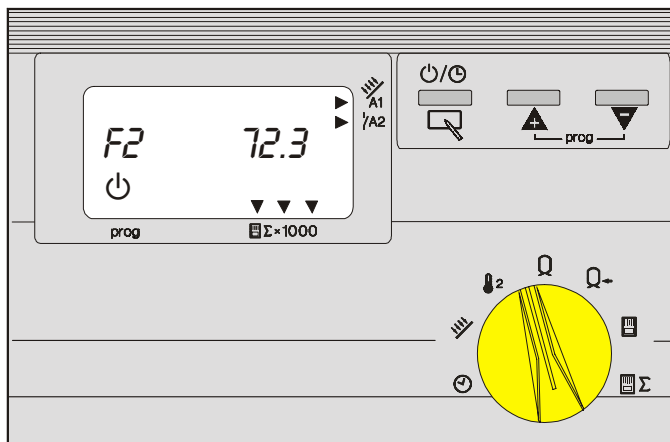


SD2-PT

Differential Controller

Operating and Installation Instructions



Please follow the safety information and read these Instructions carefully before putting the system into operation.

Power connection regulations

Please note the connection conditions specified by your local electrical power supply utility and the VDE regulations.

Your heating control system may be installed and serviced only by appropriately authorized specialists.

⚠ If the system is not installed properly, there is a risk of fatal or severe personal injury.

Warranty conditions

If the system is not installed, commissioned, serviced and repaired professionally, this will render the manufacturer's warranty null and void.

Important text passages

! Important information is highlighted with an exclamation mark.

⚠ This attention symbol indicates dangerous situations.

Installation

Information on installation of the system is provided in Part 2 of this manual together with a connection diagram.

Declaration of conformity



This device corresponds to the requirements of the relevant guidelines and standards, if the corresponding regulations and the manufacturer's instructions are complied with.

Function

This controller enables the regulation of various types of system:

- 1) Solar regulation
- 2) Solid fuel boiler regulation
- 3) Solid fuel boiler regulation with solar integration
- 4) Solar regulation with two collectors
- 5) Solar regulation with two storage tanks
- 6) Solar regulation with reheating function
- 7) Solar regulation with tank for heating the boiler return flow

The device is simple to operate and easy to control due to the direct temperature display in the first operating level.

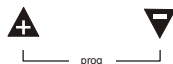
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In display level (normal mode)



OFF/ON/MANUAL switch (⏻ / ⌚ / ⚙)



Access the operating level by pressing the Plus and Minus keys simultaneously. (Automatic reset after 2 min. without operation).

In operating level (setting parameters)



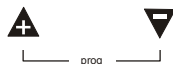
Programming key
(selection or input)



Plus key
(next value or increase value)



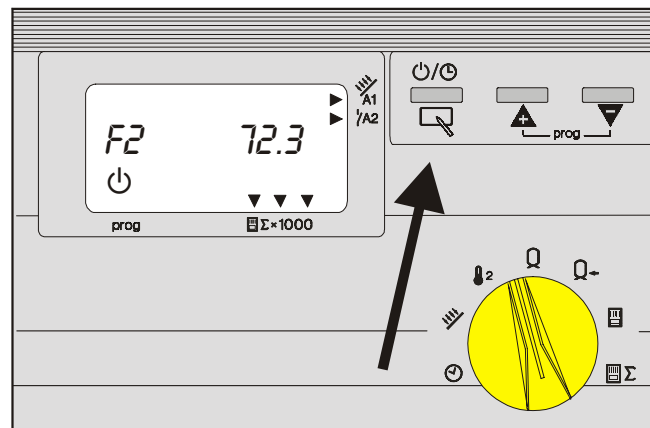
Minus key
(previous value or decrease value)



Press the Plus and Minus keys simultaneously to return to the display level.

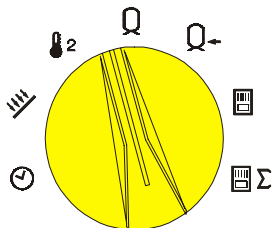
Program switch settings

- ⏻ **OFF:** The pumps are not activated.
- ⌚ **ON:** Normal operation; regulation according to settings.
- ⚙ **MANUAL:** All pumps operate (all relays closed). The function is reset to Automatic mode ⌚ after 30 min.



Display (normal mode)

When in Normal mode, select the display required with the rotary knob at the front:



A Designation of temperature displayed

⌚ -- Time

☀ F 1 System 1,3,4,5,6,7: Temperature of collector
System 2: Temperature of solid fuel boiler

🌡 F 2 System 1+5+6: Return flow sensor of collector
System 3: Temperature of solid fuel boiler
System 4: Temperature of second collector
System 7: Temperature of return flow collector

🔌 F 3 System 1,2,3,4,6,7: Storage heater at top
System 5: Temperature of storage heater 2

🔌➔ F 4 Temperature of storage heater 1 at bottom

📊 ⌈ 1 Day's production in kW

📊Σ ⌈ 2 Total production in kW. From 10 MW, display in MW (=> Arrow appears on "📊Σx1000")

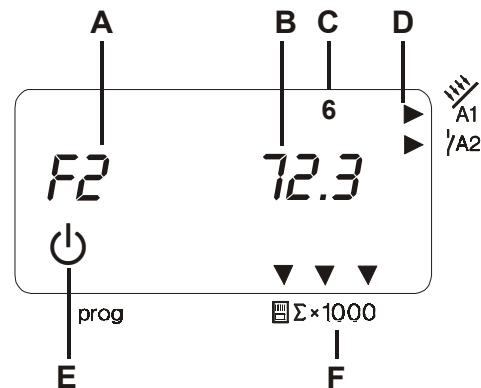
B Display the selected temperature / or time

C Weekday 1=Monday - 7=Sunday; here Saturday

D Pump operation indicator (Arrow = Pump ON)
a = Pump A1 is ON (see connection diagram)
b = Pump A2 is ON (see connection diagram)

E Operation indicator ⏻ = OFF, ⏻ = ON,
(⌘ = Hand => Pumps ON max. duration = 30 min.)

F When the total solar production in display ⌈ 2 exceeds 10 MW, the three arrows appear above the text: "📊Σx1000".



After the device has been properly installed, switch on the power supply:

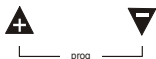
The software number for your device appears briefly in the display.

Finally, the standard display indicators appear.

The controller is now in operation and uses standard values. To define the correct display, the time and weekday can now be entered.

! It is still necessary to enter the number of the system installed [P22] (refer to 'Modify set values').

Time / Weekday



Press the Plus + Minus keys simultaneously => Operating level with set value display "01" [left]



Press the Prog key
=> LED beside Prog lights up



Set the time with the Plus/Minus keys



Setting mode can be ended at any time by pressing the Plus + Minus keys simultaneously. Changes which have been entered but not stored by pressing the

Prog key have no effect.



Press the Prog key
=> Save the new time



Press the Plus key
=> Set value display "02" [left]



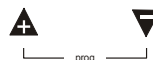
Press the Prog key
=> LED beside Prog lights up



Set the weekday (1-7) with the Plus/Minus keys

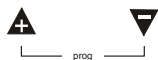


Press the Prog key
=> Save the weekday



Press the Plus + Minus keys simultaneously => Normal mode with standard display.

! The standard display can be selected/changed using the rotary knob.



Access the operating level by pressing the Plus and Minus keys simultaneously.

Display: Left no. of the set value, Right set value



Use the Plus/Minus keys to select the number of the set value required [Display: left].



A list of all the set values is provided on the following pages.



Press the Prog key
=> Select the set value
The LED beside the Prog key lights up.
This means that the set value can now be modified with the Plus/Minus keys.



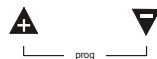
Change the set value using the Plus/Minus keys.



Press the Prog key
=> The modified value is saved.



Setting mode can be ended at any time by pressing the Plus and Minus keys simultaneously.
Changes which have been entered but not stored by pressing the Prog key have no effect.



Exit from the operating level by pressing the Plus and Minus keys simultaneously.

Set values protected by code no. (from No. 20)

It is only possible to change the set values from no. 20 after entering the code number. These set values may only be modified by an authorized fitter.

⚠ If these values are set incorrectly, they may cause malfunctions or damage to the system.

- Select set value 20 (code no. input).
- Press the Prog key and enter the 1 to 4-digit code number. Confirm each digit by pressing the Prog key.
- Select the set value to be modified.
- Press the Prog key and change the set value.
- Conclude the input by pressing the Prog key.

If an attempt is made to enter an impermissible value, the system automatically returns to set value 20 (enter code number).

No.	<u>Designation</u>	<u>Setting range</u>	<u>Setting ex works</u>	<u>Own settings</u>
	User set values			
01	Set time	0.00 – 24.00	10.00	
02	Set weekday	1 – 7	1 (Monday)	
03	Day's production	Display only /Clear	0	
04	Total production	Display only /Clear	0	
05	Pump kick function switch-on time	00.00 – 24.00	07.00	
06	Pump kick function switch-off time	00.00 – 24.00	22.00	
07	Reheating function ON	00.00 – 24.00	05.00	
08	Reheating function OFF	00.00 – 24.00	21.00	
	Fitter set values			
20	Enter code no.	0000-9999		
21	Code no.	0000-9999	0000	
22	Select system (see hydraulic diagrams)	1 - 7	1	
	Switching thresholds / Hystereses			
30	Switching threshold for difference 1	1K – 30K	3K	
31	Hysteresis to switching threshold for 1	1K – 10K	3K	
32	Switching threshold for difference 2	1K – 30K	3K	
33	Hysteresis to switching threshold for 2	1K – 10K	3K	

No.	Designation	Setting range	Setting ex works	Own settings
	Special functions			
40	Enable temperature, collector(s)	(-20)°C – (+90)°C	35°C	
41	Maximum collector temperature	80°C – 180°C	110°C	
42	Enable temperature 2nd heat generator	0°C – 90°C	60°C / 40°C [6]	
43	Maximum solid fuel boiler temperature:	30°C – 130°C	90°C	
50	Maximum storage tank temperature, tank 1	10°C – 130°C	60°C	
51	Maximum storage tank temperature, tank 2	10°C – 130°C	85°C	
52	Tolerance for solar production (System 6 only)	0°C – 90K	10K	
53	Hot water short time heating function	0, 1 (OFF, ON)	0 (OFF)	
	Pump kick function (temperature test function)			
60	Kick duration	0.2s – 59s	0 = OFF	
61	Kick pause	10 min – 60 min	30 min	
62	Measuring time for 0.5K increase	1 min – 5 min	1 min	
	Production estimate/Volume flow counter			
70	Pulse rate [milliliter/pulse] or [liter/pulse]	0– 100	1.1	
71	Pulse rate unit (0=ml/pulse; 1=l/pulse)	0.1	0 (ml/pulse)	
72	Volume flow distribution with 2 collector system	1:99 – 99:1	50:50	
75	Volume flow fix for collector 1 [liter/min]	0-100	0.0 = OFF	
76	Volume flow fix for collector 2 [liter/min]	0-100	0.0 = OFF	
78	Mixing ratio	0 – 70 vol. %	40 %	
79	Glycol type	0 – 1	0	

In order to modify the standard settings, refer to the chapter "Electrical connections", select the relevant system according to the hydraulic systems illustrated and define these settings first of all [P22].

The chapter "Explanation of set values / functions" describes the various set values according to their dependence on the selected/realized system (1-7).

If the controller, e.g. for System 1 is used, only refer to the function descriptions related to this system.

User set values

01 Set time

All systems:

Set the current time.
(Indicators, pump kick function and reheating function.)

02 Weekday


All systems:

Set the current weekday (1-7, 1=Monday)
(Display only)

Resetting the production indicators


03 Day's production indicator

System 1, 3, 4, 5, 6, 7 (System 2 -> no function):

Reset the value to "0000" by pressing the Prog key  (for at least 2 seconds). The value is reset to "0000" at 24h.

04 Total production indicator

System 1, 3, 4, 5, 6, 7 (System 2 -> no function):

This value is updated at 24:00. => To determine the current total value accurately, the day's production value must be added to the "indicated" total production value. Reset the value to "0000" by pressing the Prog key  (for at least 2 seconds).

Pump kick function (temperature test function)

System 1, 3, 4, 5, 6, 7 (System 2 -> no function):

The pump kick function can be executed during the time period of the day in which solar production is expected [P05-P06]. This function should ensure that the actual collector temperature can be measured by the collector sensor even when the collector pumps are not operating. The function is deactivated when P05=P06="----" or P60=0.

Each time the kick pause [P61] has ended, the corresponding collector pump is activated for the period of the kick duration [P60] (heat transport to the sensor). If a temperature increase of 0.5K is detected on the respective collector sensor during the measuring period [P62], the collector pump is activated for one minute. Finally, the switch-on conditions for the collector pump are checked.

05 Pump kick function switch-on time

(Refer to Chapter "Pump kick function")

06 Pump kick function switch-off time

(Refer to Chapter "Pump kick function")

Reheating function

System 6 only (Systems 1, 2, 3, 4, 5, 7 -> no function):

On selecting System 6, it is possible to enter a set temperature value [P42] for the storage tank. During the enable time [P07-P08], this temperature is set by activating an additional heat generator. The additional heat generator is activated when the set temperature falls P42 below the hysteresis P33. It is deactivated when the set temperature P42 is reached.

07 Reheating function ON

(Refer to Chapter "Reheating function")

08 Reheating function OFF

(Refer to Chapter "Reheating function")

Fitter – set values

20 Enter code no.

After entering the code number, the set values assigned to the fitter level can be modified.

Standard value: 0000

21 Valid code no.

The code number currently valid can be modified with this setting.

(Value only visible after entering the currently valid code no.)

22 System selection (see appended diagrams)

On selecting the system, the function of the device is redefined. Set the system number according to the connection descriptions (System 1 – System 7).

! After changing the System Selection parameter, all the set values are reset to the default factory values (including the code no.).
The fitter level is closed.

Switching thresholds / Hystereses

30 Switching threshold for difference 1

System 1, 2, 3, 4, 5, 6, 7:

The feeding function for storage tank I via pump A1 is activated when the temperature difference between sensor F1 (collector) and sensor F4 (bottom of tank) has exceeded the temperature [switching threshold + hysteresis = $P30+P31$].

The feeding function for storage tank I is deactivated when the difference falls below the set switching threshold.

31 Hysteresis to switching threshold for difference 1

(See P30)

32 Switching threshold for difference 2

Systems 1, 2, 6:

No function

Systems 4, 3:

The feeding function via pump A2 is activated when the temperature difference between sensor F2 (solid fuel / collector II) and sensor F4 (bottom of tank) has exceeded the temperature [switching threshold + hysteresis = $P32+P33$].

The feeding function is deactivated when the difference falls below the set switching threshold.

System 5:

The feeding function for storage tank II via pump A1 is activated when the temperature difference between sensor F1 (collector) and sensor F3 (storage tank II) has exceeded the temperature [switching threshold + hysteresis = $P32+P33$].

The feeding function for storage tank II is deactivated when the difference falls below the set switching threshold.

The valve A2 is switched in the direction of storage tank II when the feeding function for storage tank II is enabled and storage tank I cannot be fed.

System 7:

The discharging function via valve A2 is activated when the temperature difference between sensor F2 (heating system return flow) and sensor F4 (bottom of tank) has exceeded the temperature [switching threshold + hysteresis = $P32+P33$]. If a sensor F3 (top of tank) is connected, this sensor is used, instead of F4, to evaluate the difference.

The charging function is deactivated when the difference falls below the set switching threshold.

33 Hysteresis to switching threshold for difference 2

(See P32)

Special functions**40 Enable temperature, collector**

System 1, 3, 4, 5, 6, 7 (System 2 -> no function):

The collector pump is activated when the associated collector temperature exceeds the limit value set here by 5 K. It is stopped when the collector temperature falls below the threshold temperature. This function prevents the pumps continuing to run when no relevant heat production is required.

41 Maximum collector temperature

System 1, 3, 4, 5, 6, 7 (System 2 -> no function):

The collector pumps are deactivated when the related collector temperatures exceed the safety limits set here. -> System protection
The pumps are reactivated when the temperature falls below the temperature [maximum collector temperature – 10K].

42 Enable temperature of 2nd heat generator (solid fuel)

System 1, 4, 5, 7:

No function

Systems 2, 3:

The relevant pumps are activated when the temperature of

the 2nd heat generator (System 2 = F1, System 3 = F2) exceeds the limit value set here by 5K. It is stopped when the temperature of the heat generator drops below the enable temperature. This function ensures that the heat generator can reach its operating temperature.

System 6:

The 2nd heat generator (A2) is enabled when the storage tank temperature at F3 falls 5K below the limit temperature set here. It is stopped when the temperature of the storage tank exceeds the enable temperature.

43 Maximum solid fuel boiler temperature

Systems 1, 4, 5, 6, 7:

No function

Systems 2, 3:

The charge pump of the solid fuel boiler is deactivated when the temperature of the boiler exceeds the limit temperature set here. -> System protection.

The pump is reactivated when the, temperature falls 10 K below the limit value.

System 5:

Storage tank II (A2) is no longer fed when the storage tank temperature exceeds the safety limit set here.-> System protection.

The storage tank continues to be fed when the temperature falls below the value [P10 = "maximum solid fuel temperature" – 5K].

50 Maximum storage tank temperature, tank I

△ If a top of tank sensor (F3) is mounted, it is used to monitor the maximum temperature. If this sensor is not installed, the maximum storage tank temperature is monitored by F4. In this case, the tank covering must be taken into account.

System 1, 2, 3, 4, 6, 7:

The charge pumps are deactivated when the temperature of storage heater I exceed the safety limit temperature set here.-> System protection

The pumps are reactivated when the temperature falls below the temperature [maximum storage tank temperature – 5K].

System 5:

The valve A2 is set towards the second storage heater (relay A2 closes) when the temperature of the first storage heater exceeds the safety limit set here. The mixer closes again (relay opens) when the temperature falls below the temperature [maximum storage tank temperature – 5K].

51 Maximum storage tank temperature, tank II

System 5 only (Systems 1, 2, 3, 4, 6, 7 -> no function):

Charge pump A1 is stopped when the temperature of storage heater II exceeds the safety limits set here and storage tank I cannot be fed (A2 set towards storage tank II). -> System protection
The pump is reactivated when the temperature falls below the temperature [maximum storage tank temperature – 5K].

52 Tolerance with solar production

System 6 only (Systems 1, 2, 3, 4, 5, 7 -> no function):

If the storage tank is fed from the collector (A1 = ON), the additional heat generator is only activated when the storage tank temperature falls below the set temperature P42 by the value [tolerance amount + P33]. It is deactivated again when the storage tank temperature has reached the value [set temperature P42 – tolerance value].

Hot water short time heating function

System 6 only (Systems 1, 2, 3, 4, 5, 7 -> no function):

Each Saturday at 1:00 a.m., the storage tank is heated to 65 °C in a one-off action. This function is only performed when the storage tank temperature of 65 °C was not reached during the previous week. The temperature is monitored by sensor F4 "bottom of storage heater".

The hot water short time heating function is stopped when the set temperature cannot be reached within 3 hours or when the programmed maximum storage temperature (**at least 65°C**) is detected at sensor F3 (only when installed).

⚠ The hot water short time heating function can only be successfully performed when the external heat generator (reheating function) is capable of generating the corresponding temperatures.

Hot water short time heating function 53

0 = Function not active (standard)

1 = Function active

Pump kick function (temperature test function)

System 1, 3, 4, 5, 6, 7 (System 2 -> no function):

60 Kick duration [sec]

Collector pump runtime following pump kick.

61 Kick pause [min]

If the collector pump has not run for the duration set here, the pump is activated for the kick duration period [P 60].

62 Measuring time for 0.5 K increase [min]

The course of the collector temperature is controlled during this period following a pump kick. If an increase of 0.5K is detected, the pump is started for a further minute.

Production estimate / Volume flow counter

System 1, 3, 4, 5, 6, 7 (System 2 -> no function):

While collector pump is running, the pulses of an optionally connectable flow rate counter can be evaluated (see Connection Plan: Pulse).

The controller can calculate the solar heat production from the volume flow established (entry of the counter pulse rate in P70) and the temperature difference F1 to F4.

! Systems 1, 5, 6: If the sensor F2 is installed as a return flow sensor for the collector in these systems, the temperature difference between F1 – F2 is calculated.

! System 4: In the case of System 4, the calculation is made for both collectors according to the heat production. If both collector pumps are in operation, the heat flows are calculated according to the ratio of the volume flows [P72].

For the calculation, the heat transport medium used in the system (glucol type = P79) and the mixture ratio with water [P78] must be set.

The day's production and total production are displayed in [kWh]; in the case of values in excess of 10 MW, the display of the total production changes to [MWh]. The change is indicated in the display by means of three arrows. The day's production is reset to zero at midnight. Both values can be reset to zero at user level by means of the Prog key.

! If no pulse counter is connected, a **production estimate** can be executed. To do this, enter the average volume flow through the respective collector when the charging pump is in operation [P75+P76]. The volume flow can be established by installing a counter for a short time or by calculation (installation technician).

Guideline for volume flow quantity:

Approx. 0.8 [l / min] sq. meter of collector surface.

△ Caution! This value does not apply to low flow systems.

70 pulse rate [milliliter/pulse] [liter/pulse]

(Only with volume flow counter)

Refer to the flow rate counter documents for the pulse rate of the counter connected (option).

71 Set pulse rate unit

(Only with volume flow counter)

Switching between [ml/pulse] and [l/pulse].

72 Volume flow distribution with 2 collector system

(System 4 only):

Enter the ratio of the volume flows through the two collectors in case both charging pumps are in operation.

75 Volume flow fix for collector 1 [liter/min]

(Only without volume flow counter - see "Production estimate")

76 Volume flow fix for collector 2 [liter/min]

(Only without volume flow counter - see "Production estimate")

78 Mixture ratio

System 1, 3, 4, 5, 6, 7 (System 2 -> no function):

Refer to the documents supplied for information on the mixture ratio of the heat transport medium (filling of the solar energy system) or ask the installation technician.

79 Glycol type

Systems 1, 3, 4, 5, 6 (System 2 -> no function):

(Solar-electricity system documents / installation technician)

0 = Propylene glycol

1 = Ethylene glycol

Pump blocking protection

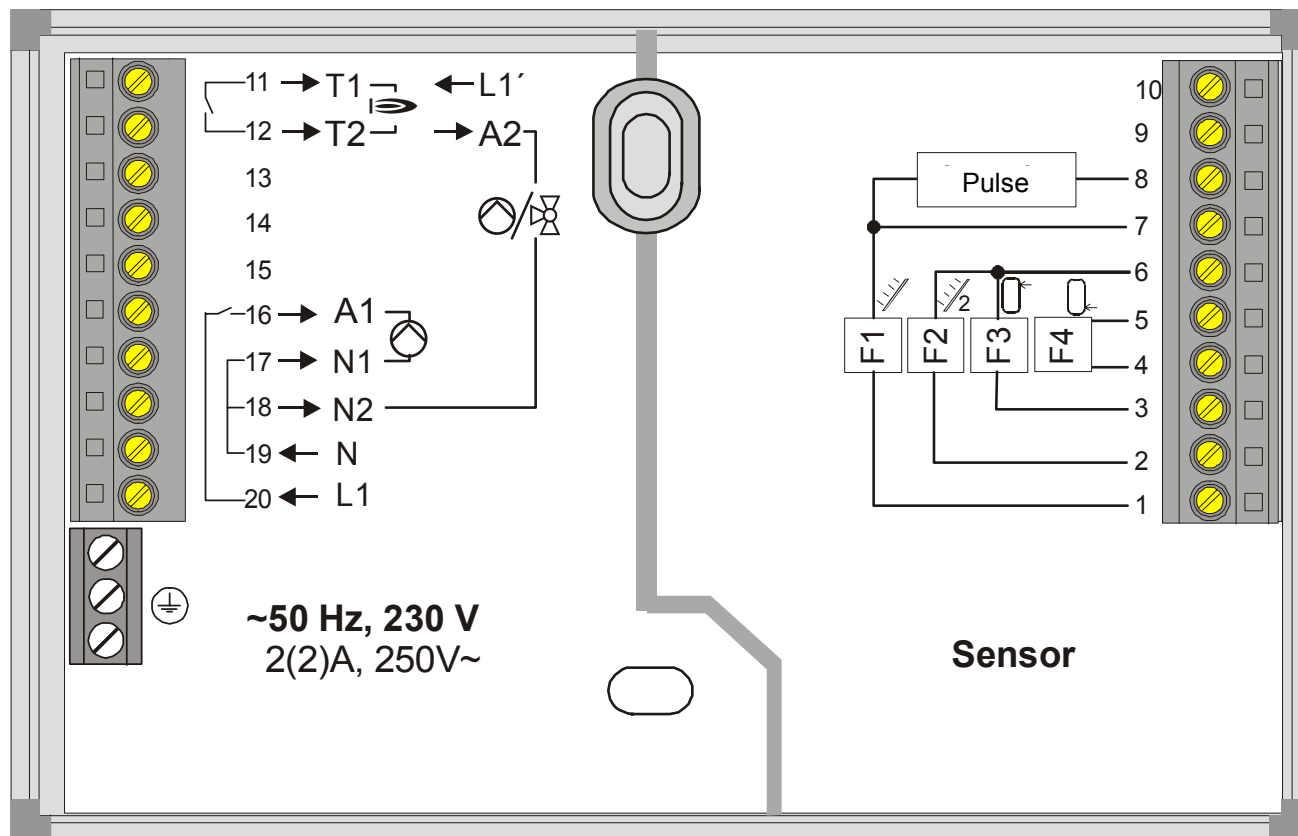
The controller effectively prevents the pumps blocking following longer periods out of operation. The integrated protection function activates all the pumps which have not operated within the last 24 hours each day for approx. 5 seconds between 12:00 and 12:01.

Stop pumps (temperature control)

(System 5 only)

Filling of the secondary storage tank (sensor F3) is interrupted for 60 sec. every 30 minutes. After the interruption period, the start conditions for filling the primary storage tank (sensor F4) are checked.

This function is only executed when the highest priority storage tank has not reached its maximum storage tank temperature [F4 < (P50-5K)].



System 1

230V~; Switching capacity of relays 2(2)A, 250V~

Mains power:

- 20 Supply to device and pump A1
- 19 N-conductor for device
- 17 N-conductor for collector pump (A1)
- 16 Supply connected to collector pump L1' (A1)

Sensors:

- 1+7 Collector sensor (F1)
- 4+5 Sensor, bottom of storage tank (F4)

Optional:

- 2+6 Return flow sensor for production indicator (F2)
- 3+6 Sensor, top of storage tank (F3)
- 7+8 Pulse input for volume flow counter

Switching conditions for A1 (P = set value):

Heat production \Leftrightarrow difference to storage tank and min. temp.:

ON: $F1 - F4 > P30 + P31$ and $F1 > P40 + 5K$

OFF again: $F1 - F4 < P30$ or $F1 < P40$

Maximum storage tank temperature:

OFF: $F4 > P50$

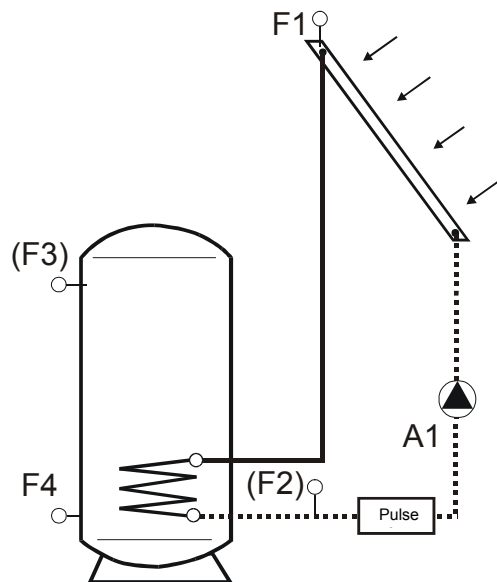
ON again: $F4 < P50 - 5K$

Maximum collector temperature:

OFF: $F1 > P41$

ON again: $F1 < P41 - 10K$

Sensor => F1+F2: KLF1000; F4+F3: SPF1000



System 2

230V~; Switching capacity of relays 2(2)A, 250V~

Mains power:

- 20 Supply to device and pump A1
- 19 N-conductor for device
- 17 N-conductor for solid fuel boiler charging pump (A1)
- 17 Supply connected to solid fuel boiler charging pump L1' (A1)

Sensors:

- 1+7 Sensor, solid fuel boiler (F1)
- 4+5 Sensor, bottom of storage tank (F4)

Optional:

- 3+6 Sensor, top of storage tank (F3)

Switching conditions for A1 (P = set value):

Heat production \Leftrightarrow difference to storage tank and min. temp.:

ON: $F1 - F4 > P30 + P31$ and $F1 > P42 + 5K$

OFF again: $F1 - F4 < P30$ or $F1 < P42$

Maximum storage tank temperature:

OFF: $F4 > P50$

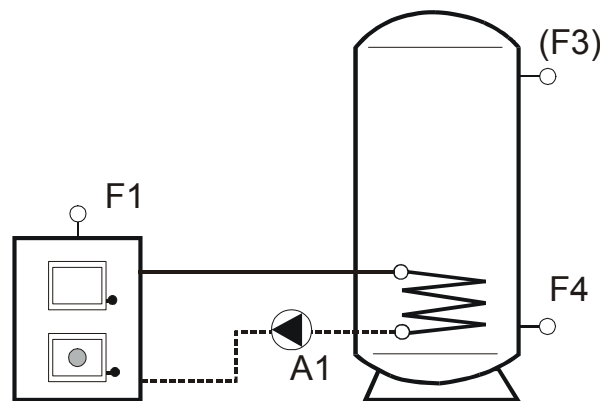
ON again: $F4 < P50 - 5K$

Maximum solid fuel boiler temperature:

OFF: $F1 > P43$

ON again: $F1 < P43 - 10K$

Sensor => F1: KLF1000; F3+F4: SPF1000



System 3

230V~; Switching capacity of relays 2(2)A, 250V~

Mains power:

- 20 Supply to device and pump A1
- 19 N-conductor for device
- 18 N-conductor for solid fuel boiler charging pump (A2)
- 17 N-conductor for collector pump (A1)
- 16 Supply connected to collector pump L1' (A1)
- 12 Supply connected to solid fuel boiler charging pump L1' (A2)
- 11 Supply for pump (A2) (e.g. bridge to 20)

Sensors:

- 1+7 Collector sensor (F1)
- 2+6 Sensor, solid fuel boiler (F2)
- 4+5 Sensor, bottom of storage tank (F4)

Optional:

- 3+6 Sensor, top of storage tank (F3)
- 7+8 Pulse input for volume flow counter

Switching conditions for A1 (P = set value):

Heat production \Leftrightarrow difference to storage tank and min. temp.:

ON: $F1 - F4 > P30 + P31$ and $F1 > P40 + 5K$

OFF again: $F1 - F4 < P30$ or $F1 < P40$

Maximum storage tank temperature:

OFF: $F4 > P50$

ON again: $F4 < P50 - 5K$

Maximum collector temperature:

OFF: $F1 > P41$

ON again: $F1 < P41 - 10K$

Switching conditions for A2:Heat production - difference to tank and min. temp.:

ON: $F2 - F4 > P32 + P33$ and $F2 > P42 + 5K$

OFF again: $F2 - F4 < P32$ or $F2 < P42$

Maximum storage tank temperature:

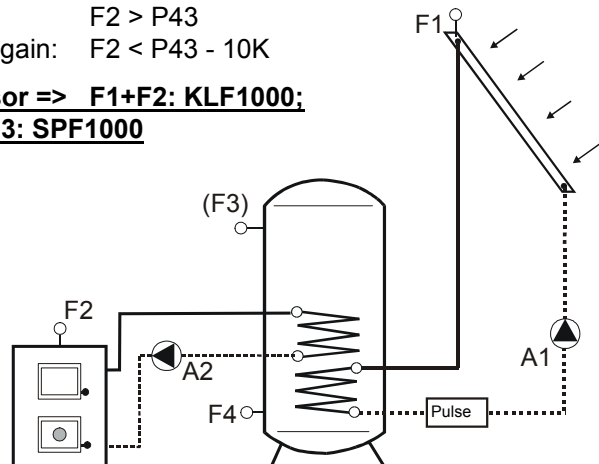
OFF: $F4 > P50$

ON again: $F4 < P50 - 5K$

Maximum solid fuel boiler temperature:

OFF: $F2 > P43$

ON again: $F2 < P43 - 10K$

Sensor => F1+F2: KLF1000;**F4+F3: SPF1000**

System 4

230V~; Switching capacity of relays 2(2)A, 250V~

Mains power:

- 20 Supply to device and pump A1
- 19 N-conductor for device
- 18 N-conductor for collector pump (A2)
- 17 N-conductor for collector pump (A1)
- 16 Supply connected to collector pump L1' (A1)
- 12 Supply connected to collector pump L1' (A2)
- 11 Supply for pump (A2) (e.g. bridge to 20)

Sensors:

- 1+7 Collector sensor (F1)
- 2+6 Collector sensor (F2)
- 4+5 Sensor, bottom of storage tank (F4)

Optional:

- 3+6 Sensor, top of storage tank (F3)
- 7+8 Pulse input for volume flow counter

Switching conditions for A1 (P = set value):

Heat production ⇔ difference to storage tank and min. temp.:

- ON: $F1 - F4 > P30 + P31$ and $F1 > P40 + 5K$
- OFF again: $F1 - F4 < P30$ or $F1 < P40$

Maximum storage tank temperature:

- OFF: $F4 > P50$
- ON again: $F4 < P50 - 5K$

Maximum collector temperature:

- OFF: $F1 > P41$
- ON again: $F1 < P41 - 10K$

Switching conditions for A2:

Heat production difference to storage tank and min. temp.:

- ON: $F1 - F4 > P32 + P33$ and $F1 > P40 + 5K$
- OFF again: $F1 - F4 < P32$ or $F1 < P40$

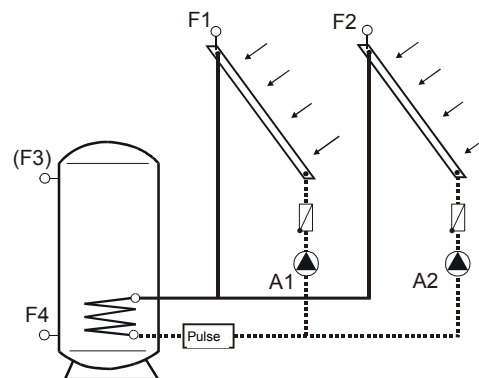
Maximum storage tank temperature:

- OFF: $F4 > P50$
- ON again: $F4 < P50 - 5K$

Maximum collector temperature:

- OFF: $F1 > P41$
- ON again: $F1 < P41 - 10K$

Sensor => F1+F2: KLF1000; F4+F3: SPF1000



System 5

230V~; Switching capacity of relays 2(2)A, 250V~

Mains power:

- 20 Supply to device and pump A1
 - 19 N-conductor for device
 - 18 N-conductor for reversing valve (A2)
 - 17 N-conductor for collector pump (A1)
 - 16 Supply connected to collector pump L1' (A1)
 - 12 Supply connected to reversing valve L1' (A2)
 - 11 Supply for reversing valve (A2)
- (e.g. bridge to 20)

Sensors:

- 1+7 Collector sensor (F1)
- 4+5 Sensor, bottom of storage tank I (F4)
- 3+6 Sensor, bottom of storage tank II (F3)

Optional:

- 2+6 Return flow sensor for production indicator (F2)
- 7+8 Pulse input for volume flow counter

Switching conditions for A1 (P = set value):

Heat production ⇔ difference to storage tank and min. temp.:

ON:

- $F1 - F4 > P30 + P31$ and $F1 > P40 + 5K$ or
- $F1 - F3 > P32 + P33$ and $F1 > P40 + 5K$

OFF again:

- $F1 - F4 < P30$ and $F1 - F3 < P32$ or
- $F1 < P40$

Maximum storage tank temperature:

- OFF: $F4 > P50$ and $F3 > P51$
- ON again: $F4 < P50 - 5K$ or $F3 < P51 - 5K$

Maximum collector temperature:

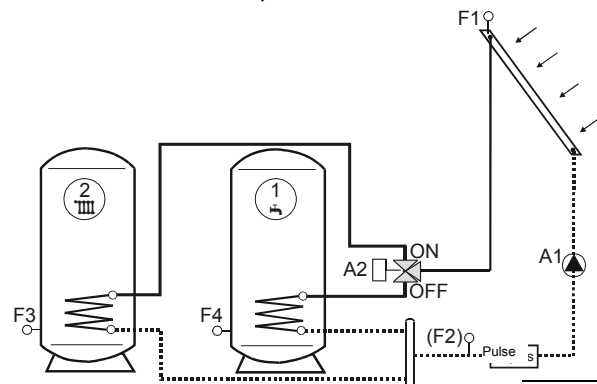
- OFF: $F1 > P41$
- ON again: $F1 < P41 - 10K$

Switching conditions for A2:

Maximum storage tank temperature:

- ON: $A1 = \text{ON}$ and $F4 > P50$ or
- $A1 = \text{ON}$ and $F1 - F4 < P30$
- OFF again: $A1 = \text{OFF}$ or $F4 < P50 - 5K$ or
- $F1 - F4 > P30 + P31$

Sensor => F1+F2: KLF1000; F4+F3: SPF1000



System 6

230V~; Switching capacity of relays 2(2)A, 250V~

Mains power: Heat generator contact potential-free

- 20 Supply to device and pump A1
- 19 N-conductor for device
- 17 N-conductor for collector pump (A1)
- 16 Supply connected to collector pump L1' (A1)
- 12 T1 for boiler request (A2)
- 11 T2 for boiler request (A2)

Mains power: Heat generator contact, potential linked 230V

- 20 Supply to device and pump A1
- 19 N-conductor for device
- 18 N-conductor for additional heating (A2)
- 17 N-conductor for collector pump (A1)
- 16 Supply connected to collector pump L1' (A1)
- 12 Supply connected to additional heating L1' (A2)
- 11 Supply for additional heating (A2)
(e.g. bridge to 20)

Sensors:

- 1+7 Collector sensor (F1)
- 4+5 Sensor, bottom of storage tank (F4)
- 3+6 Sensor, top of storage tank (F3)

Optional:

- 2+6 Return flow sensor for production indicator (F2)
- 7+8 Pulse input for volume flow counter

Switching conditions for A1 (P = set value):

Heat production ⇔ difference to storage tank and min. temp.:

ON: $F1 - F4 > P30 + P31$ and $F1 > P40 + 5K$

OFF again: $F1 - F4 < P30$ or $F1 < P40$

Maximum storage tank temperature:

OFF: $F4 > P50$

ON again: $F4 < P50 - 5K$

Maximum collector temperature:

OFF: $F1 > P41$

ON again: $F1 < P41 - 10K$

Switching conditions for A2 (P=Parameter):

Heat production ⇔ fallen below set temperature:

No solar production: A1 = OFF:

ON: $F3 < P42 - P33$

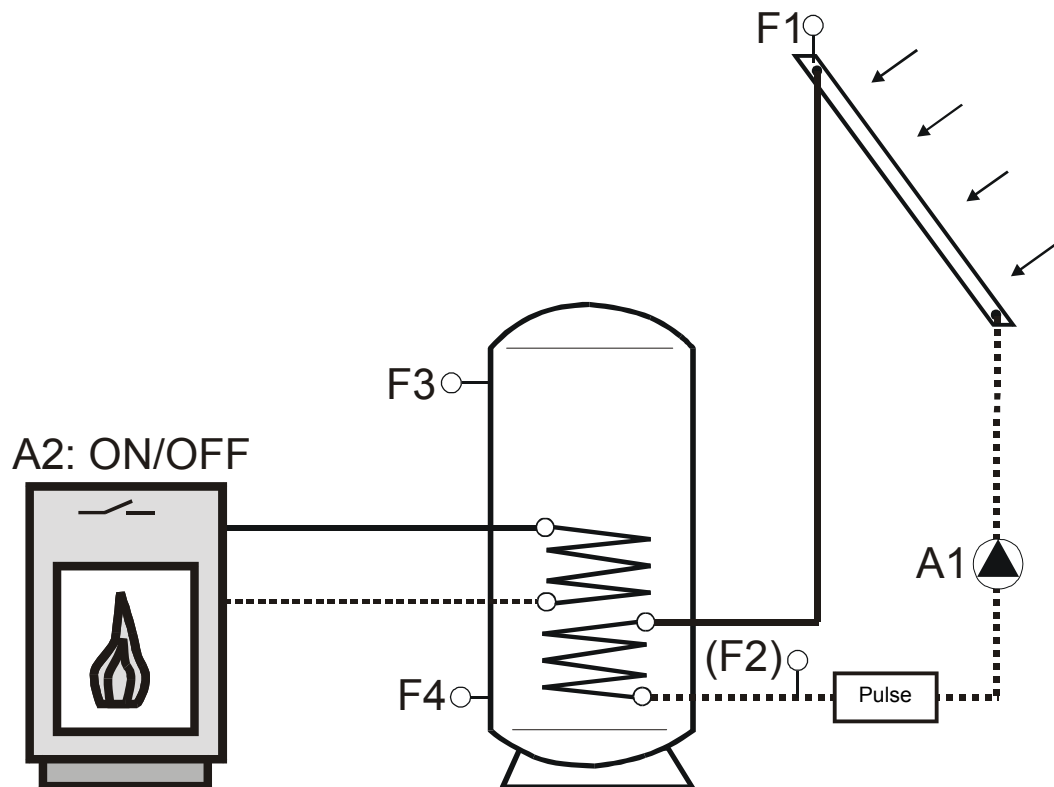
OFF again: $F3 \geq P42$

With solar production: A1 = ON:

ON: $F3 < P42 - P52 - P33$

OFF again: $F3 \geq P42 - P52$

Sensor => F1+F2: KLF1000; F4+F3: SPF1000

System 6:

System 7

230V~; Switching capacity of relays 2(2)A, 250V~

Mains power:

- 20 Supply to device and pump A1
- 19 N-conductor for device
- 18 N-conductor for reversing valve RLA (A2)
- 17 N-conductor for collector pump (A1)
- 16 Supply connected to collector pump L1' (A1)
- 12 Supply connected to reversing valve L1' (A2)
- 11 Supply for reversing valve RLA (A2)
(e.g. bridge to 20)

Sensors:

- 1+7 Collector sensor (F1)
- 2+6 Return flow sensor, heating system (F2)
- 4+5 Sensor, bottom of storage tank (F4)

Optional:

- 3+6 Sensor, top/middle of storage tank (F3)
- 7+8 Pulse input for volume flow counter

Switching conditions for A1 (P = set value):

Heat production ⇔ difference to storage tank and min. temp.:

ON: $F1 - F4 > P30 + P31$ and $F1 > P40 + 5K$

OFF again: $F1 - F4 < P30$ or $F1 < P40$

Maximum storage tank temperature:

OFF: $F4 > P50$

ON again: $F4 < P50 - 5K$

Maximum collector temperature:

OFF: $F1 > P41$

ON again: $F1 < P41 - 10K$

Switching conditions for A2:

Return flow temperature increase (without F3):

ON: $F4 > F2 + P32 + P33$

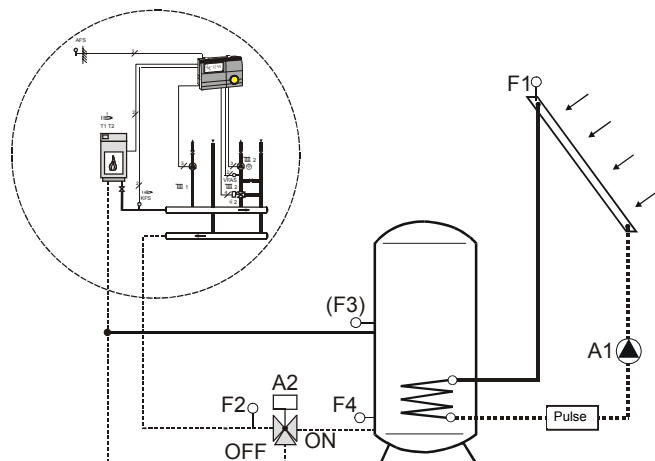
OFF again: $F4 < F2 + P32$

Return flow temperature increase (with F3):

ON: $F3 > F2 + P32 + P33$

OFF again: $F3 < F2 + P32$

Sensor => F1+F2: KLF1000; F4+F3: SPF1000



F1 + F2:

KLF 1000: collector sensor without spring;
silicone cable 2.5 m;
PT1000 sensor with 1 k Ω +/- 0.2% at 0 °C:

Temperature in °C	Resistance in Ω
-20	922
-10	961
0	1,000
10	1,039
20	1,078
30	1,118
40	1,155
50	1,194
60	1,232
70	1,270
80	1,309
90	1,347
100	1,385
110	1,422
120	1,460

F3 + F4:

SPF 1000: Storage tank sensor with spring;
PVC cable, 3.0 m;
PT1000 sensor with 1 k Ω +/- 0.2% at 0 °C:

Technical data

Supply voltage complying with DIN IEC 60 038	230 V AC ± 10%
Power consumption	Max 5 VA
Switching capacity of the relays	250 V 2(2) A
Maximum current on terminal L1'	6.3 A
Type of protection complying with DIN EN 60529	IP 40
Protection class complying with DIN EN 60730	Totally insulated
Power reserve of the timer	> 10 hours
Permitted ambient temperature during operation	0 to 50°C
Permitted ambient temperature for storage	-30 to 60°C
Sensor resistances	PT1000, 1KΩ +/- 0.2% at 0°C

If an error occurs, the \triangle symbol appears in the display and the associated error number appears, flashing.

On pressing the three operating keys simultaneously, the parameters are reset to their default factory settings.

No.	Designation	Significance
Sensor fault		
E 71	Collector sensor F1 defect	The collector sensor has short circuited or there is an interruption.
E 72	Storage tank sensor top F3 defect	The storage tank sensor has short circuited or there is an interruption.
E 73	Storage tank sensor bottom F4 defect	The storage tank sensor has short circuited or there is an interruption.
E 79	Additional sensor F2 defect	The additional sensor F2 has short circuited or there is an interruption.
E 81	EEprom	A fault has occurred in the EEprom. Please check values.

Functional defects resulting from incorrect operation or settings are excluded from the terms of warranty.