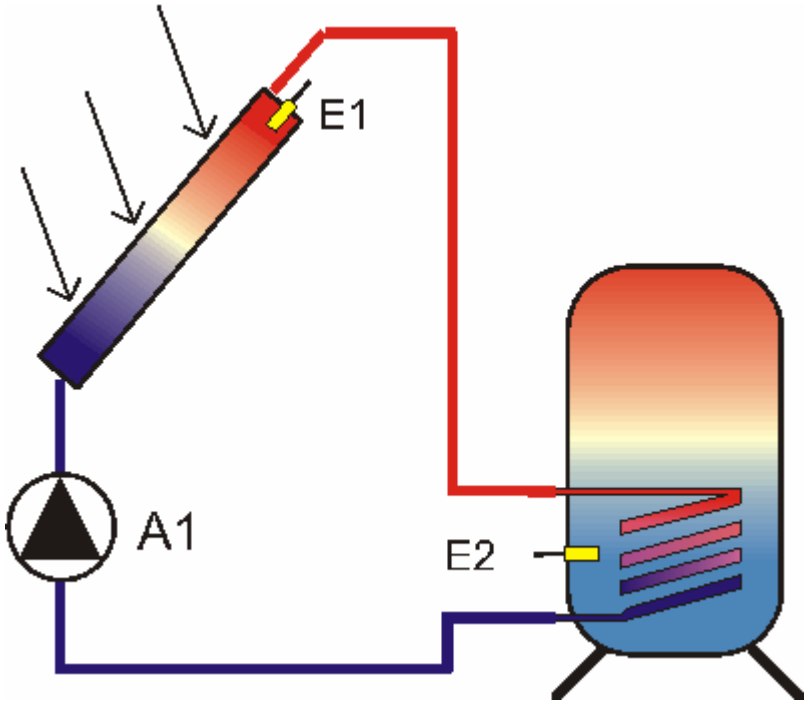
There are 5 main configurations for solar control unit SDC 204.
Output A1 is switched via the solar control circuit. The two outputs A3 (230 V) and A4 (potential-free) are switched in parallel via the control circuit R2.

i The following system diagrams are not to be understood as complete hydraulic circuit diagrams.

11.1 Basic system diagram 1:

1 collector array, 1 storage cylinder

System 1 has one collector surface and one storage cylinder. The control unit controls the solar function (temperature difference regulation).



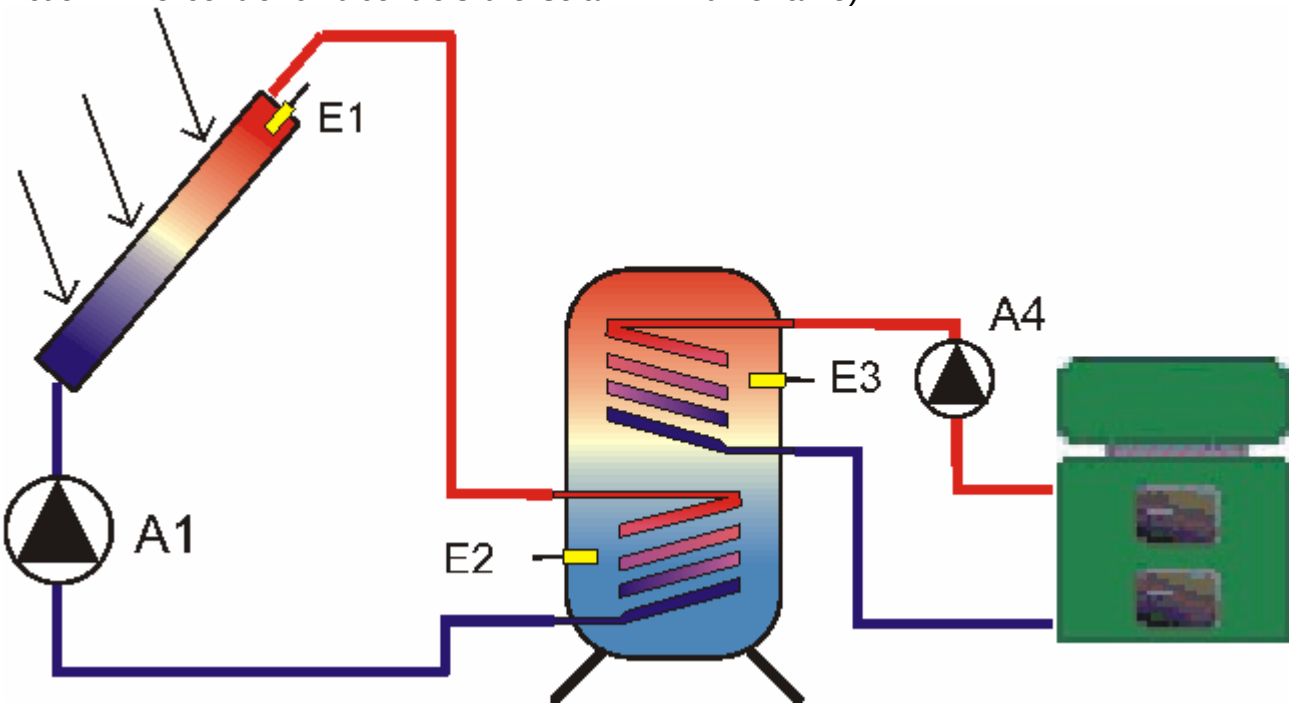
Info	Program	Manual operation	Basic setting
Current collector temperature (E1)	Maximum temperature storage cylinder	Pump A1 off/on	Code entry
Minimum collector temperature (E1)	Solar circuit dT start	A3 off/on	Reset/factory setting
Maximum collector temperature (E1)	Solar circuit dT stop	A4 off/on	Select basic configuration
Current storage cylinder temperature at bottom (E2)	Set time		Maximum collector temperature
Minimum storage cylinder temperature at bottom (E2)			Yield estimation off/on
Maximum storage cylinder temperature at bottom (E2)			Volume flow ∗
Flow rate ∗			Glycol type ∗
Daily yield ∗			Glycol percentage ∗
Total yield ∗			Code change

∗ Displayed only if yield estimation is active.

11.2 Basic system diagram 2:

1 collector array, 1 storage cylinder, auxiliary heating

System 2 has one collector surface, one storage cylinder and one auxiliary heating function. The control unit controls the solar function (temperature difference regulation) and the auxiliary heating (thermostat, timeframe).



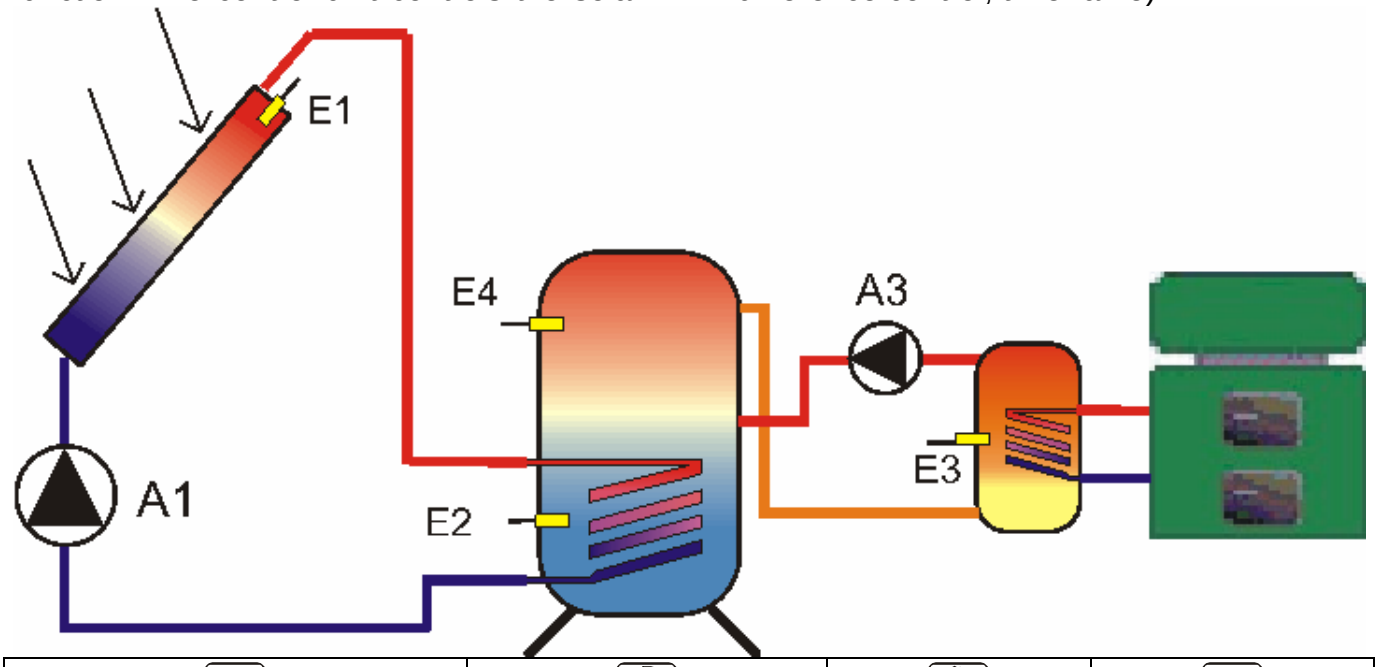
Info	Program	Manual operation	Basic setting
Current collector temperature (E1)	Timeframe R2 start	Pump A1 off/on	Code entry
Minimum collector temperature (E1)	Timeframe R2 stop	A3 off/on	Reset/factory setting
Maximum collector temperature (E1)	Maximum temperature of storage cylinder	A4 off/on	Select basic configuration (system diagram)
Current storage cylinder temperature at bottom (E2)	Solar circuit Td start		Maximum collector temperature
Minimum storage cylinder temperature at bottom (E2)	Solar circuit Td stop		Yield estimation off/on
Maximum storage cylinder temperature at bottom (E2)	Start temperature, auxiliary heating		Volume flow ∗
Current storage cylinder temperature at top (E3)	Set time		Glycol type ∗
Minimum storage cylinder temperature at top (E3)			Glycol percentage ∗
Maximum storage cylinder temperature at top (E3)			Tolerance for solar yield
Flow rate ∗			Code change
Daily yield ∗			
Total yield ∗			

∗ Displayed only if yield estimation is active.

11.3 Basic system diagram 3:

1 collector array, 2 storage cylinders (hot water), thermal transfer

System 3 has one collector surface, two storage cylinders (hot water) and a transfer function. The control unit controls the solar function (temperature difference regulation) and the thermal transfer (temperature difference control, timeframe).



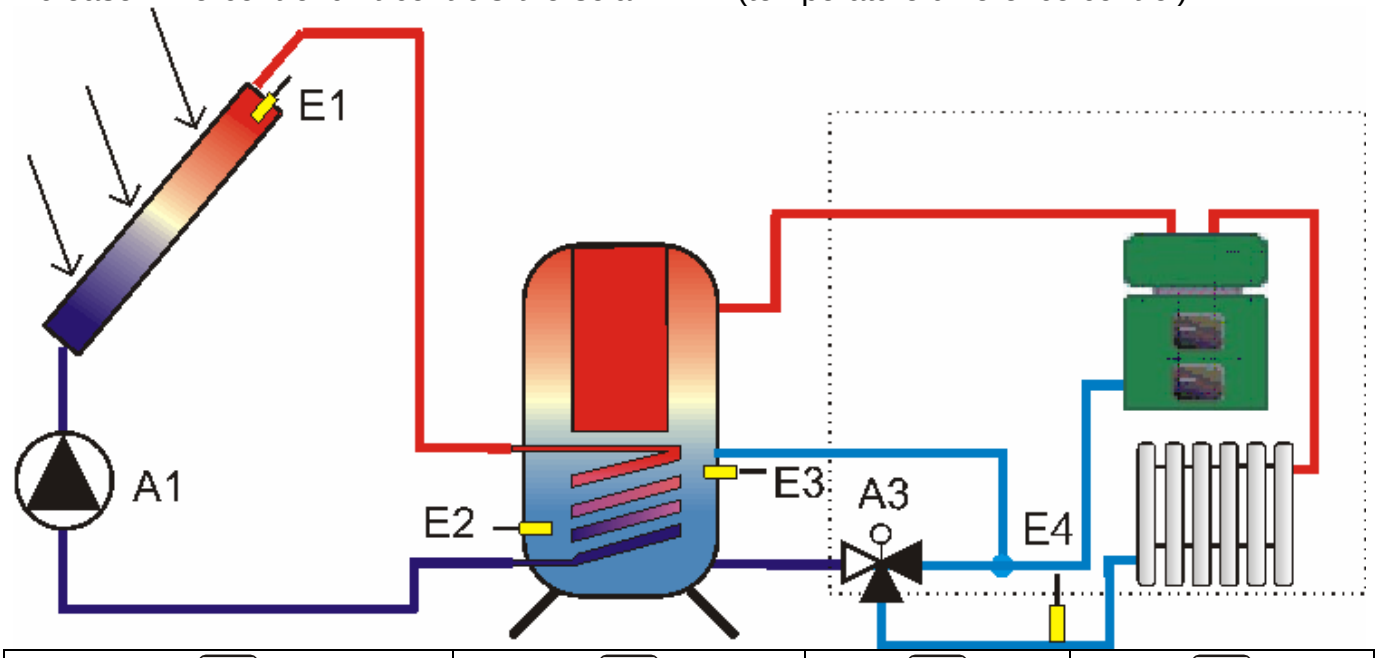
Info	Program	Manual operation	Basic setting
Current collector temperature (E1)	Timeframe R2 start	Pump A1 off/on	Code entry
Minimum collector temperature (E1)	Timeframe R2 stop	A3 off/on	Reset/factory setting
Maximum collector temperature (E1)	Maximum temperature of storage cylinder	A4 off/on	Select basic configuration
Current storage cylinder temperature at bottom (E2)	Solar circuit Td start		Maximum collector temperature
Minimum storage cylinder temperature at bottom (E2)	Solar circuit Td stop		Yield estimation off/on
Maximum storage cylinder temperature at bottom (E2)	Max. temperature for thermal transfer storage cylinder		Volume flow ∗
Current storage cylinder temperature at top (E4)	R2 Td Start		Glycol type ∗
Minimum storage cylinder temperature at top (E4)	R2 Td Stop		Glycol percentage ∗
Maximum storage cylinder temperature at top (E4)	Set time		Code change
Current temperature of thermal transfer storage cylinder at centre (E3)			
Minimum temperature of thermal transfer storage cylinder at centre (E3)			
Maximum temperature of thermal transfer storage cylinder at centre (E3)			
Flow rate ∗			
Daily yield ∗			
Total yield ∗			

∗ Displayed only if yield estimation is active.

11.4 Basic system diagram 4:

1 collector array, 1 storage cylinder, increase in return line temperature

System 4 has one collector surface, one storage cylinder and one return line increase. The control unit controls the solar function (temperature difference regulation) and the return line temperature increase (temperature difference control).



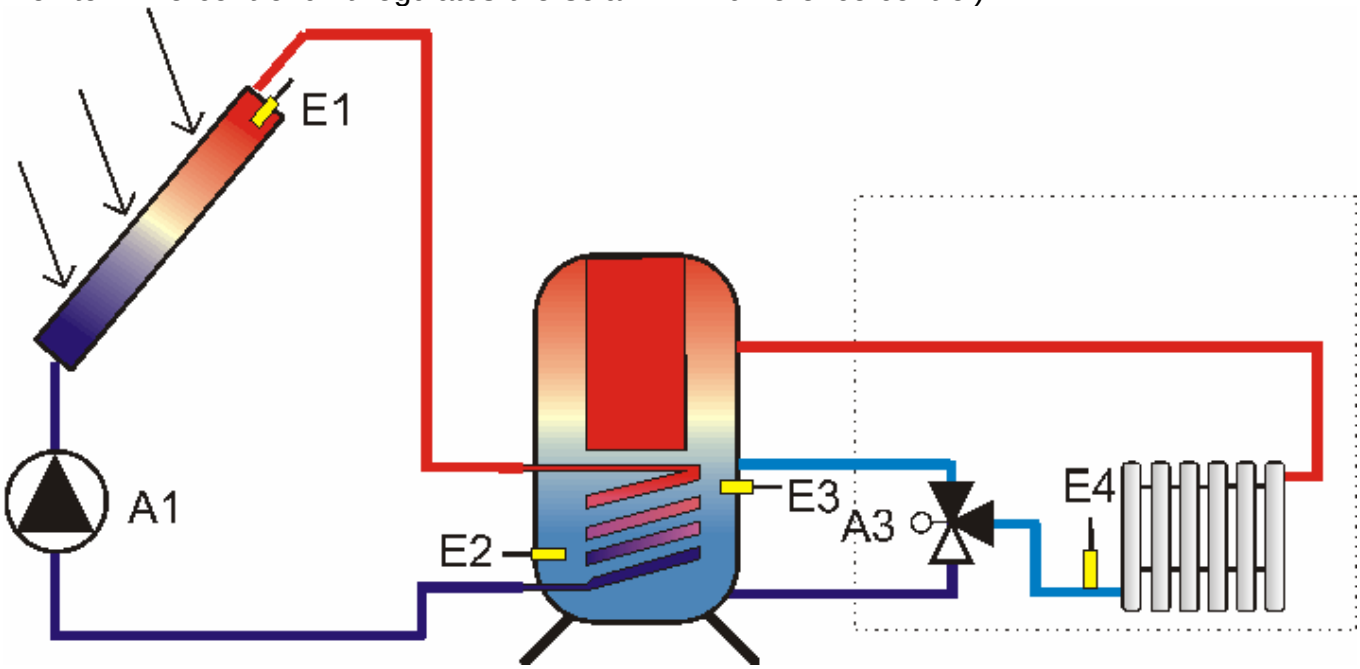
Info	Program	Manual operation	Basic setting
Current collector temperature (E1)	Maximum temperature of storage cylinder	Pump A1 off/on	Code entry
Minimum collector temperature (E1)	Solar circuit Td start	A3 off/on	Reset/factory setting
Maximum collector temperature (E1)	Solar circuit Td stop	A4 off/on	Select basic configuration (system diagram)
Current storage cylinder temperature at bottom (E2)	R2 Td start		Maximum collector temperature
Minimum storage cylinder temperature at bottom (E2)	R2 Td Stop		Yield estimation off/on
Maximum storage cylinder temperature at bottom (E2)	Set time		Volume flow ∗
Current storage cylinder temperature at centre (E3)			Glycol type ∗
Minimum storage cylinder temperature at centre (E3)			Glycol percentage ∗
Maximum storage cylinder temperature at centre (E3)			Maximum temperature sink (E4)
Current heat return temperature (E4)			Code change
Minimum heat return temperature (E4)			
Maximum heat return temperature (E4)			
Flow rate ∗			
Daily yield ∗			
Total yield ∗			

∗ Displayed only if yield estimation is active.

11.5 Basic system diagram 5:

1 collector array, 1 storage cylinder, return line monitor

System 5 has one collector surface, one storage cylinder and one return flow monitor. The control unit regulates the solar function (temperature difference regulation) and the return flow monitor (temperature difference control).



Info	Program	Manual operation	Basic setting
Current collector temperature (E1)	Maximum temperature of storage cylinder	Pump A1 off/on	Code entry
Minimum collector temperature (E1)	Solar circuit Td start	A3 off/on	Reset/factory setting
Maximum collector temperature (E1)	Solar circuit Td stop	A4 off/on	Select basic configuration (system diagram)
Current storage cylinder temperature at bottom (E2)	R2 Td start		Maximum collector temperature
Minimum storage cylinder temperature at bottom (E2)	R2 Td stop		Yield estimation off/on
Maximum storage cylinder temperature at bottom (E2)	Set time		Volume flow ∗
Current storage cylinder temperature at centre (E3)			Glycol type ∗
Minimum storage cylinder temperature at centre (E3)			Glycol percentage ∗
Maximum storage cylinder temperature at centre (E3)			Code change
Current heat return temperature (E4)			
Minimum heat return temperature (E4)			
Maximum heat return temperature (E4)			
Flow rate ∗			
Daily yield ∗			
Total yield ∗			

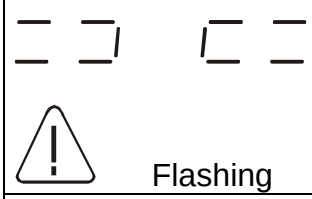
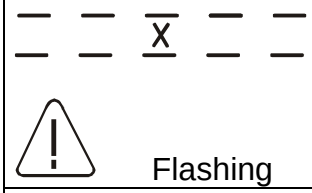
∗ Displayed only if yield estimation is active.

12 RECTIFICATION OF FAULTS

There are basically two kinds of system fault:

- Faults that are recognised by the control unit and which it can therefore indicate
- Faults that cannot be indicated by the control unit

12.1 Faults with error message

Error display	Possible causes	Action
 Flashing	• Sensor cable interrupted • Sensor defective	➲ Check cables ➲ Check sensor resistance value, replace sensor if necessary
 Flashing	• Short circuit in sensor wiring • Sensor defective	➲ Check cables ➲ Check sensor resistance value, replace if necessary
Circulation error: no flow rate  Flashing Additionally in the case of energy yield estimation: 	• Error in pump connection • Pump defective • Air in the system • Flow rate counter defective • Connection to flow rate meter defective • Sensor cable interrupted • Sensor defective	➲ Check cabling ➲ Replace pump ➲ Bleed system ➲ Check whether, when the system is running, the impeller wheel of the meter moves (if visible) ➲ Check cables ➲ Check cables ➲ Check sensor resistance value, replace sensor if necessary

12.2 Faults without error message

Faults and errors that are not displayed can be checked against the following table and possible causes and sources of error identified. If, based on the description, fault rectification is not possible, you will need to contact the supplier or installer of the system.

	**Errors relating to the 230 V AC voltage supply may only be rectified by trained personnel**

Error	Possible causes	Action
No display function  	• No 230 V power supply	➲ Switch on or connect the control unit ➲ Check domestic fuse box for connection
	• Fuse within device is defective	➲ Test fuse, replace with new, type 2A/T fuse if necessary. ➲ Test 230 V components for short circuit
	• Device defective	➲ Contact the supplier
Control unit does not work	• Control unit is in manual mode • Switch-on condition not met	➲ Exit “manual” menu. ➲ Wait until the switch-on condition is met
“Pump” symbol rotates, but pump does not work 	• Connection to pump interrupted. • Pump has seized. • No power to switching output.	➲ Test cable to pump ➲ Ensure the pump is running ➲ Contact supplier.
Displayed temperature fluctuates strongly at rapid intervals	• Sensor wires are positioned close to 230 V cables • Long sensor wires extended without shielding • Device defective	➲ Lay sensor wires in a different way shield sensor wires ➲ Shield sensor wires ➲ Contact the supplier

13 TECHNICAL DATA SDC 204

Housing	
Material	100% recyclable ABS casing for wall-mounted installation
Dimensions (H x W x D) in mm, weight	175 x 134 x 56; approx. 360 g
Protection class	IP40 in accordance with VDE 0470
Electrical values	
Operating voltage	AC 230 Volt, 50 Hz, -10...+15%
Internal device fuse	Micro-fuse 5 x 20mm 2 A/surge-proof
Radio interference level	N in accordance with VDE 0875
Maximum cable cross-section 230 V connections	2.5 mm² fine-strand/single-strand
Temperature sensor / temperature range	PTF6 - 25℃ - 200℃ PT1000, 1.000 kΩ at 0℃
Testing voltage	4 kV 1 min in accordance with VDE 0631
Switching output Output depending on switching output Total output for all outputs	230 V~ / 1 A / approx. 230 VA for cos φ = 0.7-1.0 2A/ approx. 460 VA
Fuse protection	Micro-fuse 5 x 20 mm, 2 A/T (2 amp, fine-wire)
Other	
Operating temperature	0 ... + 50℃, max. humidity 9 5%, non-condensing
Storage temperature	-10 ... + 65℃

14 RESISTANCE TABLE PT1000

The correct function of the temperature sensor can be checked against the following temperature resistance table, using a resistance measurement device:

Temperature in ℃	Resistance (Ohms)	Temperature in ℃	Resistance (Ohms)
-30	882	60	1232
-20	921	70	1271
-10	960	80	1309
0	1000	90	1347
10	1039	100	1385
20	1077	120	1461
30	1116	140	1535
40	1155	200	1758
50	1194		

Manufacturer of SDC 204 control unit devices: PROZEDA GmbH