INSTALLATION
AND
SERVICE MANUAL

microprocessor-controlled system controller for solar-thermal systems:

SOLAREG II
VISION

IMPORTANT!

PLEASE, READ CAREFULLY THIS MANUAL BEFORE INSTALLATION AND USE OF THE APPLIANCE!

NON-COMPLIANCE CAN RESULT IN GUARANTEE EXCLUSION!

KEEP THE MANUAL SAFE!

The described appliance has been made and tested in compliance with CE-guidelines.

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1 SYMBOLS AND SHORT DESCRIPTIONS

Explanation of graphic symbols used in the service manual:

	Attention! Symbol points out possible dangers and mistakes
	Attention 230V-voltage! Symbol points out the dangers through highly dangerous voltages.
•	Enumeration
☝	Please, pay attention!
i	Information for operation / characteristic features
➲	Realisation / procedure
?	Testing / checking

Often used abbreviations

In the following descriptions and in the controller display abbreviations or short symbols are partly used for simplification reasons. Their meaning is presented in the following table.

Abbr.	Meaning	Abbr.	Meaning
Tcoll	Temperature collector [°C]	min	Minimal value
Tst 1/2	Temperature storage tank [°C]	max	Maximal value
Tret	Collector return temperature [°C]	>	bigger than
Tth	Temperature for thermostat [°C]	K	Kelvin Grade, corresponds to 1 grade temperature difference
Tfr	Temperature antifreeze	°C	Celsius Grade
xxx	Any display value	dT	Temperature difference
h	Operating hours	kWh	Energy productivity in kWh

Tip: Put the enclosed with the appliance **„Quick-Info“** into the pocket provided on the back of the appliance to have always at hand an overview of all most important functions.

2 RANGE OF APPLICATION / CHARACTERISTIC FEATURES

2.1 Range of application

The solar thermal controllers SOLAREG II VISION are powerful microprocessor-controlled control appliances for function-control of solar thermal systems.

SOLAREG II VISION regulates perfectly thermal solar systems with up to 2 collectors or 2 storage tanks and may be used for five system types.

Controllers are planned for use in dry spaces, in residential, business and industrial areas.

Wrong use has to be checked before starting by means of valid regulations.

2.2 Appliance characteristic features

The series SOLAREG II is provided with the following outfit features:

- **Intuitive, menu-conducted operation** with graphic symbols and four operating keys.
- Temperature differential regulation **digitally adjustable regulation values**
- **Rotational speed control** or **switch control** of solar circulation pump.
- Special function for systems with **tube collectors**
- Integrated **operating hour meter** for storage tank charging
- Extensive functions for **system monitoring** with error and failure display through symbols
- Integrated **energy productivity measurement** which by means of the productivity measuring set (accessories) measures the energy obtained by a solar system.
- Storing of all adjusted values even in the case of any longer mains voltage breakdown.
- Various **protective functions**, as e.g. system protection, collector protection, recooling and antifreeze
- **The third switch output** for alternative choice of cooling function, heating or 2nd temperature differential regulation
- Large wiring space

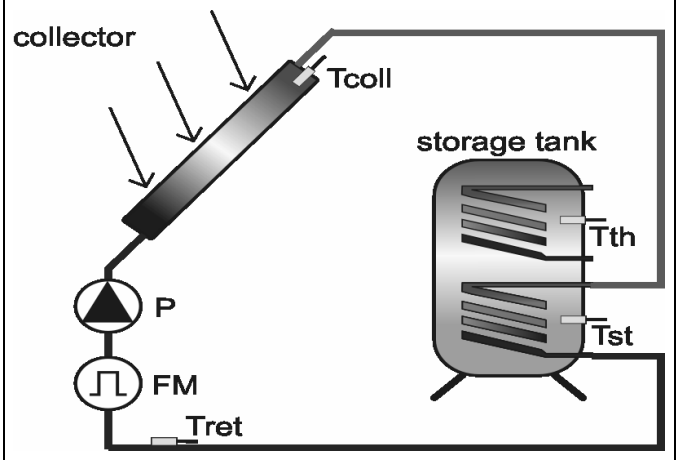
Available accessories:

- Temperature sensor PT1000
- Flow transmitter for productivity measurement

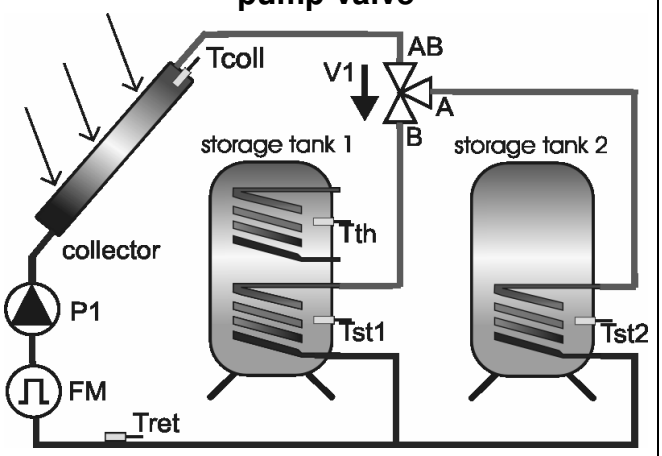
2.3 System types for SOLAREG II VISION

Tip: the following system plans are no complete hydraulic wiring diagrams

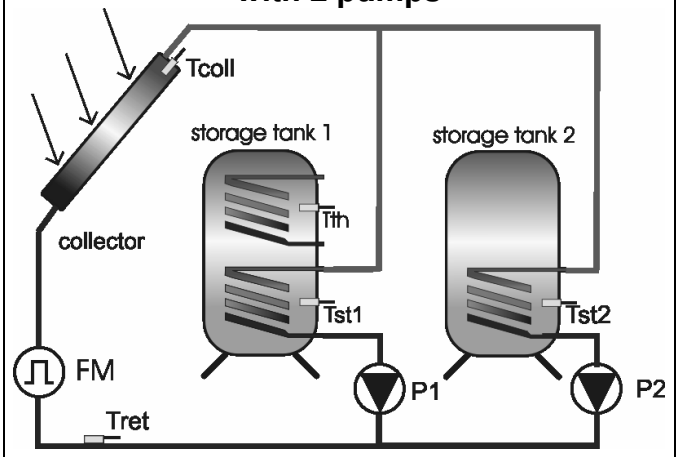
TYPE 0:
1 collector, 1 storage tank



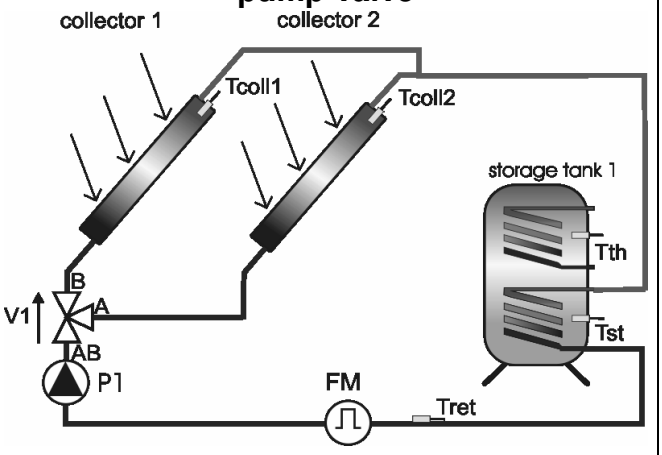
TYPE 1:
1 collector, 2 storage tanks
pump-valve



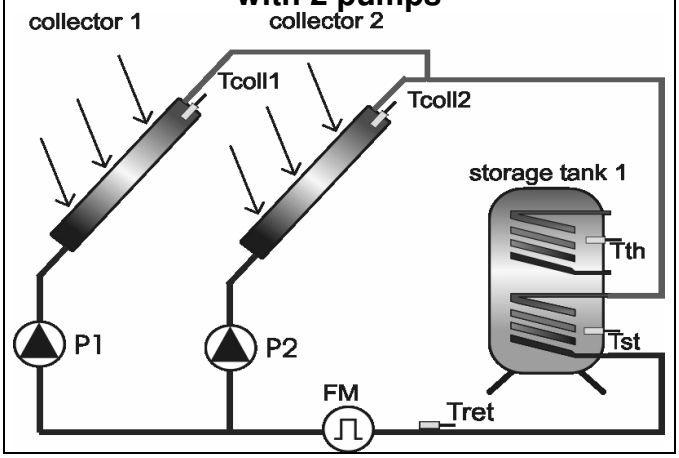
TYPE 2:
1 collector, 2 storage tanks
with 2 pumps



TYPE 3:
2 collectors, 1 storage tank
pump-valve



TYPE 4:
2 collectors, 1 storage tank
with 2 pumps



Tcoll	Temperature measuring point collector
Tth	Temperature measuring point thermostat
Tret	Temperature measuring point collector return
Tst	Temperature measuring point storage tank
P	Pump
FM	Flow meter

3 SAFETY INSTRUCTIONS

All installation and wiring work at the controller must be carried out only in an idle condition.
The connection and starting of SOLAREG II must be carried out only by a competent staff. While doing this you have to keep to valid safety regulations, above all VDE 0100.

- Disconnect the appliance from operating voltage completely before any installation or wiring work at the electrical operating material.
  Never mix-up the connections of protective low voltage area (sensor, flow transmitter) with 230V-connections. Destruction and extremely dangerous voltage on the appliance and on the connected sensors and other appliances is possible.

- Solar systems can absorb high temperatures. There is a danger of burning! Be careful during installation of the temperature sensor!

- Mount SOLAREG II so that not to cause inadmissible operating temperatures (>50°C) for the appliance e.g. through sources of heat.

- SOLAREG II is neither splash-proof nor drip-proof. And so mount it in a dry place.

- For safety's sake the system can remain in a hand mode only for test purposes. In this operating mode neither maximal temperatures nor sensor functions are monitored.

- If any damage on the controller, the cable or connected pumps and valves have been detected, the system must not be started.

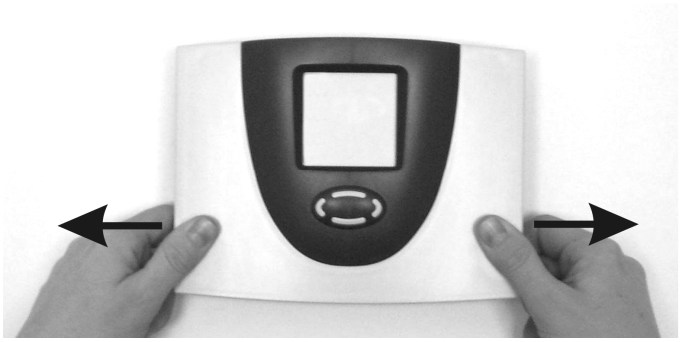
- Check if the materials used for tubing, insulation as well as the pumps and valves are suitable for existing temperatures in the system.

4 APPLIANCE INSTALLATION

The controller must be installed only in dry, no explosion-dangered places. Installation on the combustible ground is not permissible.

4.1 Opening of the appliance

You do not need any tools to open the appliance. Upper part of the appliance housing is bolted by means of two raster with a lower part. In can be unlocked and opened upwards through light pulling at the side parts (straps) of the upper part of the appliance housing (see picture).



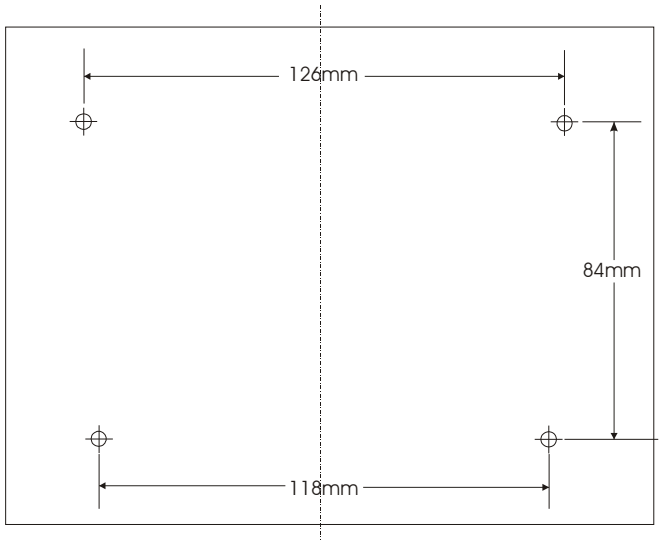
Keep opening the housing upper part so far upwards until it is latched. Now you can freely install and wire the controller.

Before starting shut the cover, please, until it is latched!

4.2 Wall installation

In the case of the wall installation proceed in the following way:

- Drill installation holes accordingly to the enclosed drilling jig
- Screw in two upper screws up to 6 mm distance
- Open the appliance as it is described and hang it onto two screws. Now two lower screws can be mounted.
- **Tighten all screws as firmly only as it is really necessary in order to avoid damages in the housing lower part!**

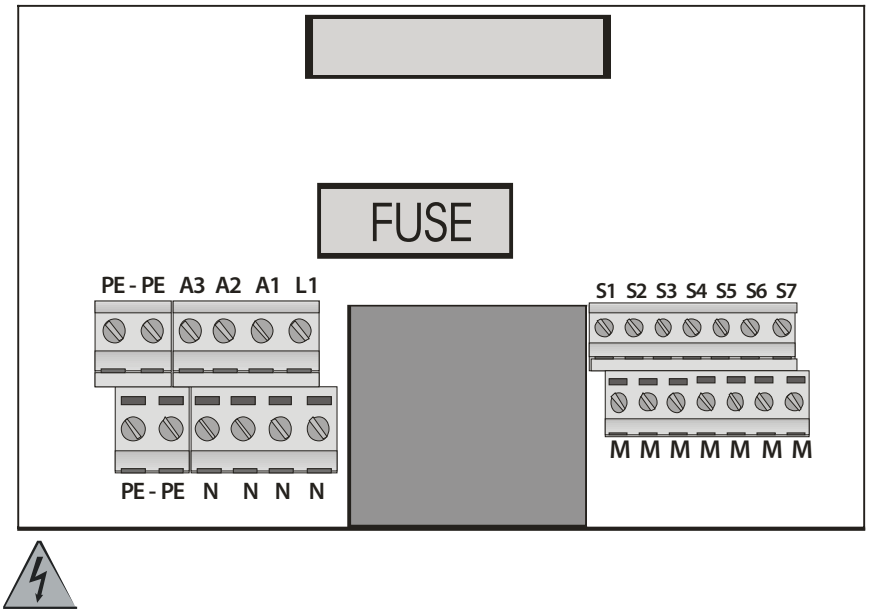


5 ELECTRICAL CONNECTION - OVERVIEW

Please, absolutely follow safety instructions in chapter 2

The appliance may be opened only when mains voltage has been safely cut off and it is protected against restarting

The connection of all electrical wires takes place on the compo entry in the housing lower part. On the right compo entry side there are (low voltage) connections for sensors and flow transmitters. On the left side there are 230V-connections. The following picture shows the connection field of SOLAREG II VISION.



PE	Earthed wire	S7	Flow transmitter
L	Phase of mains	S1	Temp.- sensor collector 1
N	Zero wire of mains	S2	Temp.- sensor storage tank 1
A1	Phase switch output 1	S3	Temp.- sensor collector 2 / storage tank 2
N	Zero wire switch output 1	S4	Temp.- sensor collector- return
A2	Phase switch output 2	S5	Temp.- sensor thermostat or for 2nd temperature differential controller
N	Zero wire switch output 2	S6	Temp.- sensor antifreeze or for 2nd temperature differential controller
A3	Phase switch output 3		
N	Zero wire switch output 3		

General connection rules:

- In the case of all connecting wires skin a cable covering ca. 6 - 8 cm long and the ends of veins ca. 10 mm long.
- In the case of flexible wires you must have outside or inside the appliance a pull-relief. The vein ends must be equipped with wire end ferrules. In the bushing nipples on the 230V-side you can mount PG9 screwed connections if necessary.
- Cables are inserted in the appliance through provided holes...
- All earthed wires must be fixed in binders marked with „PE“ (potential earth).

5.1 230V-connections

For 230V-connections you must follow the following points:

- In the case of solid electric mains the mains voltage for the controller outside the controller must be able to be switched off by a switch.
  In the case of electric mains with the help of cables and shock-proof plug this switch may be left out.
- Controllers are intended for the operation in 230V /50Hz mains. The pumps to be connected and valves must be laid for this voltage!
- All earthed wires must be connected to binders marked with PE.

i Zero wire binders (N) are electrically connected and are not switched!

i All switch outputs (A1/A2/A3) are 230V~ closers. If potential-free contacts are needed, appropriate accessories are available

i Output A1 is operated, according to an adjustment, as a closer (rotational speed = 100%) or in the case of the function „Rotational speed regulation“(rotational speed < 100%) with block-modulated output signal for the pump P1.

i Output A2 behaves as A1 for pump P2 in system types Type 2 and Type 4. In system types Type 1 and Type 3 a valve V1 switched over.

i Output A3 is planned for cooling, thermostat or for 2nd temperature differential controller function.

5.1.1 Overview: 230V-connections for SOLAREG II

In the following table an assignment of switch outputs for various controller types is presented. Grey fields are absolutely necessary for basic function of the system. White fields are intended for optional additional functions.

System type		Switch outputs		
Type	Description	A1	A2	A3
0	1 collector – 1 storage tank	P1	-	cooling or thermostat or 2nd diff. regulation
1	1 collector – 2 storage tank (pump valve)	P1	V1	cooling or thermostat or 2nd diff. regulation
2	1 collector – 2 storage tank (pump pump)	P1	P2	cooling or thermostat or 2nd diff. regulation
3	2 collector – 1 storage tank (pump valve)	P1	V1	cooling or thermostat or 2nd diff. regulation
4	2 collector – 1 storage tank (pump pump)	P1	P2	cooling or thermostat or 2nd diff. regulation

5.2 Connection temperature sensor

The appliances SOLAREG II work with precise platinum-temperature sensors type PT1000. According to the controller type and function range you need from 2 to 4 sensors.

Installation / cabling of temperature sensors:

- ➲ Mount the sensors in the provided places in the collector and storage tank. Pay attention to a good temperature crossing and use, if necessary, heat conducting paste.
- ➲ The wires of the temperature sensor can be lengthened. Up to 15 m long you need a 2 x 0,5mm² cross-section, up to 50 m 2 x 0,75 mm². In the case of long connections (collector) shielded extension lead must be used.
  On the sensor side do not pinch the shield but cut off and isolate it!
- ➲ Temperature sensors are connected according to the layout plan. Polarity of both veins may be ignored in the case of temperature sensors.

☝ Sensor wires must be laid separately from 230V-wires.

5.2.1 Overview: sensor connections for SOLAREG II

In the following table the assignment of sensor inputs is presented. Grey fields are absolutely necessary for basic function of the system. White fields are intended for optional additional functions. If **T6** is not used for antifreeze or 2nd temperature differential controller, it may be used as a universal temperature sensor input. In this case no sensor monitoring takes place.

System type		Inscription on controller					
Type	Description	1	2	3	4	5	6
0	1 collector - 1 storage tank (pump)	Tcoll1	Tst1	-	Tret	Tth TDiff1	Tfr TDiff2
1	1 collector - 2 storage tank (pump valve)	Tcoll1	Tst1	Tst2	Tret	Tth TDiff1	Tfr TDiff2
2	1 collector - 2 storage tank (pump pump)	Tcoll1	Tst1	Tst2	Tret	Tth TDiff1	Tfr TDiff2
3	2 collector - 1 storage tank (pump valve)	Tcoll1	Tst1	Tcoll2	Tret	Tth TDiff1	Tfr TDiff2
4	2 collector - 1 storage tank (pump pump)	Tcoll1	Tst1	Tcoll2	Tret	Tth TDiff1	Tfr TDiff2

Before starting shut the cover until it is latched!

5.2.2 Over voltage protector module

SOLAREG II is equipped with an over voltage fine protector on all sensor inputs. Additional protection measures are not necessary as a rule for internal sensors. For collector sensor an additional protection (PROZEDA sensor connecting box with over voltage protection) is recommended. External protection elements must not contain any additional capacitors because they may distort measurement result.

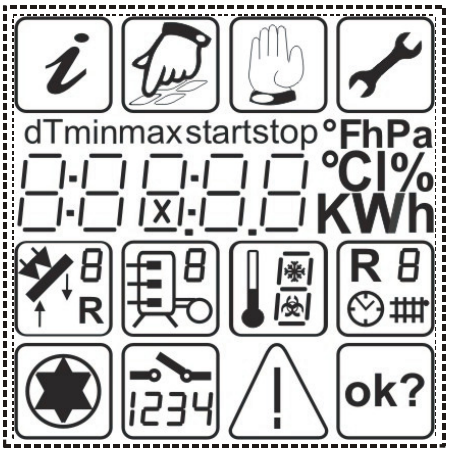
6 OPERATION / DISPLAY

6.1 Overview of display and operating elements

Number	Description
1	Display with graphic symbols
2	Control button scroll upwards / +
3	Control button exit / break-off
4	Control button scroll downwards / -
5	Control button choice / confirmation

6.2 Display – maximal display

In the following graphics there are all symbols which may appear during work on display, simultaneously presented. During a real work, according to menu position, only some of these symbols appear.



← Main menu

← Display values

← Measuring points assignment

← Status indication

6.3 Explanation of graphic symbols

In the following table the meaning of each symbol is described.

Graphic symbole	Description	Indication in operation
Main menu		
	Menu „Info“	Symbol flashes, if possible to be chosen
	Menu „Programming“	
	Menu „Manual operation“	
	Menu „Basic adjustment“	

During selection the active symbol flashes. If the menu is chosen by means of the  button, a corresponding symbol is statically presented. All others fade out.

Graphic symbole	Description	Indication in operation
Indication value		
dT	Temperature difference	
min	Min value	appears when minimal values are indicated
max	Max value	appears when maximal values are indicated
88888	5 x 7 segment display Presentation of figures 00000 to 99999	Issue of all figure values, display flashes when a value is changed
°C	Temperature in Celsius	
K	Temperature difference in Kelvin	
h	Operating hours	
kWh	Productivity indication in kWh	
Measuring points assignment		
	Temperature measuring point collector1	
	Temperature measuring point collector2	
	Temperature measuring point storage tank 1 below (storage tank charging)	
	Temperature measuring point storage tank below (storage tank charging)	
	Temperature measuring point collector-return	
	Temperature measuring point storage tank above (thermostat function)	
	Antifreeze sensor or universal temperature measuring point (T6) (no sensor monitoring)	
	2nd temperature differential controller	
	Operating hours, energy productivity measurement	

Status indication		
	Solar circulation pump	symbol goes round when solar circulation pump is on
	Switch output 1 is active	appears when switch output 1 active (on)
	Switch output 2 is active	appears when switch output 2 active (on)
	Switch output 3 is active	appears when switch output 3 active (on)
	Reference to system fault	display flashes when a fault occurs in the system
	Safety query for value changes which are stored	Input value can be rejected  or accepted 

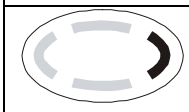
6.4 Button function

Operation of the controller SOLAREG II takes place comfortably and simply by means of 4 operating buttons. By means of operating buttons you can:

- recall display values
- carry out appliance adjustment

Graphic symbols of the display lead you in a simple way through the operating structure and show clearly the current menu points, display values or parameters.

Operating buttons have the following functions:

Button	Function	Description
	„Up“ „+“	• Menu points upwards • Value change: increase of the indicated value by 1 at longer pressing the values raise constantly
	„Call“ „Down“ „-“	• Call up of main menu, menu points downwards • Value change: decrease of the indicated value by 1 at longer pressing the values decrease constantly
	„Scroll left“ „Exit“ „Break-off“	• In main menu scroll to the left • Exit menu • Exit menu point • Break-off value change without storing
	„Scroll right“ „Choice“ „Confirmation“	• In main menu scroll to the right • Choosing one menu point • Confirmation of value change with storing

6.5 Exemplary appliance operation

When you have read the descriptions of the menu in chapter „Operating menu“, you can practise operating steps. Below an operation example is presented. The current collector temperature is the starting position in menu „Info“. Target: change of the parameter „Storage tank dToff“ from 3K to 4K in menu „Programming“

 White: Symbol static

 Grey: Symbol flashes

Button	Function	Graphic indication after operation step				Description
	„Exit“					Exit menu’s „Info“
	„Scroll right“					Choosing menu „Programming“
	„Call“		**max 65°C**			Call up menu „Programming“, the first menu point appears
	„Down“		**dT min 3 K**			Repeated pressing up to menu point „S1 dTmin„ appears.
	„Choice“		**dT min 3 K**			Choosing presented parameter
	„Up“		**dT min 4 K**			Increase of the parameter value from 3K to 4K
	„Con-firm“		**dT min 4 K**		**ok?**	Confirmation of the parameter
	„Con-firm“		**dT min 4 K**			Storing of the parameter
	„Exit“					Exit menu „Programming“
	„Scroll left“					Choosing menu „Info“
	„Call“		**60°C**			Call up menu „Info“

7 OPERATING MENU

To make the operation of the appliance clear, the appliance, operating and display functions are divided into 4 groups (= main menus).

Four menus
- Info
- Programming
- Manual operation
- Basic adjustment

give you the information about your solar system.
Each active menu is presented in the upper line of the display through corresponding graphic symbol.

Menu	Overview of contained functions
Info 	Main menu for automatic regulation of solar system. • Indication of current measuring values • Indication of system condition • Indication of error messages • Indication of operating hours and energy productivity (if available)
Programming 	Change and adjustment of programmable desired values (parameters) **Hint:** changes can affect system functions
Manual operation 	Switching on and off connected pumps / valves by hand
Basic adjustment 	Information about basic adjustment for system function. **Please, pay attention:** adjustments and changes must be carried out only by a specialist!

7.1 Overview: Construction of menu structure

The overview shows the whole menu structure. According to basic adjustment and system type some menu points may be left out or shown alternatively („/“).

 Info	 Programming	 Manual operation	 Basic adjustment
Current temperature Collector / Collector1	Maximal temperature storage tank1	pump1 on / off	Collector protect. function on / off
Minimal temperature Collector / Collector1	storage tank1 dTmax (dTon)	pump1 / valve1 on / off	Collector protection temperature
Maximal temperature Collector / Collector1	storage tank1 dTmin (dToff)	heating / cooling / 2nd diffcontr on /off	Recooling function
Current temperature Storage tank1 below / Collector2	Maximal temperature storage tank2		Recooling temperature
Minimal temperature Storage tank1 below / Collector2	storage tank2 dTmax (dTon)		Tube collector function
Maximal temperature Storage tank1 below / Collector2	storage tank2 dTmin (dToff)		Energy productivity measure on/off
Current temperature Storage tank2 below / Stor. tank	Minimal pump rotational speed in %		Choosing used glycol types
Minimal temperature Storage tank2 below / Stor. tank	Thermostat function Ton		Mixture ratio Glycol / water in %
Maximal temperature Storage tank2 below / Stor. tank	Thermostat function dT		Litres pro impulse of flow meter
Current Collector-return-temperature	2nd temp.-diff. controller Maximal temperature of heat consumer Tmax		Switching on or off function antifreeze
Current storage temperature (Storage tank above) / 2nd temp. differential controller Temperature heat generator	2nd temp.-differential controller Switching hysterisis dTmax		Antifreeze function temperature
Antifreeze sensor / 2nd temp. differential controller Temperature heat generator / Universal measuring point T6			Choice: cooling function, thermostat function, 2nd temperature differential controller
Operating hours pump1			System type
Energy productivity storage tank			
Operating hours pump2			
Energy productivity storage tank			

7.2 Menu „Info“ i

In this operational mode all measuring values and operating states are shown.

i Only controller-specific values, as well as those needed for activated additional functions are shown!

If the values are marked as „reset able“, they may be reseted in the following way:

➲ Choice of the value by means of buttons and

➲ Resetting of the value by means of the button

➲ Message „OK?“ confirm with = no or = yes

Indication e.g.	i	Meaning	Reset possible
75 °C		Indication of current collector temperature (1/2)	no
min 12 °C		Indication of minimal collector temperature (1/2) Reset able to current temperature	yes
max 105 °C		Indication of maximal collector temperature (1/2) Reset able to current temperature	yes
52 °C		Indication of current temperature storage tank (1/2)	no
min 40 °C		Indication of minimal temperature storage tank (1/2) Reset able to current temperature	yes
max 67 °C		Indication of maximal temperature storage tank (1/2) Reset able to current temperature	yes
25 °C		Antifreeze sensor Indication of universal temperature measuring points (T6)	no
55 °C		Indication of current temperature storage tank thermostat	no
60 °C	R	Indication of current temperature collector return	no
60 °C	R 2	2nd temperature differential controller Temperature of heat generator	no
35 °C	R 2	2nd temperature differential controller Temperature of heat consumer	no
1234 h		Operating hours for charging storage tank Reset able to 0 h	yes
927 kWh		Energy productivity for storage tank Reset able to 0 kWh	yes

7.3 Menu „Programming“

All changeable parameters can be checked in this menu and, if necessary, changed. In the factory-set-up usual values, which as a rule guarantee problem-free function of the system, are placed.

The number of indicated values depends on the controller type and the adjusted additional functions. Only the needed values are shown at a time:

Indication e.g.		Meaning	Value range	Typical adjustment
max 65 °C		Storage tank: Permissible maximal temperature	15..95°C	65°C
dT max 7 K		Storage tank: switch-on difference (dTon)	3..40K	7K
dT min 3 K		Storage tank: switch-off difference (dToff)	2..35K	3K
min 100	1 2	Adjustment of minimal pump power at rotational speed regulation 100% = rotational speed regulation off	30%..100 %	100%
40 °C		Switch-on temperature of thermostat function	20..90°C	40°C
dT 10 K		Hysteresis of thermostat function	1..30K	10K
Max 65 °C	R 2	2nd temperature difference controller: maximal temperature of heat consumer Tmax	15..95°C	65°C
dT max 7 K	R 2	2nd temperature difference controller: Hysteresis dTmax	3..40K	7K

7.4 Menu „Manual operation“

For service and test purposes the solar system can be operated by hand. For this purpose 230V switch outputs may be disconnected or connected. During manual operation there is no automatic regulation of the system. To avoid inadmissible operating states this mode of operation changes into „Indication“ after ca. 8 hours and the automatic regulation is activated again.

Indication	Meaning	Value range
1	Switching on / off switch output A1 (solar circulation pump) by hand	0 = off 1 = on

	Switching on / off switch output A2 (pump2 / valve1) by hand	0 = off 1 = on
	Switching on / off switch output A3 (cooling, thermostat or 2nd temperature difference controller function) by hand	0 = off 1 = on

7.5 Menu „Basic adjustment“

Adjustments and changes in this menu must be carried out only by an installator or competent staff. False adjustments may affect the function of controller and solar system.

To avoid accidental changes in menu „Basic adjustment“, it is not editable in normal functioning but has only display function. **To be able to carry out any changes, you must choose this menu within the first minute after switching on the appliance.**

Then the possibility of time-unlimited editing is given. **The basic adjustment menu „is blocked“ automatically within one minute after leaving or one minute after switching on the appliance.**

Indication Line / value	Meaning	Value range	Factory set-up
0 -- 0	Switching on or off function collector protection	0 = off 1 = on	0 = off
1 -- 120 °C	Temperature at which the collector protection function is active	110..150°C	120°C
2 -- 0	Switching on or off function recooling (only when the collector protection is on)	0 = off 1 = on	0 = off
3 -- 40 °C	Temperature to which the storage tank is recooled after active collector protection function	30..90°C	40°C
4 -- 0	Special function for time-controlled circulation in operation with tube collectors	0 = off 1 = on	0 = off
5 -- 0	Switching on or off function energy productivity measurement	0 = off 1 = on	0 = off
6 -- 0	Choosing used glycol types	0...9	0
7 -- 100	Mixture ratio of coolants	0 ... 100% 5% - steps	50
8 -- 10,0	Litres pro impulse of flowmeter	0,5 … 25 l/l 0,5l - steps	10,0
9 -- 0	Switching on or off function antifreezing	0 = off 1 = on	0
10 -- -1 °C	Temperature at which antifreezing function is active	-20 °C ... +7 °C	0
11 -- 0	Alternative choice of cooling function, thermostat function or the 2nd temperature difference controller	0 = off 1 = cooling function 2 = thermostat function 3 = 2nd temperature difference controller	0
12 -- 0	System type	0...4	0

Glycol types corresponding to menu point 6:

0	Anro	5	Ilexan P
1	Ilexan E, Glythermin	6	Tyfocor L5.5
2	Antifrogen L	7	Dowcal 10
3	Antifrogen N	8	Dowcal 20
4	Ilexan E	9	Dowcal N

8 CONTROLLER FUNCTIONS

The controllers SOLAREG II contain many functions to regulate and monitor solar system. Basically you can distinguish

- controller functions for charging a storage tank
- functions for system protection and system monitoring
- additional functions.

8.1 General controller functions

The controller collects the temperatures of various measuring points and determines the right time to charge the storage tank on account of programmed (additional) functions and controller parameters.

8.1.1 Storage tank charge

Corresponding values in menu	
„Basic adjustment“:	„Programming“
---	Maximal temperature
---	dT max (dTon) Switch-on temperature difference
---	dT min (dToff) Switch-off temperature difference

The storage tank is being charged through the pump on output A1 (A2) up to adjusted maximal temperature so long as the collector temperature becomes higher by a certain amount than the storage tank temperature. Switching action can be adjusted through dTmax (dTon) and dTmin (dToff), but dTon cannot get lower than dToff + 1K

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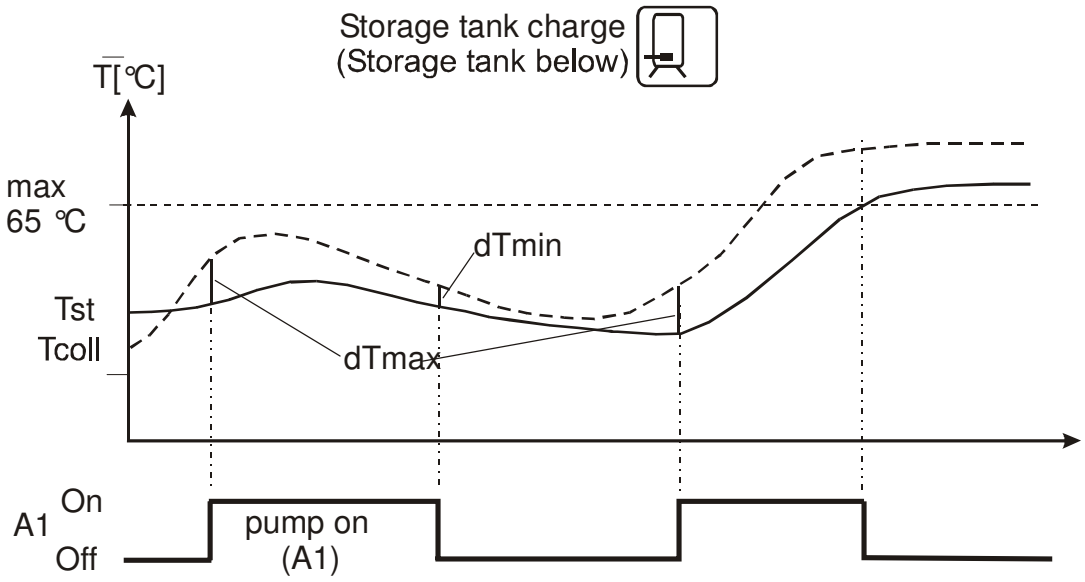


8.1.2 Rotational speed regulation

Corresponding values in menu	
„Basic adjustment“:	„Programming“
---	Rotational speed min <100%

The solar circulation pumps on 230V-outputs A1 and A2 can be operated either in switch-mode (two-point controller) or in a rotational speed regulated way.
If the rotational speed regulation is activated the pump power is adjusted by a controller so that switch-on temperature difference *„Storage tank dTmax“* is kept constant as much as possible. At lower deviation of „*Storage tank dTmax*“the pump is operated with the lowest power till the switch-off wave is reached.

8.1.3 Cooling function

Corresponding values in menu	
„Basic adjustment“:	„Programming“
11 -- 1	---

To increase the energy productivity of solar system it may be useful to „by-pass“the solar energy at reaching a certain storage tank temperature or to take it from the storage tank. If the temperature of the storage tank (Tst) goes over the temperature barrier Tstmax – 5K (adjusted maximal storage tank temperature – 5K), the switch output A3 is switched on. Switching off takes place at lower deviation of this temperature.

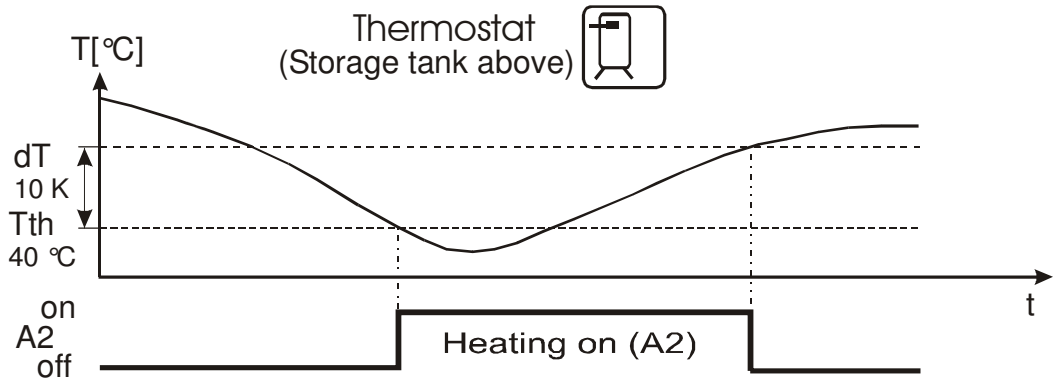
8.1.4 Thermostat function (reheating)

Corresponding values in menu	
„Basic adjustment“:	„Programming“
11 -- 2	Thermostat Ton (Tth)
---	Thermostat dT

The thermostat function is a control circuit dependant of storage charge. In this way e.g. the reheating of the upper stand-by part of the storage tank independent of solar circulation function is enabled.

Switch output A3 is

- switched on when the adjusted temperature „Thermostat Ton“ (Tth) remains under
- switched off when the adjusted temperature „Tth + dT“remains over.



8.1.5 2nd temperature differential regulation

Corresponding values in menu	
„Basic adjustment“:	„Programming“
11 -- 3	Tmax (R2 max)
	dTmax (R2 dT max)

The 2nd temperature difference regulation enables you, independently of all other control functions, to control an output according to an adjustable temperature difference criterion. TDiff1 is the temperature of a heat generator and TDiff2 of a heat consumer.

The output is switched on when TDiff1 >= TDiff2 + Diff.dTmax and simultaneously TDiff2 < Diff.Tmax. It is switched off when TDiff1 < TDiff2 + Diff.dTmax/2 or TDiff2 > Diff.Tmax.

For this controller function you need temperature sensor inputs for antifreezing and thermostat function or the 3rd switch output A3. For this reason the controller functions can be only alternatively chosen.

8.1.6 Tube collector function

Corresponding values in menu	
„Basic adjustment“:	„Programming“
4 -- 1	---

The function „Tube collector“is switched on or off in menu Basic adjustments. If the function is activated a circulation of heat carrying medium through the collector takes place for 30 seconds every 30 minutes. It is necessary to be able to measure a temperature change in the collector when no regulation-conditioned circulation has taken place for a longer time.

Indication	Meaning
	Short circuit on temperature sensor of the current measuring point
	Break on temperature sensor of the current measuring point, Circulation error at activated energy productivity measurement

8.2 System monitoring

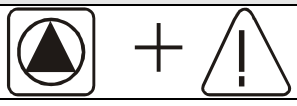
In the case of an error the flashing symbol  is shown as a rule.

8.2.1 Sensor monitoring

The sensors necessary for control functions and their connecting cables are monitored regarding break and short circuit. If a faulty sensor is recognised by Software, the symbol  is shown. By scrolling up and down you can find an error source.

Usage of false temperature sensors can lead to error message, too.

8.2.2 Flow monitoring

Indication	Meaning
	Missing circulation in solar circuit

If the option energy productivity measurement is disactivated, the temperature difference between collector and storage tank is checked.

If it exceeds the amount of (60K + dTmax),

it is then interpreted as an error because in the case of normal system dimensioning and a pump switched on such big differences cannot take place.

If the option energy productivity measurement is activated, the flow amount at the pump switched on is checked. If for 15 minutes no flow is recognised it is evaluated as an error.

Error message is automatically reseted after eliminating the failure.

8.2.3 Collector protection function / recooling

Corresponding values in menu	
„Basic adjustment“:	„Programming“
0 -- 1 1 -- 120 °C 2 -- 1 3 -- 40 °C (see 7.5)	---

The function is in menu basic adjustments switched on or off.
Glycol mixtures can decompose in certain conditions at high temperatures. Therefore the maximal temperature should be limited if possible in the collector circuit.
If all storage tanks are charged up to Tmax., the solar circulation pump is cut off. If the collector temperature exceeds the adjusted value „T Kollektor max.“, the solar circulation pump is being switched on until the collector temperature is reduced by 10K. A part of energy is given away through pipelines as a waste, the rest is charged in the storage tank which leads to the increase of the storage tank temperature over the adjusted maximal temperature. For safety reasons the function is finished when the storage tank has achieved 95°C.
If the collector temperature falls by 2K under Tst, the recooling function becomes active. The excess storage tank energy is given away again through the collector so that at the next charging cycle new reserves are available again. The recooling is finished when Tst falls under the adjusted value Tst max.
The recooling function can be switched on only when the collector protection function is on.

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8.2.4 System protection function

The system protection function switches off the system at the temperature exceed „T collector max.“ (see 8.2.3) + 10 K. This function comes into effect no matter if the collector protection is activated or not. As soon as the temperature falls below this value the system is started again.

8.3 Additional functions

8.3.1 Energy productivity measurement

Corresponding values in menu		
„Basic adjustment“:	„Programming“	„Info“
5 -- 1	---	xxxx kWh

For energy productivity measurement you need additionally a flow meter and a PT1000-sensor to measure the collector return temperature Tret.
Energy productivity of the solar system is calculated on the basis of the temperature difference between collector and collector return temperature and the measured flow quantity.

The function is switched on or off in menu „Basic adjustments“.

8.3.2 Operating hours meter

Corresponding values in menu	
„Programming“	„Info“
---	xxxx h

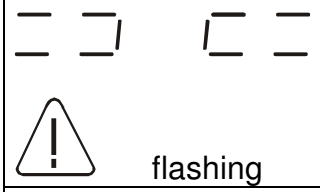
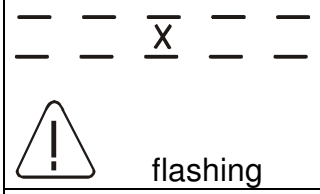
So long as the storage tank is charged by a pump, the operating hours meter runs along for each separate pump. The number of operating hours can be read in menu „Info“and for each pump separately reseted to 0.

9 FAILURE REPAIR

In the case of system failures you must basically distinguish two categories:

- failures which can be recognised by the controller itself and therefore can be indicated
- failures which cannot be indicated by the controller

9.1 Failures with error message

Error representation on display	possible reasons	Measures
 flashing	• sensor wire broken • sensor defect	➲ check wire ➲ check sensor resistance, if necessary exchange sensor
 flashing	• short circuit in sensor wire • sensor defect	➲ check wire ➲ check sensor resistance, if necessary exchange sensor
Circulation error: no flow  flashing Additionally at energy productivity measurement: 	• error in pump connection • pump defect • air in the system • flow meter defect • connection with flow meter defect • sensor wire broken • sensor defect	➲ check cabling ➲ exchange pump ➲ deaerate the system ➲ check if an impeller of the meter moves when the system runs (if visible) ➲ check wire ➲ check wire ➲ check sensor resistance, if necessary exchange sensor ➲

9.2 Failures without error message

You can check failures and malfunctioning, which are not indicated, and find their error sources according to the following table.

If failure repair is not possible on the basis of the description you must ask the deliverers or installer.

Error presentation	Possible reasons	Measures
No display function	• 230V-mains voltage not existing	➲ switch on or connect the collector ➲ check house safety fuse for the connection
	• appliance-internal safety fuse defect	➲ check safety fuse, replace it by a new one, type 2A/T, if necessary. ➲ check 230V components on short circuit
	• appliance defect	➲ consult with the deliverers
Controller does not work	• controller is in manual operation • switch-on condition not fulfilled.	➲ exit menu „Manual operation“. ➲ wait until the switch-on condition is fulfilled
Symbol „Pump“ rotates, but pump does not work	• pump connection broken. • pump is fixed. • no voltage on switch output.	➲ check cable to pump ➲ make the pump run well ➲ consult with the deliverers.
Temperature display varies strong in short time intervals	• sensor wires laid near 230V-wires • long sensor wires lengthened without shielding • appliance defect	➲ lay sensor wires differently shield sensor wires ➲ shield sensor wires ➲ consult with the deliverers

10 TECHNICAL DATA SOLAREG II

Housing	
Material	100% recyclable ABS-housing for wall installation
Measures L x W x D in mm, weight	175 x 134 x 56; ca. 360 g
System of protection	IP20 according to VDE 0470
Electrical values	
Operating voltage	AC 230 Volt, 50 Hz, -10...+15%
Interference grade	N according to VDE 0875
Max. conductor cross-section 230V-connections	2,5 mm² fine-strand/single-wire
Temperature sensor / temperature range	PTF6 - 25°C - 200°C PT1000, 1,000 kΩ at 0°C
Testing voltage	4 kV 1 min according to VDE 0631
Switching voltage Capability per one switch output Total capability of all outputs	230V~ / 1A / ca. 230VA for cos φ = 0,7-1,0 2A / ca. 460VA maximal
Fuse protection	fine-wire fuse 5 x 20mm, 2A/T (2 amperes, slow)
Others	
Recommended flow transmitter	PVM 1,5/90 1500l/h, Tmax >=90°C, 10l/impuls
Operating temperature	0 ... + 50°C
Storing temperature	-10 ... + 65°C

Changes for technical purposes reserved!

11 RESISTANCE TABLE PT1000

The correct function of temperature sensors can be checked on the basis of the following temperature resistance table with a resistance measuring instrument:

Temperature in °C	Resistance in Ohm	Temperature in °C	Resistance in Ohm
-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		

12 TABLE TYPICAL - CURRENT ADJUSTMENTS

Adjustments in menu „Programming“	Typical adjust-ment	Current adjust-ment
Storage tank1: permissible maximal temperature	65 °C	
Storage tank1: switch-on difference (dTon)	7 K	
Storage tank1: switch-off difference (dToff)	3 K	
Storage tank2: permissible maximal temperature	90 °C	
Storage tank2: switch-on difference (dTon)	7 K	
Storage tank2: switch-off difference (dToff)	3 K	
Minimal pump power at rotational speed regulation	100 %	
Switch-on temperature of thermostat function	40 °C	
Hysteresis of thermostat function	10 K	
2nd temperature differential controller maximal temperature Tmax	65 °C	
2nd temperature differential controller hysteresis dTmax	7 K	

Adjustments in menu „Basic adjustment“	Typical adjust-ment	Current adjust-ment
Switching on or off the function collector protection	0 = off	
Temperature at which the collector protection function is active	120 °C	
Switching on or off the function recooling (only when the collector protection is on)	0 = off	
Temperature to which the storage tank is recooled after the active collector protection function	40 °C	
Special function for time-controlled circulation in operation with tube collectors	0 = off	
Switching on or off the function energy productivity meas-urement	0 = off	
Alternative choice of the cooling function or the thermostat function	0 = off	
Choice of glycol types used	0 = Anro	
Mixture ration of coolants	50 %	
Litres pro impulse of the flowmeter	10,0 L/I	
Switching on or off the function antifreezing	0 = off	
Temperature at which the antifreezing is active	-1 °C	
Alternative choice of the cooling, thermostat function or the 2nd temperature differential controller	0 = none	
System type	type 0	

13 TERMS OF GUARANTEE

The controlling appliances SOLAREG II are carefully produced and checked at an automatic test place. Should any failures occur, check first if there are any operation / adjustment or system error. Furthermore the pump and temperature sensor connections are to be checked.

PROZEDA GmbH provides a guarantee according to the following terms for 24 months beginning from the purchase date.

a) The guarantee takes place in the case of existing material defect of the purchased good. If this defect is due to an operating error, exceeding the permissible technical data, false wiring, not permissible technical changes in the appliance made by the customer or other company than ROZEDA GmbH, no guarantee is provided.

b) The **guarantee** requires a **notification in writing** which **describes the defect in detail** and a copy of a customer´s invoice.
The guarantee takes place according to the free choice of PROZEDA GmbH through
- repair (improvement) or
– delivery of functioning spare part
The maximum repair period is 1 month with effect from receipt of the appliance by PROZEDA GmbH.
If two repair attempts go wrong, the customer has the right to the claim to the delivery of functioning spare part.
In the case of delivery of a spare part a new guarantee meeting these terms comes into effect.

c) Any further warranty (exchange, price reduction) is excluded.
Guarantee claims are entitled only to the customer and are not transferable.

In the case of defects within the guarantee time communicate first with the deliverers / installators. In the case of returns you always have to enclose error description, if possible the appliance plan and wiring plan.

14 DECLARATION OF CONFORMITY

The described appliance has been made and tested in compliance with CE-guidelines.