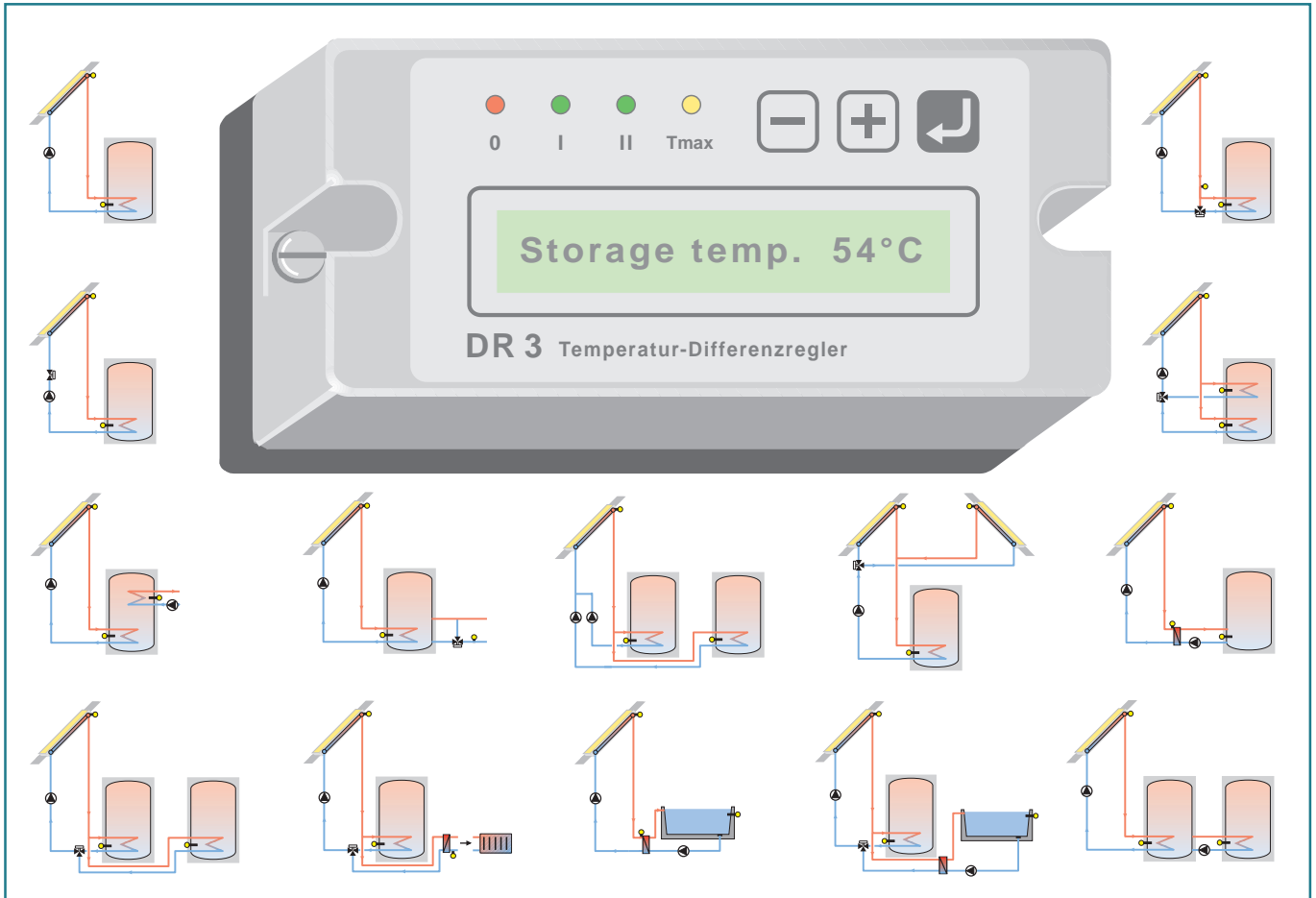


Differential Controller DR 3

Installation and Operating Instructions

temperature difference controller DR3 for 14 selectable solar heating systems / rotational speed regulation of the solar pump with adjustable minimal and maximal pump speed / running hours counter, sensor monitor and function control / various collector protection, storage protection and freeze protection functions / special start logic for vacuum tube collectors / priority settings for 2-storage tank and swimming pool systems / menu guiding in German, English, French, Spanish / easy to operate with 3 input keys and one 1x16-digit LCD display with energy-saving mode / the adjustments of the controller can be protected against unintentional adjustment by a menu locking device.




Description of the DR 3 Controller

The DR 3 controller is a microprocessor-controlled temperature difference controller with 3 Pt1000 sensor inputs and 2 relay outputs, of which the (R1) relay output is provided for the speed regulator of standard pumps.

The controller has the ability to implement 14 different controller variations for thermal solar systems, which are illustrated and described on the following pages.

On a 16 digit display and with 3 keys, the menu will be guided in the languages German, English, French or Spanish.

Using the three input keys Plus, Minus und Enter,  settings are carried out in the selected menu as well as selected values like current temperatures, operating hours or operating state can be displayed.

PT1000 sensors - with guaranteed degree-accuracy according to DIN EN60751 - provide for precise detection of the temperature difference, which guarantees the controlled switching characteristics within the entire operative range.

The LEDs on the front panel of the DR 3 controller indicate the current operational status of the system:

- LED 0 (red):
 - lights in automatic operation when there is no other switching-on condition for the solar pump(s) or valves than the standby function
 - flashes slowly and continuously as a sign until the operating mode „manual“ or „off“ is chosen
 - flashes quickly to warn when there is a fault like a defect collector sensor, for example
- LED I (green):
 - lights when the solar pump at relay R1 is switched on
- LED II (green):
 - lights when the pump / the valve at relay R2 is switched on
- LED Tmax (yellow):
 - lights in automatic operation when the desired max. storage or swimming pool temperature is reached.
 - flashes slowly as a sign for the activated solar protection at present
 - flashes quickly as a sign for the activated freeze protection

These instructions must be read before setting into operation!

2. Installation of the DR 3 controller

2.1 Wall installation

Simple wall installation of the device base by two-point attachment by means of attachment screws (4x6) and wall plugs (M6).

2.2 Electrical connection

The installation must only be carried out by a qualified specialist according to the VDE regulations.

Caution: Placement of the sensors and the accompanying relay outputs for each user is to be taken from the fields of application 1-14 on page 3.

The base plate is divided into a safe voltage side and a mains voltage side by a separation bar.

The mains voltage live lines are inserted into the right half of the base and attached with the cable strain reliefs included, if necessary. The sensor / extra-low voltage lines are to be inserted into the left half of the connection base.

The protective conductors of the mains supply and the connected consumers must be connected using the 3-pole grounding terminal strip inside the right-hand side of the base!

Then the wires must be connected according to terminal assignment in the following order:

Left of the base: Sensor connection terminal (5V DC)

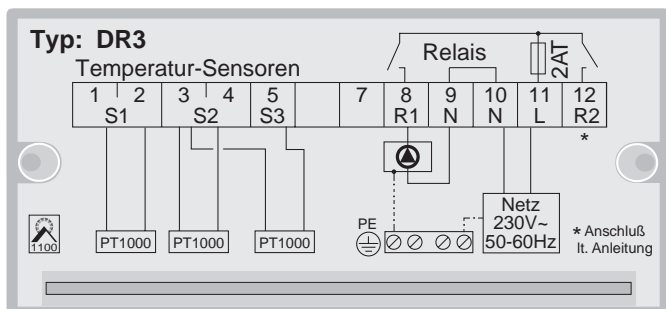
- 1/2 Temperature sensor „S1“ -any polarity
- 3/4 Temperature sensor „S2“ -any polarity
- 3/5 Temperature sensor „S3“ -any polarity

Right of the base: Mains connection terminal (230V AC 50Hz)

- 8 Relay output „R1“ (Caution: speed regulated)
- 9 Neutral conductor N of the consumer at relays R1 und R2
- 10 Neutral conductor N of the mains supply
- 11 Phase conductor L of the mains supply
- 12 Relay output „R2“

All PE protective conductors must be connected at the 3-pole grounding terminal strip.

Note: The R1 relay output is suitable for the control of standard pumps (20-120VA) whose speed can then be controlled via the controller. Due to the controller's internal wiring, valves, contactors or other consumers with low power consumptions must not be operated using this output. (Even in resting state, there will still flow residual currents at the electric relay output R1.)



2.3 Cable installation

To avoid interfering pulses (e.g. due to induction) the temperature sensor and interface cables must be run separately from the mains cables. For the extra-low voltage cables the safety regulations of VDE 0100 part 410 for protective low voltage must be observed.

If required, the temperature sensors' cables can be extended up to approx. 50 m, e.g. using 3 x 1.5 NYM cables, without affecting the measuring accuracy. Special care must be taken that the connection of the extensions does not show any contact transition.

3. Temperature sensors with PT1000 sensors

Correct installation and proper placement of the sensors is one critical factor for the overall function of the system.

Care must be taken that during installation the temperature sensors are actually installed in the area to be measured and that the sensor cables, if possible, run inside tube heat insulation on a length of approx. 20 cm measured from the measuring point and consequently are protected against cooling. This in particular applies for the collector sensor.

4. Setting into operation

Safety note: When working on the controller and the connected consumers all poles of the mains voltage must be switched off first, as residual currents flow through the electronic wiring of the devices.

Caution: The controller under no circumstances replace safety devices. Measures such as protection against frost, scalding, overpressure etc. must be provided on the installation side, if necessary. Plugging the main module onto the wall base (**with no voltage applied!**).

After switching on the main voltage, the controller is operable.

Procedure of the parametrisation for the specialist:

1. Poss. changing language (see 10.4)
2. Selecting the control programme (see 7.)
3. Adapting the settings (see 8.1-8.14)
4. Poss. activating the solar protect. funct. (see 9.1)
5. Poss. activating the freeze protect. funct. (see 9.2)
6. Poss. determining the rotational speed stages for R1 (see 10.1)
7. Poss. parametrisation of storage priority (see 10.2)
8. Poss. activating the start help function (see 10.3)
9. Functiontest in manual operating (see 11.)
10. Checking the temperature display (see 12.)
11. Poss. locking the setting menus (see 14.)

Error messages like e.g. due to defect sensors will be displayed by the red LED flashing. In addition, the fault is clearly displayed in the menu Service values.

In case of an error, the service values can be taken down to make a telediagnosis by phone possible for the specialist.

5. Notes on failures

Before opening the controller turn off main voltage!

The controller is protected with a 2AT fine-wire fuse. This fuse can be checked and replaced, if necessary, after switching off the power and detaching the plug-in module from the wall base and removing the rear panel. The function of the temperature sensors can be checked with a resistance measuring device as per the table. If a needed sensor is faulty, the controller deactivates the affected function.

Temperature-Resistance table for Pt1000 sensors

T/°C	0	10	20	30	40	50	60	70	80	90	100
R/Ω	1000	1039	1077	1116	1155	1194	1232	1270	1308	1347	1385

10m sensor cable 2x0,75² = approx. 0,1°C temperature measuring error

6. Specifications

- Base unit: plug-in case
- Dimensions: 112 x 52 x 106 (W x H x D)
- System of protection: IP40 / DIN 40050 CE
- Operating voltage: 230 V +/- 10% / 50-60 Hz
- Power consumption: approx. 2 VA
- Switched power: 400VA (for relay R1 min. 20VA max. 120VA)
- Fuse: 2AT
- Ambient temperature: 0 to 40°C
- Display: LCD 1 x 16 alphanumeric characters
- Measuring range: -40°C ... 230°C
- Sensors: PT1000 degree-accuracy acc.to DIN EN60751

7. Selecting the control programme

05 Special Func.

Select with **+** or **-**
Confirm with **↵**

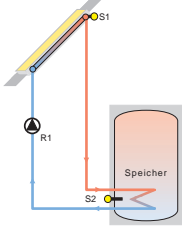
Select Programme

Select with **+** or **-**
Confirm with **↵**

Programme: 1

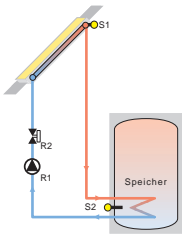
Select with **+** or **-**
Confirm with **↵**

After setting the device into operation now the control programme desired must be selected. Under the menu item „Special Func.“ the appropriate software version (1-14) must be set in the sub-menu „Select programme“. Note: The illustrations are just example sketches for explanation of the control functions and not complete hydraulic systems. Change-over valves e.g. must be installed according to the information of the respective fabricators.



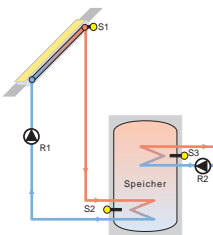
Programme: 1

S1 = collector sensor
S2 = storage sensor
S3 = option to display
R1 = solar pump
R2 = without any funct.



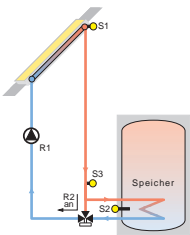
Programme: 2

S1 = collector sensor
S2 = storage sensor
S3 = option on display
R1 = solar pump
R2 = lock valve



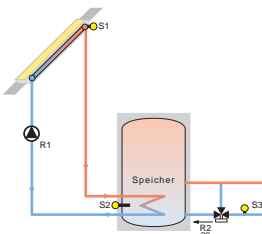
Programme: 3

S1 = collector sensor
S2 = storage sensor d.
S3 = storage sensor u.
R1 = solar pump
R2 = e.g. pump



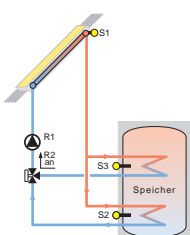
Programme: 4

S1 = collector sensor
S2 = storage sensor
S3 = forerun sensor
R1 = solar pump
R2 = change-over valve (R2on-mode in bypass)



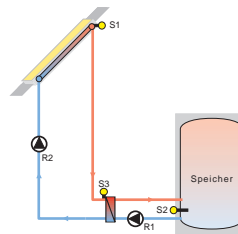
Programme: 5

S1 = collector sensor
S2 = storage sensor
S3 = heat circle return sen.
R1 = solar pump
R2 = change-over valve (R2on-way through storage)



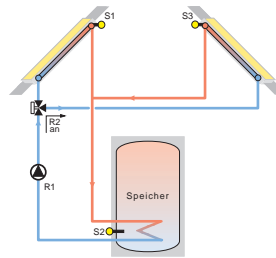
Programme: 6

S1 = collector sensor
S2 = storage sensor d.
S3 = storage sensor u.
R1 = solar pump
R2 = change-over valve (R2on-charge storage up)



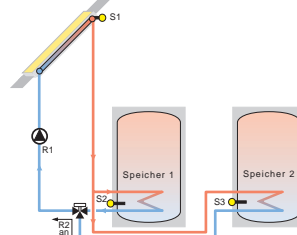
Programme: 7

S1 = collector sensor
S2 = storage sensor d.
S3 = forerun sensor prim.
R1 = solar pump sec.
R2 = solar pump prim.



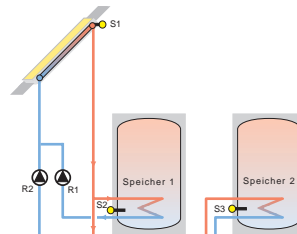
Programme: 8

S1 = sensor collector 1
S2 = storage sensor
S3 = sensor collector 2
R1 = solar pump
R2 = change-over valve (R2on-way through collector 2)



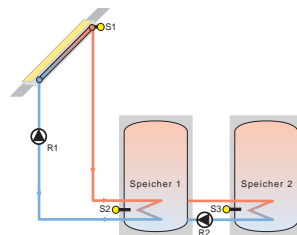
Programme: 9

S1 = collector sensor
S2 = sensor storage 1
S3 = sensor storage 2
R1 = solar pump
R2 = change-over valve (R2on-way through storage 2)



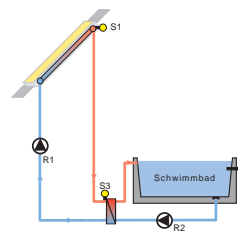
Programme: 10

S1 = collector sensor
S2 = sensor storage 1
S3 = sensor storage 2
R1 = solar pump st.1
R2 = solar pump st.2



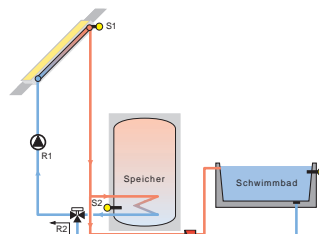
Programme: 11

S1 = collector sensor
S2 = sensor storage 1
S3 = sensor storage 2
R1 = solar pump
R2 = charge pump st.2



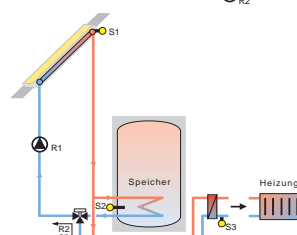
Programme: 12

S1 = collector sensor
S2 = swim. pool sensor
S3 = forerun sensor prim.
R1 = solar pump prim.
R2 = charge pump sec.



Programme: 13

S1 = collector sensor
S2 = storage sensor
S3 = swim. pool sensor
R1 = solar pump
R2 = valve/pump sec. (R2on-swim. pool charge)



Programme: 14

S1 = collector sensor
S2 = storage sensor
S3 = heat circle return sen.
R1 = solar pump
R2 = change-over valve (R2on-way through heat.circle)

8. Setting the control parameter

02 Settings

Select with  or 
Confirm with 

Depending on the set software version 1-14, the following control parameters must be set for the respective scheme. The settings which must be done for programme 1 also apply for the usage programmes 1-14, and they will be supplemented by further settings for the respective programme, if necessary.

Use the Plus key to increase and the Minus key to decrease the set values. The Enter key is to confirm the selected value and the menu skips automatically to the next setting value. Got to the end of the setting values, the controller returns back to the main menu on its own.

Caution: Faulty settings can lead to hazards and malfunctions of the device. Instructions as well as information of the fabricators must be respected and a specialist must be consulted.

8.1 Menu „02 Settings“ for Programme 1

Tmin S1

The minimum collector temperature set must be exceeded at sensor S1 for the solar function to be released.

Setting range: 0...90°C Default value: 30°C

Tmax S2

Desired maximum solar storage tank temperature at sensor S2.

If the temperature set in the solar storage tank is exceeded at sensor S2, the solar pump is switched off at what the shift hysteresis amounts 2°C.

Setting range: 0...120°C Default value: 60°C

ΔT R1

Here the temperature difference must be set which must be exceeded between the collector sensor and the storage sensor for the solar heat charge///transfer into the storage tank to begin. The heat is charged///transferred into the storage tank until the temperature difference has fallen to 1/3 of the set value.

(Excetion see rotational speed control under 10.1)

setting range: 6...18K Default value: 10K

Notes for the rotational speed control of the pump for the specialist:

The DR3 controller is able to change the rotational speed of standardpumps (and only these!) by means of the electronic semiconductor relay R1.

Settings for the rotational speed control of the solar pump are to be done in the menu Special functions under „Rotational speed R1“.

8.2 Menu „02 Settings“ for Programme 2

The same settings as in programme 1 must be done. The mechanical relay R2 switches on and off with the solar pump R1, which makes it possible that an electric lockvalve is triggered by the controller, e.g..

8.3 Menu „02 Settings“ for Programme 3

At first, the same settings as in programme 1 must be done. Afterwards, the thermostat function must be set via sensor S3 and relay R2:

Tnom S3

If the temperature at sensor S3 in the upper storage tank area falls below this value and a positive value is set subsequently under „Hysteresis“, then relay R2 switches on as backup heating. The backup heating remains active until the storage is heated up to the value Tnom S3 plus hysteresis.

If the temperature at sensor S3 in the upper storage tank exceeds this value and a negative value is set under „Hysteresis“, then relay R2 switches on as cool function. The cooling of the storage tank remains active until the storage is cooled down to the value Tnom S3 minus the hysteresis.

Setting range: 0...90°C Default value: 60°C

Hysteresis

This setting at first determines decisively whether a backup heating (positive value) or a heat discharge/storage tank cooling function (negative value) is used. In addition, it will be determined how many °C since the value Tnom S3 set beforehand shall be heated/cooled down.

Setting range: -20...20°C Default value: +10°C

8.4 Menu „02 Settings“ for Programme 4

The same settings as in programme 1 must be done. The mechanical relay R2 switches on the valve for the bypass operation with the solar pump R1 until the temperature at the forerun sensor S3 is bigger than at the storage sensor S2.

8.5 Menu „02 Settings“ for Programme 5

At first, the same settings as in programme 1 must be done and afterwards, the additional difference for the heating return rise must be set.

Tmin S2

The set minimum storage temperature must be exceeded at S2 for a heat discharge to the heating circle to be released.

Setting range: 0...90°C Default value: 50°C

Tmax S3

If the set temperature exceeds at the heatcircle return sensor S3, the return rise / relay R2 will switch off for the heating circle not to be overheated.

Setting range: 0...120°C Default value: 60°C

ΔT R2

Here the temperature difference must be set which must be exceeded between the storage sensor S2 and the heating circle return sensor S3 for a heat discharge to the heating circle to begin.

The heat is transferred into the heating circle until the temperature difference has fallen to 1/3 of the set value.

Setting range: 6...18K Default value: 10K

8.6 Menu „02 Settings“ for Programme 6

At first, the same settings as in programme 1 must be done and afterwards, the parameters for the second storage zone of the storage tank must be set. Further adjustments for the priority settings must be done under the item 10.2.

Tmax S3

Desired maximum solar storage tank temperature at the upper storage sensor S3. If the set temperature is exceeded at sensor S3, the valve at R2 switches off at what the shift hysteresis amounts 2°C.

Setting range: 0...120°C Default value: 60°C

Priority

It must be set which storage tank area (storage sensor) shall be charged with priority. The charge of the lower-level storage part is interrupted in regular intervals to prove that the temperature rise at the collector submits a charge of the prior storage area.

Setting range: S2 / S3 Default value: S2

8.7 Menu „02 Settings“ for Programme 7

The same settings as in programme 1 must be done. After exceeding of the difference „ ΔT R1“, the primary pump R2 switches on, though.

The secondary pump R1 does not switch on before the temperature at the forerun sensor S3 is higher than at the storage sensor S2. Pumps R1 and R2 switch off via sensors S1 and S2. The rotational speed of the secondary pump R1 is controlled via the forerun sensor S3 and the storage sensor S2.

8.8 Menu „02 Settings“ for Programme 8

The same settings as in programme 1 must be done. The set value of the minimum collector temperature „Tmin S1“ is for both collector areas. The warmer collector is always perfused via the change-over valve R2 when the solar pump R1 is active. The change-over hysteresis amounts 8°C.

The reference sensor to control the rotational speed and to switch off the solar pump R1 is always the sensor of the collector area which is being perfused.

8.9 Menu „02 Settings“ for Programme 9

At first, the same settings as in programme 1 must be done and afterwards, parameters for the charge of the second storage tank must be set. Further adjustments for the priority settings must be done under the item 10.2.

Tmax S3

Desired maximum solar temperature of storage tank 2 at sensor S3. If the set temperature is exceeded at S3, the valve at R2 switches off and the storage tank is not charged any longer at what the shift hysteresis amounts 2°C.

Setting range: 0...120°C Default value: 60°C

Priority

It must be set which storage tank (storage sensor) shall be charged with priority. The charge of the lower-level storage tank is interrupted in regular intervals to prove that the temperature rise at the collector submits a charge of the prior storage tank.

Setting range: S2 / S3 Default value: S2

Tnom

The lower-level storage tank is not charged until the set Tnom value is exceeded at the storage sensor of the prior storage tank.

Setting range: 0...90°C Default value: 30°C

8.10 Menu „02 Settings“ for Programme 10

At first, the same settings as in programme 1 must be done and afterwards, the parameters for the charge of the second storage tank must be set. Generally, there is no parallel operation of pump R1 and pump R2.

Further adjustments for the priority settings must be done under the item 10.2.

Tmax S3

Desired maximum solar temperature of storage tank 2 at sensor S3. If the set temperature is exceeded at S3, the pump at R2 switches off and the storage tank is not charged any longer at what the shift hysteresis amounts 2°C.

Setting range: 0...120°C Default value: 60°C

ΔT R2

Here the temperature difference must be set which must be exceeded between the collector sensor and the sensor S3 of the second storage tank for the solar heat charge///transfer into the second storage tank via the pump R2 to begin.

The heat is charged///transferred into this storage tank until the temperature difference has fallen to 1/3 of the set value.

Setting range: 6...18K Default value: 10K

Priority

It must be set which storage tank (storage sensor) shall be charged with priority. The charge of the lower-level storage tank is interrupted in regular intervals to prove that the temperature rise at the collector submits a charge of the prior storage tank.

Setting range: S2 / S3 Default value: S2

Tnom

The lower-level storage tank is not charged until the set Tnom value is exceeded at the storage sensor of the prior storage tank.

Setting range: 0...90°C Default value: 30°C

8.11 Menu „02 Settings“ for Programme 11

At first, the same settings as in programme 1 must be done and afterwards, the additional difference for the charge into the sequence storage tank must be set.

Tmin S2

The set minimum storage temperature must be exceeded in the solar storage tank at S2 for a heat discharge into the sequence storage tank to be released.

Setting range: 0...90°C Default value: 50°C

Tmax S3

Desired maximum storage temperature at sensor S3 in the sequence storage tank. If the set temperature is exceeded at S3, the pump at R2 switches off at what the shift hysteresis amounts 2°C.

Setting range: 0...120°C Default value: 60°C

ΔT R2

Here the temperature difference must be set which must be exceeded between the solar storage sensor S2 and the sequence storage sensor S3 for a heat discharge into the sequence storage tank to begin.

The heat is recharged until the temperature difference has fallen to 1/3 of the set value.

Setting range: 6...18K Default value: 10K

8.12 Menu „02 Settings“ for *Programme 12*

The same settings as in programme 1 must be done. The swimming pool pump R2 switches on when the forerun sensor S3 is warmer than the swimming pool sensor S2.

8.13 Menu „02 Settings“ for *Programme 13*

At first, the same settings as in programme 1 must be done and afterwards, the parameters for the charge of the second storage tank must be set. Further adjustments for the priority settings must be done under the item 10.2.

Tmax S3

Desired maximum swimming pool temperature at sensor S3. When exceeding, the valve and the pump at R2 switch off at what the shift hysteresis amounts 2°C.

Setting range: 0...120°C Default value: 60°C

Priority

It must be set whether the storage tank (sensor S2) or the swimming pool (sensor S3) shall be charged with priority. The charge of the lower-level consumer is interrupted in regular intervals to prove that the temperature rise at the collector submits a charge of the prior consumer.

Setting range: S2 / S3 Default value: S2

Tnom

The lower-level consumers are not charged until the set Tnom value is exceeded at the sensor of the prior consumer.

Setting range: 0...90°C Default value: 30°C

8.14 Menu „02 Settings“ for *Programme 14*

At first, the same settings as in programme 1 must be done and afterwards, the additional difference for the heating return rise must be defined.

Tmax S3

If the set temperature exceeds at the heatcircle return sensor S3, the return rise / relay R2 will switch off for the heating circle not to be overheated. The shift hysteresis amounts 2K.

Setting range: 0...120°C Default value: 60°C

Priority

It must be set if the storage tank (sensor S2) shall be charged with priority or if the heat shall be used with priority for the heating return rise (sensor S3). The charge of the lower-level consumer is interrupted in regular intervals to prove that the temperature rise at the collector submits a charge of the prior consumer.

Setting range: S2 / S3 Default value: S2

Tnom

The lower-level consumers are not charged until the set Tnom value is exceeded at the sensor of the prior consumer.

Setting range: 0...90°C Default value: 30°C

Note: After adapting the settings to the system, the solar protection function (see 9.1) and/or the freeze protection function (see 9.2) must be activated and adapted to the system, if necessary.

Afterwards, rotational speed control of the solar pump and consequently discharge rate etc. can be adapted precisely (see 10.1).

With programmes 6,9,10,11,13,14, additional parameters regarding the storage prior settings must be set (see 10.2).

In addition, the controller makes it possible to activate and adapt a special start help function (see 10.3), e.g. for systems with vacuum tube collectors and when the uptake of temperature measurements is too slow or too inaccurate.

9. Activating the protection functions

04 Protect. function

Select with  or 
Confirm with 

Depending on information of storage and collector fabricators, the controller makes it possible to activate and set different solar protection and freeze protection functions. In state of delivery of the controller, the solar protection function as well as the freeze protection is switched off.

By using the Plus or Minus key, the respective sub-menu Solar protection (see 9.1) or Freeze protection (see 9.2) can be chosen and then confirmed by pressing the Enter key.

Caution: These functions under no circumstances replace safety devices. Measures such as protection against frost, scalding, overpressure etc. must be provided on the installation side, if necessary. Settings and changes in this menu have a considerable effect on the safety and function of the device and should only be done by a specialist.

9.1 Activating and setting solar protection

04 Protection funct.

Solar protection

Solar protection

If 'no' is selected, the solar protection function is not activated and the controller returns subsequently back to the main menu. If 'yes' is set, the solar protection function is activated. In addition, the following settings have to be done.

Setting range: yes / no Default value: no

Variation

If selecting variation 1, the controller switches on the solar pump for the collector to be protected against overtemperature when the following set value „Protection on“ is exceeded at the collector sensor and the storage sensor/s has/have exceeded the set Tmax value. In devices with several storage tanks, the heat discharge happens in the lower-level storage tanks. If selecting variation 2, the solar pump switches off when the value of „Protection on“ exceeds. The function of the solar pump will not be released again before the value of „Protection off“ has fallen below.

Setting range: 1 / 2 Default value: 1

Protection on

If the set value exceeds at the collector sensor, the solar protection function will be activated.

Setting range: 60...150°C Default value: 110°C

Protection off

The solar protection function remains active until the set value to switch off at the collector sensor has fallen below.

Setting range: 50...protection on -5K

Default value: 100°C

St.-Max (query only with variation 1)

The solar protection switches off as soon as the selected value at the lower storage sensor exceeds for the storage tank to be protected against overtemperature.

Setting range: 50..140°C Default value: 90°C

9.2 Activating and setting freeze protection

04 Protection funct.

Freeze protection

Freeze protection

If 'no' is selected, the freeze protection function is not activated and the controller returns subsequently back to the main menu. If 'yes' is set, the freeze protection is activated. In addition, the following settings have to be done.

Setting range: yes / no Default value: no

F-protection on

If the set value at the collector sensor falls below, the solar pump switches on for the heat to be transferred from the storage tank into the collector and the tube system.

The pump switches off again as soon as the set value at the collector sensor exceeds with 5°C.

Setting range: -25...+5°C Default value: 0°C

10. Setting the special functions

05 Special functions

Select with \oplus or \ominus
Confirm with \square

Caution: The parameters that can be set under Special functions have a considerable effect on the safety and function of the device. Settings and changes when switched on should only be done by a specialist.

Submenu:

- Programme select \square (see further under 7.)
- 1x \oplus Rotational speed \square (see further under 10.1)
- 2x \oplus Storage priority \square (see further under 10.2)
- 3x \oplus Start help \square (see further under 10.3)
- 4x \oplus Language selection \square (see further under 10.4)
- 5x \oplus Sensor adjustment \square (see further under 10.5)
- 6x \oplus Auto adjustment \square (only for the fabricator)

10.1. Adapting the rotational speed control

05 Special function

Rotational speed R1

Rotational speed R1

If 'yes' is set, the pump at relay R1 is rotational speed controlled through the DR3 controller in 30 steps. The functionality of the speed regulation control is determined subsequently.

Setting range: yes/no Default value: no

R1 variation

There are three different control options to select from, provided that the set ΔT is retained constantly:

Variation 1: The controller changes to the set R1max value after pre-flushing. If the temperature difference between collector and storage tank is below the set value, the rotational speed will be reduced for one level after the control period is over. If the temperature difference is above the set value, the rotational speed will be exalted for one level after the control period is over. Should the controller change the rotational speed of the pump down to the smallest level and the ΔT between collector and storage sensor amounts only 1/3 of the set value, the pump switches off.

Variation 2: like variation 1, but the controller changes immediately to the set R1min value after pre-flushing and changes it up again, if necessary.

Variation 3: like variation 2, but the controller tries to retain / reach the subsequently adjustable value „Tnom S1“ at the collector sensor via the rotational speed control.

Setting range: Variants 1...3 Default value: Variant 1

Tnom S1 (query only with variation 3)

If this value at the collector sensor is fallen below, the rotational speed will be reduced. In case of exceeding, the rotational speed will be exalted.

Setting range: 0...90°C Default value: 50°C

Control period

The period, which must pass by after changing the rotational speed, must be entered before a new adjustment of the rotational speed can happen.

Setting range: 5...30sec. Default value: 8sec.

Preflushing period

For this period, the pump gets going with its full rotational speed (100%) to guarantee a faultless start. The pump will not run with rotational speed control until this pre-flushing period is over, and it will change, depending on the set variation, to the R1max or R1min rotational speed value.

Setting range: 10...600sec. Default value: 15sec.

R1 max.

Here the maximum rotational speed of the pump at relay R1 is determined. While setting, the pump runs at the respective rotational speed and the flow rate can be determined.

Note: The given values are just guiding values, which can differ more or less intensely depending on device and pump.

Setting range: R1 max. 70...100%

Default value: R1 max. 100%

Continuation of 10.1

R1 min.

Here the minimum rotational speed of the pump at relay R1 is determined. While setting, the pump runs at the respective rotational speed and the flow rate can be determined.

Setting range: R1 min. 30...70%

10.2 Setting the storage priority

05 Special function

Storage priority

For programmes 6, 9, 10, 11, 13, 14, the subsequent functions for the storage priority must be set additionally. These settings are not important for the other programmes.

Interruption

The charge of the lower-level storage tank will be interrupted after the period set here. This is to prove if the collector can reach a temperature level which makes a charge in the prior storage tank possible shortly afterwards. If the conditions for the charge of the prior storage tank or for a further interruption will not be fulfilled, the charge of the lower-level storage tank will be released again and after the period set here interrupted again for the current temperature increase of the collector to be regarded.

Setting range: 5...90min. Default value: 10min.

Temp.-increase

Here the necessary temperature increase of the collector must be set for an exact setting of the charge priorities at devices with several storage tanks. While doing this, the interruption of the charge of the lower-level storage tank is prolonged by one minute as the temperature level of the collector can probably make a charge into the prior storage tank possible shortly afterwards. If the temperature increase falls below the set value, the charge of the lower-level storage tank will be released and interrupted again after the beforehand set time for the current temperature increase of the collector to be regarded.

Setting range: 1...10K / min. Default value: 3K / min.

10.3 Activating and setting the start help funct.

05 Special function

Start help function

Usually, this function is not necessary for normal solar systems. However, it can happen with some systems, in particular with vacuum tube collectors, that the measurement coverage at the collector sensor is too slow or too inaccurate as the sensor is not at the warmest place. The pump will temporary get started on certain conditions via the start help function to make a correct measurement assimilation possible for the sensor.

Start help

If 'yes' is set, the function described afore will be activated and the subsequent settings must be done.

Setting range: yes/no Default value: no

Flushing period

The pump will switch on for the time set here when the subsequent condition of the temperature increase at the collector sensor is reached.

Setting range: 2...30sec. Default value: 5sec.

Temp.-increase

When the temperature increase at the collector sensor reaches the value set here, the solar pump switches on for the afore selected flushing period to make a correct measurement assimilation possible for the collector sensor. This is followed by a measure and lock period of 5 minutes in which no further start help functions can happen. If the normal switching on conditions for the solar pump are fulfilled when measuring, the storage tank charge will be released.

Setting range: 1...10K / min. Default value: 3K / min.

10.4 Determining the language of the menu

05 Special function

Language selection

The menu of the controller can be displayed in following different languages.

Language

Setting range: German, English, French, Spanish

Default value: German

10.5 Calibrating temperature sensors

05 Special function

Sensor adjustment

Note: Usually, there are no settings to be done in this menu as the device is adjusted to sensors Pt1000 and operates with degree-accuracy.

However, long sensor cables or bad placement of the sensor can lead to distortion of the measurements which can be balanced via adjustments in this menu.

Offset S1...S3

The three sensors can be adjusted one after the other. Each step corresponds to a change of the measurement of approx. 1/3 °C upwards (+) or downwards(-).

Setting range: -20...+20 Default value: 0

11. Changing the operating mode

03 Operating mode

Automatic

Here the operating mode of the controller can be changed between automatic, off or manual operation. Caution: In the off or manual operation, there is no normal control process and also functions like solar and freeze protection as well as storage temperature limit etc. are not in operation and the red LED flashes to warn. After quitting the off or manual operation, the controller returns in back to the automatic mode on its own.

Only the specialist is allowed to activate the manual operation for control or adjustment works. The manual operation must be quit after finishing the work for the controller to return back to the automatic operation.

In the manual operation, relay R1 / R2 is selected via the Plus or Minus key and is switched on / off via the Enter key.

The controller returns back to the automatic operation via the option „Esc“ and by using the Enter key.

12. Displaying temp. values and measurements

01 Measurements

Collector 74°C

The desired values are displayed via the Plus or Minus key and the menu can be quit again via the Enter key.

At first, the current temperatures at sensors S1-S3 are displayed. Afterwards, the current rotational speed stage of the solar pump is proportionally displayed. The total running hours of the solar pump (the relay) can be read under the displayed value „Running hours R1“ and „Running hours R2“.

If one of the sensors is defect which is necessary for the control function, the red LED flashes and the temperature value <-40°C in case of a bypass or >230°C in case of an interruption is displayed.

13. Query of service values

06 Service values

DR3/xx-xxxxxx

In case of obscurities with the control system and of errors, the diagnosis values, which can be called up here, must be written down at the moment of the error. Afterwards, these data can be used e.g. for a telediagnosis by phone. The different values one after the other are displayed by using the Plus key. The menu will be quit via the Enter key.

14. Locking / Releasing the modulation menus

07 Menu lock

Select with + or -
Confirm with ↵

Menus 02,03,04,05 can be protected against unintentional adjustment. For this purpose, the item Menu lock must be called up and the lock or release must be confirmed, if necessary. When the menu lock is activated, the above-mentioned menua cannot be selected. For this purpose, the lock must be released again.

Setting range: lock/release yes/no

15. Brief overview of the menu operation

The main menu of the DR3 consists of the six menu items which are presented briefly in the following. Using the Plus or Minus key, the selected menu can be chosen, and the respective menu can be entered via the Enter key.

01 Measurements



display menu:
- 3 temperature values
- rotational speed stages
- running time



02 Settings



modulation menu:
- temp.-difference ΔT
- storage Tmax
- start temp. Tmin
- rated values Tnom
- shift hystereses



03 Operating mode



state menu for:
- automatic operation
- manual operation
- off



04 Protection funct.



modulation menu for:
- solar protect. funct.
two variations
on/off set values
storage protection
- freeze protect. funct.
release temperature



05 Special function



modulation menu for:
- programme selection
- rotational speed control
- priority setting
- start help function
- language selection
- sensor adjustment



06 Service values



service menu:
- error messages
- temperature values
- operating state



07 Menu lock



lock function against unintentional adjustment in the menus:
- 02 Settings
- 03 Operating mode
- 04 Protect. function
- 05 Special function